

SUPREME COURT OF THE STATE OF NEW YORK
COUNTY OF BROOME

JAMES L. and BARBARA A. FURCH,
 et al.,

Plaintiffs,

Vs.

Index No. 1370/1982

RJI No. 86-1107-M

GENERAL ELECTRIC COMPANY, et al.

Defendants.

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VOLUME II

DEPOSITION OF WILLIAM B. PAPAGEORGE, P.E.
 On behalf of Plaintiffs
 April 28, 1999

GATEWAY REPORTING ASSOCIATES, INC.
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Gateway Reporting Associates, Inc.

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GENERAL ELECTRIC COMPANY, et al.

Defendants.

CONTINUED DEPOSITION OF WILLIAM B. PAPAGEORGE, P.E., produced, sworn and examined on behalf of the Plaintiffs, April 28, 1999, between the hours of eight o'clock in the forenoon and six o'clock in the afternoon of that day, at the offices of Husch & Eppenberger, 100 North Broadway, St. Louis, Missouri, before FAITH A. OLLIGES, a Registered Professional Reporter and a Notary Public within and for the State of Missouri.

A P P E A R A N C E S

Plaintiffs were represented by Mr. Kevin F. McDonough of the law firm of Ball, McDonough, Artz & Farnetti, 117 Hawley Street, Binghamton, New York 13902-1740.

Defendant Monsanto was represented by Mr. John C. Sabetta of the law firm of Seyfarth, Shaw, Fairweather & Geraldson, 1270 Avenue of the Americas, Suite 2500, New York, New York 10020-1801 and Mr. Timothy Peck of the law offices of Smith, Helms, Mulliss & Moore, L.L.P., Suite 1400 300 North Greene Street, Greensboro, NC 27420.

Defendant General Electric was represented by Mr. Eric E. Grondahl of the law offices of Cummings & Lockwood, CityPlace I, 185 Asylum Street, Hartford, Connecticut 06103-3495.

Also present was Plaintiff James Furch.

1 WILLIAM B. PAPAGEORGE, P.E.,
2 of lawful age, being produced, reminded of his oath, and
3 examined on the part of the Plaintiffs, deposes and
4 says:

5 CONTINUED DIRECT EXAMINATION

6 QUESTIONS BY MR. McDONOUGH:

7 Q. Good morning, Mr. Papageorge.

8 A. Good morning.

9 Q. I remind you you're still under oath, and
10 I'd like to ask you a few more questions if I can.

11 A. I'm ready.

12 Q. Would you please put that book of exhibits
13 in front of you again and open it up to tab 14, if you
14 would?

15 A. I have it.

16 Q. All right. We've placed an exhibit tag on
17 that exhibit as 392; is that correct?

18 A. Yes.

19 Q. 392 purports to be a March 3rd, 1969
20 correspondence over the typed signature of Elmer Wheeler
21 on Monsanto Company letterhead with no addressee; is
22 that correct?

23 A. That is correct.

24 Q. Have you seen this document before?

25 A. Yes, I have.

1 Q. What is it?

2 A. This is a copy of a letter composed by
3 Mr. Wheeler and sent to many customers of Monsanto's
4 PCBs.

5 Q. How did it come about that you happened to
6 see it?

7 A. During my tutorial, and I forget at what
8 point in the period, Mr. Wheeler showed me a copy. That
9 was my first exposure to it.

10 Q. And this would be the tutorial that took
11 place in the first month or two after your employment in
12 I think you said January of 1970?

13 A. That's correct.

14 Q. And do you know whether General Electric
15 received a copy of this?

16 A. I understand they did.

17 Q. Did Monsanto ever keep a list of addressees
18 of correspondence such as this?

19 A. Normally they do. I cannot speak for this
20 particular...

21 Q. And what department or individual at
22 Monsanto would be in charge of transmittal of such
23 matters and keeping of the list?

24 A. The assignment of the subject matter to be
25 covered varies depending on what the subject is and who

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1 is in the position to know the most about it. Once that
2 person is appointed to do that assignment, it's up to
3 him or her to keep the records.

4 Q. Do you know whether Mr. Benignus might have
5 played a role in this?

6 A. When you say "might," that's possible. I
7 don't know.

8 Q. Well, do you know anybody else, any other
9 name at Monsanto that might have played a role in the
10 sending out of this document?

11 MR. SABETTA: Object to the form.

12 A. Again, when you say "might" --

13 Q. Well, remove "might". Who probably would
14 have played a role in sending out this document?

15 A. I would suggest that the group that we
16 referred to earlier as the Ad Hoc PCB Committee, I think
17 we did. Nevertheless, there were some individuals
18 involved with addressing the subject of PCBs in the
19 environment. That would appear to me to be a logical
20 group to participate in the decision to send the letter
21 and what should be contained in that letter.

22 Q. Did you ever see any written practice or
23 procedure with respect to sending correspondence to
24 customers with respect to this PCB matter?

25 A. No, I have not.

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1 Q. Do you know if any such practice or
2 procedure in writing exists?

3 A. I have never seen one. I do not know.

4 Q. Would you turn to tab 15 for me, please?
5 Has that exhibit been marked with a 392 exhibit tag?

6 A. Yes.

7 MR. SABETTA: 393.

8 A. I'm sorry.

9 Q. Exhibit 393 purports to be a memo from W.
10 R. Richard to E. Wheeler, dated March 6th, 1969,
11 "Aroclor Wildlife Accusations"; is that correct? That's
12 what it appears to be?

13 A. That is correct.

14 Q. Have you seen that document before?

15 A. Yes, I have.

16 Q. And how did it come about that you saw that
17 document?

18 A. Mr. Wheeler gave me a copy in January of
19 1970.

20 Q. Was this document in that two three-ring
21 binders that you told us about yesterday?

22 A. I don't recall it as being part of the
23 collection of documents in that binder. This most
24 likely was a separate contribution to my information
25 that I was accumulating.

1 Q. Was Exhibit 392 also most likely a separate
2 document from that two three-ring binders?

3 A. Yes.

4 Q. What was contained in the two three-ring
5 binders? Was it a particular sort of material?

6 MR. SABETTA: Objection as asked and
7 answered. You can answer it again.

8 A. It consisted primarily of what I'm going to
9 call medical-type information, toxicology reports,
10 exposure limits, that kind of subject matter.

11 Q. Were all the documents prepared by Monsanto
12 employees that you saw yesterday during our deposition
13 and these two, 392 and 393, made and kept by Monsanto in
14 the ordinary course of their business?

15 MR. SABETTA: Objection to the form.

16 A. Yes.

17 Q. If you look at the second page of Exhibit
18 392 at the bottom --

19 MR. SABETTA: You're saying 392. I think
20 you mean 393.

21 Q. I'm sorry. Yes. 393. If you look at the
22 second page of 393 at the bottom, the last entry says,
23 "Well-prepared discussions with Industrial Bio-Test,
24 Monsanto's biochemist, the Medical and Legal Departments
25 must take place now." Do you see that?

1 A. Yes, I do.

2 Q. Do you know if such discussions did take
3 place?

4 A. Certainly. Yes, they did.

5 Q. Did you participate in any discussions with
6 Industrial Bio-Test, the Monsanto chemists, the Medical
7 and Legal Departments where they were all together on
8 this PCB matter?

9 A. I don't recall a meeting in which all of
10 these that are listed here were present at the same
11 time.

12 Q. How about any grouping of two or more of
13 those entities, Industrial Bio-Test, Monsanto's
14 biochemist, the Medical and Legal Department? Did you
15 participate in any meetings with two or more of those
16 groups?

17 A. Yes.

18 Q. How many such meetings?

19 A. I never kept score, sir. It's part of my
20 job. I did it often.

21 Q. If we limit it to the group Medical and
22 Legal Departments, did you meet with them in a meeting?

23 A. Occasionally. I'm assuming you mean them
24 at the same time?

25 Q. Yes.

1 A. Occasionally.

2 Q. Was there a regularity to those meetings?

3 MR. SABETTA: Objection to form.

4 A. By regularity, you mean a certain day and
5 hour, week and so on?

6 Q. No. How did it come about that you met
7 with the Legal and Medical Department together?

8 MR. SABETTA: Object to the form.

9 A. It only happened when whoever called the
10 meeting decided that the presence of the other
11 profession would be helpful in the discussion, and
12 depended on whether the legal person called a session or
13 the medical person called the session.

14 Q. Were there agendas for these meetings in
15 writing?

16 A. No.

17 Q. Were there minutes kept of these meetings?

18 A. No.

19 Q. Who in the Legal Department did you most
20 often deal with on this PCB matter?

21 A. There again, I did not keep a score on the
22 number of times, but there were several attorneys in
23 Monsanto, and whoever was available would show up. I
24 didn't keep score.

25 Q. Aside from whether you kept score or not,

1 was there a certain attorney or more than one attorney
2 that participated in PCB matters at Monsanto?

3 MR. SABETTA: Objection to form.

4 A. There was more than one.

5 Q. Can you give me the names?

6 A. Yes. I'll try to remember them. Phocian
7 Park was one.

8 Q. I'm sorry?

9 A. P-H-O-C-I-A-N P-A-R-K. I'm trying to
10 remember the name of the other attorney. Stapleton was
11 his surname, S-T-A-P-L-E-T-O-N. There was a third one,
12 Tom. His name doesn't come to mind.

13 Q. Is that it?

14 A. As best I can remember, yes, sir.

15 Q. Do you know if any of these gentlemen still
16 work for Monsanto? I'm assuming they are all gentlemen.
17 Maybe I'm --

18 A. Yes, they are males. I don't believe any
19 of them are still working for Monsanto.

20 Q. Do you know if they still are alive and
21 live in the St. Louis area?

22 A. To the best of my knowledge, yes.

23 Q. Would you turn to tab 16 for me, please?
24 We've marked as Exhibit 394 a memo on Monsanto
25 letterhead over the signature of P. G. Benignus, dated

1 March 17th, 1969, the "Regional Water Quality Control
2 Board". Let me rephrase that. We've marked as 394 a
3 letter over the signature of P. G. Benignus to H. S.
4 Bergen, B-E-R-G-E-N, on the subject of the Regional
5 Water Quality Control Board. Have you ever seen that
6 document before?

7 A. As I scan the document, it does not help me
8 recall ever seeing it before. I don't remember seeing
9 it.

10 Q. The documents that you were provided as
11 part of your tutorial by Mr. Wheeler, did they come in
12 the form of a notebook or a file or something of that
13 sort?

14 MR. SABETTA: Objection as asked and
15 answered. You can answer it again.

16 MR. McDONOUGH: Let me withdraw it.

17 MR. SABETTA: I thought he testified he got
18 two binders.

19 Q. I want to make it clear. I'm not asking
20 about them. As I understand it, you've told us that you
21 received two binders that generally had scientific and
22 medical information in them, is that correct, in the
23 course of this tutorial?

24 A. Yes, sir.

25 Q. You've also indicated you received other

1 documents during this tutorial, and I'm asking whether
2 those other documents came in the form of a notebook or
3 a file or in what fashion did they come to you?

4 A. They were individual. If it was multi
5 page, it was stapled and without a file or a folder or a
6 binder.

7 Q. They came to you loose?

8 A. Yes. They just would hand it to me across
9 the table.

10 Q. Were they in chronological order?

11 A. Not necessarily.

12 Q. Did they come all at one time?

13 A. No.

14 Q. How did it happen that they came to you at
15 different times during this tutorial?

16 A. I, sir, am in no position to know how
17 Mr. Wheeler and others arrived at the decision to bring
18 along a given document.

19 Q. Well, were you talking about a particular
20 topic and then Mr. Wheeler would give you some
21 correspondence or document pertaining to that particular
22 topic?

23 MR. SABETTA: Objection to form.

24 A. At times that happened, and there are other
25 times when the presence of the document created the

1 subject of the moment.

2 Q. Did he give you the document before the
3 discussion took place?

4 MR. SABETTA: Objection to form.

5 A. At times.

6 Q. Was there an agenda or anything in writing
7 with respect to this tutorial as to how it was conducted
8 or to be conducted?

9 A. No, sir.

10 Q. Would you turn to tab 17 for me, please?
11 Has that been marked Exhibit 395?

12 A. It is.

13 Q. That purports to be a memo from W. R.
14 Richard, dated April 14th, 1969, to P. Benignus on the
15 subject of disposal and incineration of Aroclor. Is
16 that what the document appears to be?

17 A. Yes.

18 Q. Have you ever seen that before?

19 A. Yes.

20 Q. Did that come to you during the course of
21 this tutorial?

22 A. When we say "this tutorial," I'm under the
23 assumption you're still referring to Mr. Wheeler's
24 discussion with me. Is that a correct assumption?

25 Q. Let me withdraw the question and begin

1 over. How many tutorials did you have after you started
2 in January of 1990 in the job assignment that you had?

3 A. Again, I never counted. I would suggest
4 that I had half a dozen or so.

5 Q. And those half dozen or so took place in
6 the 30 days after you started work in January of 1970?

7 A. No. In I would suggest the 90 days,
8 January, February, March period.

9 Q. How long did these half dozen tutorials
10 take?

11 A. Oh, again, part days. They were not
12 full-day discussions.

13 Q. So as I understand it, you had six part-day
14 discussions that you are calling a tutorial?

15 A. Well, some of these discussions were multi
16 days. Like Mr. Wheeler's lasted for six weeks of them.

17 Q. That's what I'm trying to find out,
18 Mr. Papageorge, how long these tutorials took place,
19 what period of time they occurred.

20 A. I have no record of dates and times.

21 Q. I didn't ask you about dates and times. As
22 I understood yesterday, you said you had tutorials, as
23 you phrased it, that lasted over a 30-day, perhaps
24 60-day time period from January 1970 forward. Do I
25 understand that correctly?

1 A. If you understood that to refer to
2 Mr. Wheeler's tutorials, that is correct, yes.

3 Q. That refers only to Mr. Wheeler's
4 tutorials?

5 A. That's all we were talking about.

6 Q. What particular -- Withdrawn. Who gave you
7 the two notebooks?

8 A. Mr. Wheeler.

9 Q. Did you have tutorials with anyone else in
10 the first 90 days after January 1970 other than
11 Mr. Wheeler?

12 A. We just talked about another half a dozen
13 or so people.

14 Q. You're saying you and I just talked about
15 that?

16 A. That was one of the questions this morning.

17 Q. Who is this half dozen or so other people?

18 A. Oh, there were two research directors of
19 the two business groups.

20 Q. Who would they be?

21 A. Dr. Richard and Dr. Ferrar.

22 Q. What was Dr. Ferrar's training?

23 A. Training?

24 Q. Yeah.

25 A. He's a Doctor of Science in Chemistry.

1 Q. Dr. Richard, I can't remember if you told
2 me yesterday what his particular field of specialty was
3 and training.

4 A. He is also a Doctor of Science in
5 Chemistry.

6 Q. Would you continue to tell me the other
7 people that you had these tutorials with in this 90-day
8 period?

9 A. I had tutorials with the marketing people,
10 for example, Mr. Benignus, whose name has appeared here
11 in some of these documents, a Mr. Johnson, who is also a
12 marketing individual.

13 Q. Can you tell me what Mr. Johnson's full
14 name is, first name anyway?

15 A. Norman. Norman Johnson.

16 Q. Do you know whether he had any particular
17 area of training?

18 A. Not really, no.

19 Q. Did Mr. Benignus have any field of training
20 that you're aware of?

21 A. Yes.

22 Q. What was that?

23 A. Bachelor's degree in Chemistry.

24 Q. Were there others that you participated in
25 tutorials with in that first 90 days?

1 A. Mr. Springgate and Mr. Bergen, the two
2 directors of the two business groups. I'm trying to
3 recall the name of the member of the corporate
4 engineering department. It doesn't come to mind right
5 now. Mr. Kuhn and Mr. Savage. I'm sorry. Mr. Kuhn,
6 who represented the manufacturing activity.

7 Q. Do you know whether he had a particular
8 area of training?

9 A. Yes. He had a Bachelor's degree in
10 Chemical Engineering. Dr. Keller and Dr. Tucker from
11 the analytical research group.

12 Q. Were they both toxicologists? Let me
13 withdraw that. I think you told me Dr. Keller was a
14 Ph.D. in Organic Chemistry.

15 A. Well, I don't know what type of -- a Ph.D.
16 in Chemistry.

17 Q. What about Dr. Tucker?

18 A. Dr. Tucker had --

19 Q. What specialty did he have?

20 A. -- a Ph.D. in Analytical Chemistry.

21 Q. Any other people that you recall talking to
22 during your tutorial in this 90-day period?

23 A. Paul Hodges and his supervisor, Desmond
24 Hosmer, D-E-S-M-O-N-D H-O-S-M-E-R, who represented the
25 manufacturing activity.

1 Q. Do you know what his field of training was?
2 A. What? Mr. Hodges or Mr. Hosmer?
3 Q. Mr. Hosmer.
4 A. Mr. Hosmer, a Bachelor's degree in Chemical
5 Engineering.
6 Q. What about Mr. Hodges?
7 A. The same degree.
8 Q. Anyone else that you consulted with during
9 your tutorial in this 90-day period?
10 A. I spoke with at least one attorney. I'm
11 trying to think of the others that might have been
12 involved, but I can't at the moment.
13 Q. Do you recall which attorney that was?
14 A. Mr. Park.
15 Q. Do you recall the subject of that
16 conversation?
17 A. Just general review of his understanding of
18 the issue from his position.
19 Q. Do you recall what he told you?
20 A. I don't remember the specifics.
21 Q. Do you recall the names of any other
22 attorneys, in-house attorneys I'm talking about, that
23 you met with during this 90-day period?
24 A. I don't think I met with any of the other
25 attorneys at that time.

1 Q. Do you recall speaking to anyone else in
2 this tutorial period?

3 A. I spoke with John Mason, who was my boss's
4 boss.

5 Q. Who was your boss?

6 A. Howard Bergen.

7 Q. What was Mr. Mason's field of training?

8 A. I don't think I ever knew. He was from
9 England, so I don't know what kind of degrees they gave
10 there.

11 Q. Did his area of specialty manifest itself
12 to you in the course of your discussions with him?

13 A. No.

14 Q. Did you talk about the baseball team?

15 MR. SABETTA: Objection to form.

16 A. I don't understand.

17 Q. Do you recall what you talked about with
18 Mr. Mason?

19 A. He discussed with me his understanding of
20 the PCB environmental issue from his position and really
21 his hopes that I could kind of help out a bit with my
22 new assignment. That kind of discussion. Sort of a
23 welcome to the team approach.

24 Q. Do you recall talking to anyone else during
25 this tutorial period?

1 A. At the moment, I can't recall any others.

2 Q. Do you recall the general purpose of why
3 you were going through this tutorial with these various
4 individuals?

5 A. This was my way of getting tuned into the
6 situation and getting updated on the details as much as
7 I could understand and absorb.

8 Q. And the situation would be the
9 environmental concerns with PCBs?

10 A. Yes.

11 Q. You say "your way". Are you saying that
12 you're the one that steered your tutorial as to being
13 brought up to speed on PCBs?

14 MR. SABETTA: Objection to form.

15 A. I am the one that instituted the activity
16 and made the appointments and found the individuals to
17 talk to.

18 Q. Before you did that, did you meet with
19 people who called you into session to discuss things
20 with you?

21 A. I don't remember any such activity.

22 Q. Do I understand generally that you arrived
23 at work in your new assignment, sat down at your desk
24 and decided who you wanted to call?

25 A. Yes.

1 Q. Did you have your three-ring or your two
2 three-ring binders at that point?

3 A. No.

4 Q. Did you have anything at that point?

5 MR. SABETTA: Objection to form.

6 A. I had some things.

7 Q. I mean, let me ask another question. Did
8 you have anything on the topic of environmental issues
9 with PCBs at that point when you sat down at your desk
10 on that day?

11 A. I did not.

12 Q. Did you ever have a discussion with anyone
13 as to why your position was created?

14 A. Yes.

15 Q. Who did you discuss that with?

16 A. Mr. Bergen and Mr. Springgate.

17 Q. Was that discussion prior to you being
18 given your new position or after?

19 A. Prior to.

20 Q. What did they tell you?

21 A. December of '69.

22 MR. SABETTA: I think he said what.

23 Q. As I understand it, you had conversations
24 in December of 1969 time period with Mr. Springer.

25 MR. SABETTA: Mr. Springgate.

1 Q. Mr. Springgate and Mr. Bergen; is that
2 correct?

3 A. Yes.

4 Q. Was that both of them participating in the
5 conversation, or were there separate conversations?

6 A. Separate.

7 Q. And what did Mr. Springgate tell you?

8 A. Sir, I just can't remember the details.

9 Q. Aside from the details, can you tell me
10 generally what Mr. Springgate and Mr. Bergen told you as
11 to this assignment?

12 A. It was generally the sharing with me of
13 their understanding of the findings of PCB in the
14 environment, the fact that there are two business groups
15 who were selling PCBs, and they were interested in doing
16 what was perceived to be responsible, and they were
17 trying to find someone to help with this matter.

18 Q. And that matter would be what?

19 A. PCBs in the environment.

20 Q. Did they tell you in substance what you
21 were supposed to do to help with this matter?

22 A. I don't know what you mean by in substance.
23 Do you mean in detail?

24 Q. Did they tell you what you were supposed to
25 do to help with this matter in these conversations in

1 December of 1969?

2 A. I don't recall the exact wording, but I was
3 left with the impression that a lot of activity was
4 underway, more than the usual team could handle, and
5 they wanted someone who could devote full time to
6 communicating in terms of gathering information and
7 disseminating information.

8 Q. Were you told who you were supposed to
9 disseminate information to?

10 A. Yes.

11 Q. Who?

12 A. People within Monsanto whose job
13 assignments involved PCBs. Any inquiries coming from
14 other laboratories, customers, government agencies
15 co-producers -- not co-producers, but competing
16 producers. I can't think of any other group.

17 Q. You were supposed to disseminate
18 information to competing producers of what?

19 A. PCBs is the subject we're talking about.

20 Q. Had anybody produced PCBs in the United
21 States at that time other than Monsanto?

22 A. Not to our knowledge.

23 Q. So these competing producers would be
24 located in other countries? Is that what I understand?

25 A. Yes.

1 Q. Did you disseminate information to
2 government agencies?

3 A. Certainly.

4 Q. What agencies?

5 A. Well, certainly the Food and Drug
6 Administration, the Department of Agriculture,
7 Department of Interior, Department of Commerce. The
8 Office of -- I don't think I remember the name properly.
9 The Office of Science and Technology or some such
10 wording. And eventually the EPA and OSHA, O-S-H-A, the
11 Corps of Engineers, the military department, Defense
12 Department. That's all that comes to mind at the
13 present.

14 Q. Did the Office of Science and Technology
15 come directly under the President of the United States?

16 A. Sir, I'm not an expert at the government
17 organization.

18 Q. I don't think anybody proposes to be.

19 MR. SABETTA: If you don't know, you can
20 say you don't know.

21 A. I just don't know.

22 Q. You said that you were to gather
23 information, devoting full time to that as well as the
24 dissemination of information. Were you told where you
25 were supposed to gather the information from?

1 A. No. That was part of my assignment.

2 Q. Part of your assignment was to figure out
3 where you were supposed to gather the information from?

4 A. Yes.

5 Q. Did you understand you were supposed to
6 gather information from scientists?

7 A. Information from anyone.

8 Q. Up and to this point, January of 1970, had
9 you testified on behalf of Monsanto in any proceedings?

10 A. No.

11 Q. Since January 1970, have you testified on
12 behalf of Monsanto in proceedings?

13 A. Yes.

14 Q. About how many?

15 A. There again, I never kept a score sheet,
16 but since 1973 I would suggest that I'm approaching 40
17 or 50. This includes trial and deposition, under oath.

18 Q. Did you also make presentations to various
19 government agencies since January 1970?

20 A. On January?

21 Q. Since January of 1970.

22 MR. SABETTA: Concerning PCBs or any
23 subject?

24 Q. Let's take any subject. Did you make any
25 presentations to any government agency since January of

1 1970 on any subject other than PCBs?

2 A. Will you help me with the expression
3 "presentation"? You're talking about a formal setting
4 or a face-to-face, one-on-one discussion?

5 Q. Let's start with formal.

6 A. Yes, I have.

7 Q. And how many formal presentations?

8 A. I don't again have a score sheet. I'm
9 going to suggest that it's less than six, less than half
10 a dozen.

11 Q. What's a formal presentation?

12 A. I'm sorry. What formal --

13 Q. What is a formal presentation in your mind
14 as you've answered that question for me?

15 A. It generally in my mind involves a group of
16 audience -- group of people to form the audience, is
17 generally something that is prepared in advance in terms
18 of subject matter and mode of presentation, and might
19 include charts or handouts that are shared with the
20 audience, projection of slides on a screen, and that
21 type of activity.

22 Q. You mentioned -- Withdrawn. Other than
23 formal presentations, have you made other presentations
24 to government agencies?

25 A. I had what I prefer to call discussions

1 with maybe a couple individuals from an agency or one
2 individual, or they might start off with one, and he
3 would call in others to join us, and the group kind of
4 grew as the day progressed, and the topic was free
5 ranging, depending on the interest of the group and the
6 questions they posed.

7 Q. About how many of those sort of discussions
8 did you have?

9 A. I never kept score. I don't know. 50 or
10 so. I don't know.

11 Q. Did you meet with General Electric Company
12 from January of 1970 through the time you retired with
13 respect to PCBs?

14 A. Yes.

15 Q. About how often?

16 A. Will you help me with again -- When you say
17 General Electric, are you referring again to a group of
18 people or individuals involved with various activities
19 at a meeting somewhere?

20 Q. Do you have in your head formal
21 presentations with respect to General Electric as
22 something that you want me to include in my question?

23 MR. SABETTA: Objection to form.

24 A. Well, it would help in my mind to come up
25 with some idea of the numbers that you asked for.

1 Q. Well, how many discussions or meetings did
2 you have with General Electric or its employees or
3 consultants?

4 MR. SABETTA: Objection to form. Are you
5 including in this telephone discussions, for example?
6 Not necessarily face no face.

7 MR. McDONOUGH: Yes.

8 MR. SABETTA: In other words, all contacts,
9 all oral contacts with GE representatives?

10 MR. McDONOUGH: Yes.

11 MR. SABETTA: Not including writings, but
12 oral contacts. That's the scope of Mr. McDonough's
13 question.

14 A. Since I never kept a score sheet on this,
15 many, many discussions.

16 Q. Hundreds?

17 A. Could be.

18 Q. Did General Electric ever come to St. Louis
19 and meet with you in the form of its employees?

20 A. I attended meetings involving personnel
21 from General Electric in a room bigger than this at
22 which many topics were raised. One of them was the
23 environmental issue. At that point, I would actively
24 participate.

25 Q. About how many of these meetings from

1 January 1970 through January 1980?

2 MR. SABETTA: Objection to form. Again, is
3 this in St. Louis or anywhere?

4 MR. McDONOUGH: In St. Louis.

5 MR. SABETTA: In St. Louis, okay.

6 A. I can remember two.

7 Q. Were those formal presentations? Were
8 there agendas?

9 A. Yes.

10 Q. Were there minutes kept?

11 A. I recall there was some notes taken by a
12 participant that were distributed later. I don't know
13 if you'd call those true minutes or not.

14 Q. Who was the employer of this participant?

15 A. Monsanto.

16 Q. Who was that that took the notes?

17 A. I think it was Paul Benignus.

18 Q. Did you ever travel to General Electric
19 facilities with respect to this PCB matter that you were
20 working on?

21 A. Yes.

22 Q. How often did you do that from January 1970
23 through January 1981?

24 A. Just once to each location.

25 Q. When you say "each location," what

1 locations are you referring to?

2 A. Well, I remember Schenectady; Pittsfield,
3 Massachusetts; Rome, Georgia; I think Glens Falls on the
4 Hudson River. That's all that comes to mind.

5 Q. Was the purpose of the meeting at Glens
6 Falls some issues that the State of New York had raised
7 with respect to PCBs?

8 A. That visit predated that. The issue had
9 not been raised by the State when I made the visit.

10 Q. Were there any agendas for these visits or
11 meetings that you just told me about?

12 A. I don't recall any agendas being prepared.

13 Q. Who did you meet with in Schenectady?

14 A. I don't remember the people anymore.

15 Q. Did you meet with Dr. Brown?

16 A. I don't remember the name or the face.

17 Q. Do you know who you met with in Pittsfield,
18 Massachusetts?

19 A. I remember Ed Raab, R-A-A-B. There were,
20 of course, others involved, but I don't remember their
21 names.

22 Q. Do you know what the time period of your
23 meeting in Schenectady was and Pittsfield, Mass.?

24 A. I don't remember Schenectady. I think, if
25 my memory serves me right, that the Pittsfield, Mass.

1 visit occurred the summer of 1970.

2 Q. Do you know what the purpose or topic of
3 the meeting was?

4 A. The topic of the meeting was PCBs in the
5 environment.

6 Q. Do you know if there were any minutes or
7 notes kept of that meeting?

8 A. I did not see any. I don't know.

9 Q. Did you keep any?

10 A. No.

11 Q. Did anyone from Monsanto go with you?

12 A. No.

13 Q. Did you go to any other meetings during the
14 course of that trip to Pittsfield, Massachusetts?

15 A. I hesitate because I have confusion with
16 other meetings. You mean with General Electric people
17 at that site?

18 Q. Did you make a swing down to Rome, Georgia
19 or a swing over to Schenectady or a swing from
20 Schenectady to Pittsfield or a swing from Pittsfield to
21 Schenectady or a swing from any of those places to Glens
22 Falls?

23 A. During the summer of 1970, I was making a
24 concerted effort to visit customers' plants. I don't
25 recall going to two General Electric locations during

1 one leg of these multiple trips that I took. I also
2 don't recall when I went to Pittsfield which plants
3 other than General Electric I visited in the
4 Massachusetts area, New England area.

5 Q. These would be other plants who might
6 employ PCBs in their processes?

7 A. That was the intent of my trip.

8 Q. Do you recall who you met with in Rome,
9 Georgia?

10 A. No. I'm having a hard time remembering. I
11 knew the man very personally, because he used to come to
12 Alabama, and I can't remember his name.

13 Q. He used to come to Alabama, to Anniston?

14 A. Yes.

15 Q. Was that during the time period that you
16 were general manager at Anniston?

17 A. Yes.

18 Q. And how often would he come to Anniston?

19 A. Oh, there again, I don't know, because I
20 wouldn't see him every time he arrived.

21 Q. How often would you see him in this time
22 period you were general manager?

23 A. At least a couple times.

24 Q. Do you know whether that was Mr. Moe,
25 M-O-E, at Rome, Georgia?

1 A. I don't know. No. I don't recall that
2 name at all.

3 Q. Do you know if it was Mr. Mayes, M-A-Y-E-S?

4 A. No. That doesn't ring any bells.

5 Q. What about R. A. Nelson?

6 A. That's a faint recollection.

7 Q. Do you recall seeing some papers written on
8 PCBs by Mr. Nelson?

9 A. I'm sorry?

10 Q. Do you recall seeing some papers written on
11 PCBs by Mr. Nelson? Call it "PCB, An Industry Problem"?

12 A. I don't recall that.

13 Q. What about Mr. Rogers? Would he be the man
14 from Rome, Georgia that you met with while you were at
15 Anniston?

16 A. I just don't remember.

17 Q. Do you recall who you met with at Glens
18 Falls?

19 A. No, I don't.

20 Q. Were they the same people at Glens Falls
21 that you met with at Schenectady?

22 A. Again, I don't remember.

23 Q. Do you recall telling any of these people
24 that heating of Pyranol produced dibenzofurans and
25 dioxins?

1 MR. SABETTA: Objection to form.

2 MR. GRONDAHL: Objection.

3 Q. I'll withdraw it. Do you recall telling
4 any of these GE people that you met with at the time,
5 summer of 1970, that heating of Pyranol resulted in
6 dioxins?

7 MR. SABETTA: Objection to form.

8 MR. GRONDAHL: Objection.

9 A. The word "heating" kind of disturbs me a
10 bit because it's so many ranges of temperature that
11 could be involved. I do recall discussing with the
12 audience assembled the subject of incineration of waste
13 PCBs. I did not at any time refer to material by the
14 name Pyranol. I did say that the temperatures had to be
15 high enough to make certain that no other harmful
16 chemicals are formed, and I used as examples chlorinated
17 furans and chlorinated dioxins.

18 Q. When you refer to the term "waste PCBs,"
19 what do you mean?

20 A. These are PCBs that no longer have the I'm
21 going to call it the purity required for the intended
22 application.

23 Q. In what way had the purity changed as you
24 refer to this fluid as waste PCBs?

25 MR. SABETTA: Objection to form.

1 A. Well, I'd have to have the -- Under what
2 conditions? Heat transfer application? Hydraulic?

3 Q. I'm just using your words, Mr. Papageorge,
4 not mine.

5 A. Yes.

6 Q. You said that you designated waste PCBs as
7 some fluid in which the purity had changed; is that
8 correct?

9 A. Correct.

10 Q. In what way had the purity changed?

11 MR. SABETTA: Objection to form.

12 MR. GRONDAHL: Objection.

13 A. When it contains material that did not
14 exist when the PCB product was introduced into a system
15 or a product.

16 Q. Was one of those materials that did not
17 exist in your opinion dibenzofurans?

18 MR. SABETTA: Objection.

19 MR. GRONDAHL: Objection.

20 A. Never.

21 Q. Did you know that dibenzofurans existed in
22 the product as manufactured by Monsanto during the
23 course of these trips in the summer of 1970?

24 A. No.

25 Q. Did you ever find that out?

1 A. Eventually, yes.

2 Q. What impurities were you referring to that
3 were encompassed in this phrase "waste PCBs"?

4 A. There again, it depends on what this PCB
5 material was exposed to. It could be a presence of
6 metals, chrome, iron, what-have-you. It could be the
7 presence sometimes of just plain water. Water itself is
8 objectionable. It could be the presence of other
9 chemicals that are present in the system in which the
10 PCB material was being used.

11 Q. Had the scientists and the world community
12 been complaining about water in the PCBs?

13 MR. SABETTA: Objection to form.

14 Q. At that time.

15 A. Not specifically water. They would just
16 say it doesn't meet specifications.

17 Q. Had the scientists and the world community
18 been complaining about irons or metals or other
19 chemicals in the PCBs other than PCBs at that time?

20 MR. SABETTA: Objection to form.

21 A. Sir, scientists don't talk that way. They
22 would not complain in that fashion.

23 Q. Did Professor Jennsen raise any issues in
24 1966 with respect to water or irons or metals or other
25 chemicals --

1 MR. SABETTA: Objection to form.

2 Q. -- in PCBs?

3 A. I'm confused by your question because
4 Dr. Jennsen reported PCBs as a contaminant in his
5 samples.

6 Q. Did Dr. Jennsen report PCBs in the hair of
7 his newborn child?

8 A. Yes.

9 Q. Did he theorize that it came from his
10 wife's breast milk?

11 A. I don't remember that theory.

12 Q. Was one of the purposes of this or these
13 trips that you took to Schenectady, Pittsfield, Rome and
14 Glens Falls to discuss disposal of PCBs?

15 A. Yes.

16 Q. Had you done any communication on that
17 topic to these particular facilities of General Electric
18 prior to going to the trip?

19 A. Yes.

20 Q. Was that communication in the form of
21 correspondence or memos, or what form did it take?

22 A. In February of 1970, a group of General
23 Electric representatives came to Monsanto in St. Louis,
24 and we had a day and a half to two day meeting. At that
25 meeting, we shared with them our thoughts regarding

1 incineration, the progress we had made to that point
2 regarding the design of a proper incinerator, and we
3 informed them that we expected to install that unit
4 later that year, 1970, and that service would be
5 available to our customers.

6 Q. Do you recall who was present at that
7 meeting from General Electric?

8 A. No, sir.

9 Q. Did you tell them that Monsanto had
10 determined that incineration of waste PCBs below 800
11 degrees centigrade could cause dioxins and furans?

12 MR. SABETTA: Objection to form.

13 MR. GRONDAHL: Object to form.

14 A. I mentioned that unless the right
15 temperature was achieved you could get unknown
16 chemicals, which could include dioxins or furans. There
17 was no evidence that they would be a contaminant under
18 those conditions, but I used the word "could", only
19 because I preferred erring on the wrong side if it
20 didn't create dioxins.

21 Q. It turned out to be the right side; didn't
22 it?

23 MR. SABETTA: Objection to form.

24 MR. GRONDAHL: Objection.

25 A. The dioxin, sir, had nothing to do with

1 PCBs.

2 Q. What about Pyranol? Did dioxin have
3 something to do with Pyranol?

4 A. That was not Monsanto's product.

5 Q. Did dioxin have something to do with waste
6 PCBs?

7 MR. SABETTA: Objection to form.

8 MR. GRONDAHL: Objection.

9 A. Not as a contaminant in PCBs.

10 Q. Why do you say Pyranol was not Monsanto's
11 product?

12 A. Because it was specified and made according
13 to the customer's recipe.

14 Q. Who made it?

15 A. Monsanto.

16 MR. SABETTA: Objection to form.

17 A. Monsanto blended the agreement as
18 specified.

19 Q. Where did you get that information with
20 respect to there could be dioxins or dibenzofurans if it
21 wasn't heated to the correct temperature or words to
22 that effect?

23 A. In my own mind, knowing something about
24 organic chemicals, oxygen, and chlorine, I came up with
25 I'm going to call it an hypothesis, just a scientific

1 thought, and in order to make sure that the person or
2 company I was talking to would pay particular attention
3 to high temperature incineration instead of sending it
4 to the city incinerator, I chose to mention those
5 chemicals that involved the benzene ring, chlorine and
6 oxygen, as examples of what might be created in an
7 effort to get attention of the right degree. That's
8 where it came from. That's my idea.

9 Q. Did the General Electric people attending
10 the meeting appear stunned with your idea?

11 MR. SABETTA: Objection to form.

12 MR. GRONDAHL: Object.

13 A. I did not look to see the impression that
14 was made.

15 Q. Did anyone from General Electric take issue
16 with your hypothesis that dioxins and furans could be
17 produced if the waste PCBs were not heated to the proper
18 temperature?

19 A. No.

20 Q. Do you know of any other company in the
21 world that has more Ph.D.'s and scientists than General
22 Electric Company?

23 MR. GRONDAHL: Objection.

24 A. I know nothing about their personnel. I
25 can't answer that.

1 Q. What about companies -- Withdraw it. Did
2 you communicate this information about your hypothesis
3 to General Electric in writing?

4 A. I don't recall any written document to
5 General Electric that covers that.

6 Q. Did you have a practice of communicating
7 such hypothesis to customers of Monsanto?

8 MR. SABETTA: Objection to form.

9 A. I suppose you'd call it a practice. When
10 I'd get an inquiry regarding incineration, I believe in
11 most cases I included that as an example of what might
12 happen under the wrong conditions.

13 Q. Do you recall communicating to several
14 customers with respect to your hypothesis in the 1970
15 time period?

16 A. Yes.

17 Q. What customers do you recall communicating
18 to?

19 A. I don't remember.

20 MR. McDONOUGH: Off the record.

21 (Whereupon, there was an off-the-record
22 discussion.)

23 (Reporter marked Plaintiff's Exhibits 400
24 through 405.)

25 Q. Mr. Papageorge, I'm showing you an exhibit

1 marked 400 for identification. It purports to be
2 correspondence over your typed signature dated July 6th,
3 1970 to Mr. Cavanaugh, C-A-V-E-N-A-U-G-H, at Espey
4 Manufacturing Company, Saratoga Springs, New York, and
5 ask you to take a look at it, please. I want to ask you
6 if that's your correspondence.

7 A. It appears to be something that I composed.

8 Q. If you look at the second page, the second
9 paragraph, second sentence of the second paragraph says,
10 "Any incineration below 800 degrees C will result in
11 vaporization, which will contaminate the atmosphere, or
12 impartial oxidation, which may yield materials which are
13 highly toxic." Do you see that?

14 A. I do.

15 Q. This reference to materials that are highly
16 toxic is with reference to that hypothesis you told us
17 about?

18 MR. SABETTA: Objection to form.

19 Q. Withdrawn. What were you referring to when
20 you said "may yield materials which are highly toxic"?

21 A. No chemical specifically, but anything that
22 could be created with carbon, oxygen and chlorine
23 unknown at that point in time and could be highly toxic.
24 That's true of any incineration.

25 Q. May I have it back, please?

1 A. Yes.

2 Q. I'm showing you 402 for identification. It
3 purports to be correspondence over your signature dated
4 July 6th, 1970 to Mr. Wilburn, W-I-L-B-U-R-N, Manager,
5 Engineering, Westinghouse, and ask if you can look at
6 that for me, please.

7 A. I have read the document.

8 Q. Would you look at the second paragraph? It
9 says, "As we discussed previously, total destruction of
10 PCBs can only occur above 800 degrees C. Any
11 temperature below this minimum will result in
12 vaporization with release to the atmosphere or, worse
13 yet, it is possible to partially oxidize PCBs into
14 materials which can be highly toxic (eg., dioxins or
15 furans). Your incineration should be thoroughly
16 reviewed." Is that your correspondence?

17 A. Yes.

18 Q. Is that exhibit, which is 401, as well as
19 Exhibit 400, were they correspondence that you made and
20 kept in the regular course of your business for
21 Monsanto?

22 MR. SABETTA: I don't think you've shown
23 him 401. I don't remember seeing 401.

24 Q. What one do you have in front of you?

25 MR. SABETTA: 402.

1 A. 402.

2 Q. Are the two exhibits, Exhibit 400 and 402,
3 correspondence that you made and kept in the course of
4 your regular business with Monsanto?

5 A. Yes.

6 Q. I'm showing you 403 for identification. It
7 purports to be correspondence over your typed signature
8 dated July 7, 1979 to Mr. Gene Lewis with a P. R.
9 Mallory, M-A-L-L-O-R-Y, Company in Waynesboro,
10 Tennessee, and ask if you prepared and sent that
11 correspondence.

12 A. I have prepared this document.

13 Q. And on the second page of that
14 correspondence, in the third paragraph, did you
15 reference, "Incineration below 800 degrees centigrade
16 will result in vaporization which will contaminate the
17 atmosphere or impartial oxidation which may yield
18 materials which are highly toxic"? Did you say that?

19 A. Yes.

20 Q. Was that correspondence that you made and
21 kept in the course of your business and Monsanto's
22 business?

23 A. Yes.

24 Q. I'm showing you Exhibit 404 for
25 identification. It purports to be a July 8th, 1970

1 letter over your signature to Mr. F. G. Jenkins, Vice
2 President, Materials, Sprague, S-P-R-A-G-U-E, Electric
3 Company, North Adams, Mass. and ask if you prepared and
4 sent that correspondence.

5 A. It appears to be a copy of correspondence I
6 prepared.

7 Q. Was that correspondence that you made and
8 kept in the course of Monsanto's business?

9 A. Yes.

10 Q. On the second page in the first full
11 paragraph of that page, it refers to incineration and
12 uses the words "furans and dioxins"; does it not?

13 A. Yes, it does.

14 Q. Was there a particular reason that you
15 recall as to why some letters referred to material that
16 was "highly toxic" and other letters referred to "furans
17 and dioxins"?

18 MR. SABETTA: Objection to the form.

19 A. I don't recall any particular reason. I
20 just -- It reflects what I dictated to the secretary on
21 that particular day.

22 Q. I'm showing you Exhibit 405 for
23 identification. It purports to be an August 17th, 1970
24 letter over your typed signature to Mr. J. M. O'Leary,
25 Technical Superintendent, Industrial Chemicals Division,

1 Hooker Chemical Company, Niagara Falls, New York, and
2 ask if you prepared and sent that correspondence.

3 A. This appears to be a copy of a document I
4 prepared at that time.

5 Q. Was that document made and kept in the
6 course of Monsanto's business?

7 A. Yes.

8 Q. In the third, I'm sorry, fourth paragraph,
9 it states, "Disposal of scrap PCB by burning can be
10 achieved if the temperature is maintained above 800
11 degrees C. Attempts to dispose at lower temperatures
12 will result in vaporization or worse if partial
13 oxidation to highly toxic furans or dioxins results."
14 Did you make that statement to Mr. O'Leary?

15 A. Yes.

16 Q. Do you recall doing letters to other
17 customers of Monsanto's on that same topic?

18 A. Yes.

19 Q. Do you recall doing one to General Electric
20 Company?

21 A. No.

22 Q. Is that because you had your meeting with
23 him and told him of your hypothetical?

24 MR. GRONDAHL: Object to the form.

25 A. Many meetings.

1 Q. Well, you mentioned a meeting here in St.
2 Louis in the summer of 1970.

3 MR. SABETTA: I think it was February of
4 1970 I believe was the testimony.

5 Q. In February of 1970 where you told them
6 your hypothesis; is that correct?

7 A. Yes.

8 Q. Was that the reason -- Let me withdraw
9 that. Do you recall whether you did or did not do any
10 correspondence to General Electric on that topic?

11 MR. SABETTA: Objection as asked and
12 answered. You can answer it again.

13 A. I just don't recall that subject being
14 covered in a mailing.

15 Q. Does that mean that you don't recall one
16 way or the other?

17 A. I don't know how to answer that because I
18 just cannot visualize -- I don't remember, first of all,
19 sending such a document. On the other hand, my dealings
20 with General Electric were such that such a document
21 would be redundant. It would not cover a new subject.
22 So I don't recall or even consider that such a document
23 would have been appropriate.

24 Q. Well, did you recall before I showed them
25 to you Exhibits 400, 402, 403, 404, 405?

1 MR. SABETTA: Objection to the form.

2 A. If by your question you're saying did I
3 recall the dates of the documents and the addressees as
4 well as the subject matter, I do not recall those dates.
5 I did not recall those details.

6 Q. Did you recall --

7 A. But the --

8 Q. Go ahead.

9 A. But the fact that such letters were sent
10 out in response to questions from customers I did
11 recall.

12 Q. Did you discuss your hypothesis with other
13 employees at Monsanto prior to this February 1970
14 meeting with GE?

15 A. Not prior to that meeting, no.

16 Q. Did you discuss it after that meeting?

17 A. Yes.

18 Q. About what time? Let me rephrase it. Did
19 you discuss your hypothesis with employees of Monsanto
20 prior to doing this correspondence that we've marked as
21 Exhibits 400, 402, 403, 404, 405?

22 A. Yes.

23 Q. Do you know about what time you had these
24 discussions about your hypothesis?

25 A. Sometime between February and April of

1 1970.

2 Q. Do you recall who you discussed the
3 hypothesis with?

4 A. I discussed it with Dr. Richard and
5 Dr. Tucker and Dr. Keller, chemists who were involved in
6 the project.

7 Q. Were Dr. Tucker and Dr. Keller working on
8 the incineration issue for Monsanto at that time?

9 A. They certainly had the assignment, and
10 Dr. Tucker, of course, was personally directly involved,
11 and as best as I recall, he joined me in March of 1970
12 when we visited the John Zinc Company for the
13 incinerator demonstration.

14 Q. What about Dr. Richard? Was he involved in
15 this incineration issue during that time period?

16 A. Only as an advisor in chemical matters.

17 Q. Do you recall if they said anything about
18 your hypothesis in these meetings?

19 A. Of course, I don't recall the exact
20 wording, but the impression I'm left with is that they
21 were supportive.

22 Q. Did they tell you in words or substance
23 that you were a genius to have figured out this
24 hypothesis?

25 MR. SABETTA: Objection to the form.

1 MR. GRONDAHL: Object to the form.

2 A. No, sir. That was not the intent of my
3 inquiry.

4 Q. Did they tell you in substance that, of
5 course, your hypothesis was correct?

6 MR. SABETTA: Objection to form.

7 MR. GRONDAHL: Object to the form.

8 A. I don't recall anybody saying it was
9 correct. They implied that they would support the
10 "could happen" approach.

11 Q. Did they tell you in substance that anyone
12 could look at the molecular structure and decide if you
13 heated it in the presence of oxygen you would have
14 furans and dioxins?

15 MR. SABETTA: Objection to form.

16 MR. GRONDAHL: Object to the form.

17 A. When you said "anyone," I don't know that
18 they covered the full spectrum of...

19 Q. Good point. Did they tell you in substance
20 that any Ph.D. in organic chemistry could look at the
21 molecular structure and tell you that if you heated it
22 in the presence of oxygen the dioxins and dibenzofurans
23 could be a byproduct?

24 MR. SABETTA: Objection to form.

25 MR. GRONDAHL: Object to the form.

1 A. We did not get in that kind of discussion.

2 Q. How are you doing?

3 A. All right.

4 Q. Can I see your book for a moment, please?

5 If you look at Exhibit 394 for me again, and look at the
6 eighth page in in the exhibit, it purports to be
7 correspondence from Elmer P. Wheeler to Howard S.
8 Bergen, which is not a good copy. I'd ask if you take a
9 look at that and tell me whether you ever saw that
10 correspondence before.

11 A. I'm having difficulty reading.

12 Q. I agree. It's not a good copy. I wanted
13 to ask you about page two more than page one, which is a
14 clearer copy. I'd ask if you have seen it before.

15 A. I'm having some difficulty in recalling
16 whether I've seen it before, primarily because I can't
17 read enough of it to help my recollection. I can't even
18 read the date.

19 Q. Okay. If you look at the last sentence on
20 page two, it says, "Where such incidents have occurred,
21 the irritation caused by the vapors from the hot
22 material," somebody appears to have written in something
23 which looks to be "(up to 600 degrees C)" "have limited
24 voluntary exposures such that systemic toxic effects are
25 rare." Do you see that?

1 A. I do.

2 Q. Do you know what systemic toxic effects
3 means as used by Mr. Wheeler in that correspondence?

4 A. I have an understanding I could share with
5 you.

6 Q. I don't think I want your understanding.
7 I'm wondering if you know what Mr. Wheeler meant when he
8 said "systemic toxic effects".

9 A. I can't speak for Mr. Wheeler, sir.

10 Q. If you turn to tab 18 for me, please, we've
11 marked this document Exhibit 396. It purports to be
12 Minutes of Meeting of Corporate Development Committee,
13 dated April 28, 1969, with a list of attendees. I'd ask
14 if you've ever seen that document before.

15 A. I have never seen this document.

16 Q. I note that you looked at the last page of
17 that exhibit, which is marked 292 in terms of the page
18 number. It has a heading called "Appropriation
19 Request," which includes a recommendation, "Organic
20 Division Appropriation Request No. CEA-2080 for
21 1,100,000 for solid Aroclor expansion -- Anniston." Do
22 you see that?

23 A. I do.

24 Q. Do you know what that refers to?

25 A. Yes.

1 Q. What?

2 A. This means that that particular part of
3 Monsanto referred to as Organic Division, following
4 Monsanto's procedures for requesting funding, has asked
5 for 1,100,000 for the expansion of chlorinated
6 terphenyls.

7 Q. Is that referred to as solid Aroclor?

8 A. Yes.

9 Q. Do you know whether that expansion was ever
10 undertaken?

11 A. Yes, it was.

12 Q. Do you know whether this chemical was ever
13 produced pursuant to this resolution?

14 MR. SABETTA: Objection to form.

15 A. What was the word before "resolution"?

16 Q. Do you know whether that expansion ever
17 resulted in Aroclor being produced?

18 MR. SABETTA: Objection to form.

19 MR. GRONDAHL: Objection to form.

20 A. Aroclors were being produced. All that
21 this does is expand the process in terms of equipment to
22 make more, and it doesn't refer to PCBs.

23 Q. Was the equipment expanded?

24 A. Yes.

25 Q. And was that equipment -- Did it become

1 operational to make Aroclor as referred to here?

2 A. To make that type of Aroclor, yes.

3 Q. I'm showing you the next exhibit, which is
4 marked 397 for identification. It purports to be
5 minutes of the meeting of the Board of Directors, May
6 22nd, 1969. Have you ever seen that before?

7 A. I have not.

8 Q. Does that approve that expansion that was
9 referred to in the last document?

10 A. That's what I read, sir, yes.

11 Q. Did you ever make any presentations to the
12 Monsanto board with respect to PCBs?

13 A. No.

14 Q. Did you ever make any presentations to the
15 Corporate Development Committee with respect to PCBs?

16 A. I made a presentation to a committee. I at
17 this point in time don't remember if it was referred to
18 as the Corporate Development Committee or the Corporate
19 Management Committee or the Corporate Administrative
20 Committee. The committee had name changes through the
21 period of time.

22 Q. Aside from the name changes, did you
23 understand the committee substantially did the same
24 thing?

25 A. Yes.

1 Q. Do you know about when it was that you made
2 that presentation?

3 A. Yes. April. Early April of 1970.

4 Q. Do you know what the topic of your
5 presentation was?

6 A. PCBs in the environment.

7 Q. Did you prepare material with respect to
8 that presentation?

9 A. Yes.

10 Q. Did it have a title, the material that you
11 prepared?

12 A. It had a title, but I don't remember the
13 exact wording.

14 Q. Do you know how long it was, about how many
15 pages?

16 A. About four.

17 Q. Were minutes kept of that meeting?

18 A. Yes.

19 Q. Do you know who kept the meeting minutes?

20 A. I believe it was Mr. Ehlers, E-H-L-E-R-S.

21 Q. Do you recall his first name?

22 A. I think it's James, but I'm not certain.

23 Q. If you turn to tab 20 for me, has that got
24 an exhibit number on that? Could you tell me what the
25 exhibit number is?

1 A. 398.

2 Q. Exhibit 398 purports to be minutes of
3 Aroclor "Ad Hoc" Committee, first meeting date September
4 5, 1969. Have you ever seen that document?

5 A. Yes, I have.

6 Q. When did you first see it?

7 A. Sometime in 1970. I don't recall the
8 timing any closer than that.

9 Q. Do you recall whether you were given that
10 document by Mr. Wheeler or anyone else in the course of
11 your tutorial in that 90-day period?

12 A. I don't recall that.

13 Q. Do you recall whether you have been asked
14 about this document in the course of depositions and
15 testimony you've given on the subject of PCBs?

16 A. Yes.

17 Q. How many times?

18 A. I don't remember. Several.

19 Q. If you look at page two of Exhibit 398, it
20 has a heading 5, "Toxicity Levels". It says, "Aroclors
21 have been shown to be safe for man in reasonable
22 exposure concentrations. We are testing 100 ppm in diet
23 of rats and dogs on a rule-of-thumb basis that 1/100 of
24 toxicity level is safe and one ppm is probably the upper
25 limit in total diet." Do you see that?

1 A. I do.

2 Q. Did you ever have any discussions about a
3 rule of thumb?

4 MR. SABETTA: Objection to form.

5 Q. Did you ever have any discussions with
6 anyone on rule of thumb for reasonable exposure
7 concentrations of Aroclors?

8 MR. SABETTA: Same objection.

9 A. I don't recall the wording you used, but
10 there were discussions with Dr. Kelly and with
11 Mr. Wheeler regarding how exposure limits are set and
12 what they're based on. We did get into this upper limit
13 in diet in test animals and how that translates to the
14 workplace and so on.

15 Q. Did Mr. Wheeler or Dr. Kelly use the phrase
16 "rule of thumb" as this document does?

17 A. I don't remember that.

18 Q. If you look in the third paragraph under
19 "Toxicity Levels," it says, "One problem we are facing
20 is to keep the 'safe level' (?) for shrimp from being
21 applied to, eg. Lake Michigan, where more tolerant fish
22 species probably exist. We need to show the safe level
23 in shrimp, clams, oysters, and several species of fish."
24 Do you see that?

25 A. Yes.

1 Q. Do you know what the toxicity level for the
2 shrimp had been shown to be?

3 A. I don't recall the exact number, but there
4 was a study that indicated that juvenile shrimp were
5 very sensitive to PCBs.

6 Q. Where was that study performed?

7 A. The Commercial Fisheries Laboratory in Gulf
8 Shores, Florida.

9 Q. Was that area in the general vicinity of
10 any rivers?

11 A. When you say "general vicinity," I don't
12 know how to interpret that.

13 Q. Does the Coosa River flow in there?

14 A. I don't know my geography that well. I
15 don't remember.

16 Q. Was the Anniston plant in the general
17 vicinity of the Coosa River?

18 A. You could see a river, yes.

19 Q. Do you know whether any chronic studies had
20 been completed with respect to PCBs up through this
21 September 5th, 1969 time period?

22 A. Chronic studies with any species, all
23 species?

24 Q. Yes.

25 A. No, there weren't any.

1 Q. If you look at the next entry under six, it
2 says "Escambia," E-S-C-A-M-B-I-A, "River Problem". Do
3 you see that?

4 A. Yes.

5 Q. There's a discussion of, "For a clearer
6 understanding of the general problem, the situation at
7 Pensacola was reviewed." Then there's a discussion of
8 quantities of chemical measured in various areas
9 downstream and in the mud; is that correct?

10 A. Are you paraphrasing the wording here, sir?

11 Q. I was paraphrasing, yes.

12 A. Well, the wording does indicate that there
13 were levels of PCBs found in water and higher level in
14 mud.

15 Q. Did you find that out in the course of your
16 tutorials with respect to this Escambia River?

17 A. Yes.

18 Q. Were there plants or customers of Monsanto
19 that used PCBs in the area of the Escambia River?

20 A. Yes.

21 Q. What customers would that be?

22 A. That was Monsanto itself.

23 Q. And what plant would that be?

24 A. Pensacola Florida plant.

25 Q. Did that plant manufacture PCBs?

1 A. No.

2 Q. How did it come about that it used PCBs?
3 Do you know?

4 A. PCBs were present in a fluid used in an air
5 compressor.

6 Q. Was that plant associated with testing of
7 wood posts that you testified to yesterday?

8 A. No.

9 Q. What plant was associated with the testing
10 of the wood posts by burying them in the ground?

11 MR. SABETTA: Objection to form.

12 A. There was no plant associated with it, with
13 that study.

14 Q. Where were the wood posts buried?

15 A. They were over in Florida associated with
16 the University of Florida as part of a scientific study.

17 Q. That was a scientific study done by the
18 University of Florida?

19 A. Yes.

20 Q. Do you know whether the study was supported
21 by Monsanto?

22 MR. SABETTA: Objection to form.

23 A. I do not.

24 Q. Was that on the west coast or the east
25 coast of Florida? Do you know?

1 A. Gainsville. I don't know. I think it's
2 more to the east.

3 Q. If you look at page three under eight, it
4 says "Environmental Contamination By Customers". It
5 says, "Our in-plant problems are very small versus
6 problems of dealing with environmental contamination by
7 customers." Was that information brought to your
8 attention in your tutorial?

9 A. Yes.

10 Q. Was that part of your general duties to
11 travel around to Monsanto customers to try to eliminate
12 disposal of the PCBs into the environment?

13 MR. SABETTA: Objection to the form.

14 A. When you use the expression "travel
15 around," I'm confused in terms of -- I perceive that as
16 indicating that the only time I was involved with
17 customers was when I traveled. That was just one way to
18 do it.

19 Q. Would you turn to tab 21, please? What
20 exhibit tag is on that?

21 A. 399.

22 Q. I'm showing you Exhibit 399 for
23 identification. It's entitled "PCB Environmental
24 Pollution Abatement Plan". On the first page, it says
25 "Introduction". It appears to be a multi-page document.

1 And I'd ask if you've ever seen that document before.

2 A. I believe I have. It looks familiar.

3 Q. Did you prepare it?

4 A. No.

5 Q. Do you know who prepared it?

6 A. I do not.

7 Q. Do you know where any of the information
8 came from that's set forth on the document?

9 MR. SABETTA: Well, it's a multi-page
10 document. He hasn't read it line by line, so I don't
11 know how he could answer that question. If you want him
12 to do that and then respond to your question, we can
13 certainly do that.

14 Q. You can't answer that question,
15 Mr. Papageorge, without reading the document line by
16 line? Is that correct?

17 A. As I remember your question, it asked me
18 who prepared this document.

19 Q. I asked you that, and you didn't know, and
20 then I asked you if you knew where the information came
21 from within the document, and your counsel objected and
22 said that unless I had you read line by line you
23 couldn't answer it, and I'm asking you if that's true,
24 that you can't answer that without reading that line by
25 line.

1 A. I can answer that the first page refers to
2 an ad hoc committee of several individuals. They were
3 the individuals that with their understanding and
4 knowledge of the PCB issue at the time put this data
5 together.

6 Q. Have you been asked about this document by
7 other lawyers in depositions and trial?

8 A. Yes.

9 Q. If you look at the last page of the
10 document, it appears to be handwritten and has a title
11 "Profit and Liability Versus Time". Have you seen that
12 document before?

13 A. Yes, I have.

14 Q. Did you see that during the course of your
15 tutorial?

16 A. No. This came later.

17 Q. Do you know who prepared it?

18 A. Prepared this whole document again?

19 Q. Prepared this one page we're looking at,
20 the last page of the exhibit.

21 A. No, I don't.

22 Q. Now, to the left it says "Action," and
23 underneath it it says a heading "do nothing". Then
24 there purports to be a graph on profits against
25 liability; is that correct?

1 A. Yes.

2 Q. Does that refer to PCBs?

3 A. Yes.

4 Q. And the liability line interrupts the
5 profit line on the "do nothing" graph at a little bit
6 past mid 1971; is that correct?

7 A. Yes.

8 Q. Under the next heading, it says
9 "Discontinue Manufacture of PCB," and it has a graph
10 with profits showing a drop to zero, again a little bit
11 past 1971.

12 A. Yes.

13 Q. Sometime in the 1971 time period?

14 A. Yes.

15 Q. And the last graph says "responsible
16 approach," and it graphs profits against liability; is
17 that correct?

18 A. Yes.

19 Q. And the closest liability and profits lines
20 come appears to be in 1972?

21 A. Yes.

22 Q. Did you ever discuss these graphs with
23 anyone at Monsanto?

24 A. Yes.

25 Q. Who did you discuss them with?

1 A. Elmer Wheeler and Bill Richard.

2 Q. Did you discuss them during the time of
3 your tutorial?

4 A. No. I was not aware of this document until
5 mid 1970.

6 Q. How did it come about that you discussed
7 this graph with Mr. Wheeler and Mr. Richard?

8 A. I don't remember that.

9 Q. Is this one of these pieces of paper that
10 was handed over to you at the beginning of some
11 discussion?

12 A. Yes.

13 Q. Who initiated the discussion?

14 A. I don't even know what the discussion
15 started out with.

16 Q. For example, do you recall saying to
17 Mr. Wheeler or Mr. Richard, "We ought to dump this stuff
18 and get out of the business" and they handed you this
19 piece of paper?

20 MR. SABETTA: Objection to form.

21 MR. GRONDAHL: Objection.

22 Q. When I said "dump this stuff," I was
23 referring to discontinuing manufacturing.

24 A. I understand.

25 MR. SABETTA: Objection to form. Do you

1 understand the question? You want her to read it back
2 perhaps as amended by Mr. McDonough?

3 MR. McDONOUGH: The witness doesn't seem to
4 be having any trouble, Mr. Sabetta.

5 MR. SABETTA: Object to the question as
6 argumentative, vague.

7 A. As I remember the question now, I've gotten
8 confused with the conversation here, but --

9 Q. I'm just trying to find out what caused
10 this conversation that you had over this particular
11 graph.

12 MR. SABETTA: Objection to form.

13 Q. Do you recall what initiated the
14 discussion?

15 A. You're just concentrating on the graph?

16 Q. I'm concentrating on the graph.

17 A. Just the graph itself.

18 Q. Now, I'm going to ask you a new question.
19 Do you recall prior to receiving this graph how it was
20 that the conversation was initiated?

21 MR. SABETTA: Objection to form.

22 A. As best I recall, it came up when we were
23 as a group discussing the withdrawal of the sale of PCBs
24 to certain uses, and someone in the group, and I don't
25 recall who, brought up this graph as an example of how

1 this individual visualized the results would develop.

2 Q. The results would develop by doing what?
3 Discontinuing certain lines?

4 A. If you discontinued, you'd get this middle
5 chart. If you took what this person called the
6 responsible approach, you could end up with the bottom
7 chart.

8 Q. Do you know who this individual was?

9 A. I don't remember at the moment, no.

10 Q. Do you recall whether he was a chemist or a
11 doctor or a lawyer or an accountant?

12 A. No, I don't.

13 Q. You mentioned discussion in a group. Was
14 there an agenda for this particular discussion?

15 A. No.

16 Q. Were minutes kept?

17 A. No.

18 Q. About how many people were there?

19 A. Oh, half a dozen or so.

20 Q. Was this the ad hoc committee on PCBs?

21 A. They were there, plus others that joined
22 us.

23 Q. And do you know about when that meeting
24 was?

25 A. About April 1970.

1 Q. Was anyone from GE there?

2 A. No.

3 Q. Anyone from your customers there?

4 A. No.

5 Q. Was there a determination made at the end
6 of the meeting?

7 MR. SABETTA: Objection to form.

8 A. Yes, there was.

9 Q. What was the determination?

10 A. To recommend to higher management the
11 discontinuance of sales to what Monsanto understood to
12 be open systems and to continue the sale into systems
13 that were perceived to be closed and where the
14 properties of PCBs were critical.

15 Q. Were hydraulic usages of PCBs considered to
16 be open or closed systems at this meeting?

17 A. At this meeting, they were considered to be
18 closed systems.

19 Q. Do you recall whether there was a
20 discussion as to the amount of PCBs or the percentage of
21 sales that was devoted to open systems?

22 MR. SABETTA: Objection to form.

23 A. I don't remember that specific being
24 brought up at this meeting.

25 Q. Well, did anybody say, for example, "If we

1 discontinue the following open sales, we will lose X
2 percentage of business" or words to that effect?

3 MR. SABETTA: Objection to form.

4 A. No. There was -- That didn't come up.

5 Q. Did anyone say, "If we discontinue a sale
6 on hydraulics, we'll lose X percentage of business"?

7 MR. SABETTA: Objection to form.

8 A. No.

9 Q. Do you recall whether Monsanto discontinued
10 sales of PCBs for use in hydraulics after this meeting?

11 A. At any time?

12 MR. SABETTA: Objection to form.

13 Q. Yes.

14 A. At any time?

15 Q. Yes.

16 A. Later, yes.

17 Q. When?

18 A. About 1971 or '2.

19 Q. Had Monsanto discontinued sales in open
20 systems other than hydraulics prior to the
21 discontinuance of sales in hydraulics?

22 MR. SABETTA: Objection to form.

23 A. I think I heard you say discontinue sales
24 to open systems.

25 MR. McDONOUGH: Please read the question

1 back.

2 (Whereupon, the reporter read back the last
3 question.)

4 A. The sales to open systems were terminated
5 on August 30, 1970.

6 Q. Can you answer my question, Mr. Papageorge?

7 MR. SABETTA: Objection to the form of that
8 question. Misstates the witness's earlier testimony.

9 MR. McDONOUGH: I'll withdraw it, my
10 comment.

11 MR. SABETTA: You mischaracterized what he
12 testified to earlier.

13 MR. McDONOUGH: That's what you say,
14 counsel. I don't agree with you obviously. Let me ask
15 another question so we don't waste time.

16 MR. SABETTA: All right.

17 Q. On August 30th, 1970, did Monsanto
18 discontinue sales of PCBs for use in hydraulic systems?

19 A. No.

20 Q. Can you fix any better date than 1971 or
21 1972 for Monsanto's discontinuance of sales of PCBs in
22 hydraulic systems?

23 A. I cannot come up with a specific date
24 because this process was evolutionary. Different fluids
25 were replaced over a period of time. But I am certain

1 that by the end of -- let me think -- 1971 -- No. The
2 end of '72 we were out of the business.

3 Q. You were out of the business of sale of
4 hydraulic fluids?

5 A. Correct.

6 Q. What, if anything -- Withdraw that. Did
7 Monsanto continue to use the equipment that it had to
8 produce PCBs that were used in these open systems?

9 MR. SABETTA: Objection to form. As of
10 what date? As of what time? I don't think the question
11 is being answered the way it's proposed. I object to
12 the form.

13 A. Well, when the sales to open uses were
14 terminated, the producing units were still kept active
15 at a lower rate of production. Eventually, and I'm
16 trying to recall the date, the unit at Anniston, Alabama
17 was shut down.

18 Q. After the discontinuance of sales for open
19 units, I understood you to say that the equipment was
20 used at a lesser rate; is that correct?

21 A. Yes.

22 Q. What was it used to make at a lesser rate?

23 A. PCBs for the continuing sales.

24 Q. Do you know about when Anniston was shut
25 down?

1 A. '72, '73.

2 Q. When you say Anniston was shut down, do you
3 mean the entire plant?

4 A. No.

5 Q. What do you mean?

6 A. I'm referring to the unit that produced
7 PCBs.

8 Q. What happened to the equipment in that
9 unit? Do you know?

10 A. It was dismantled and buried.

11 Q. What about the particular area of the plant
12 that was used to make PCBs? Do you know what happened
13 to that area of the plant?

14 A. They cleaned up the contaminated soil and
15 backfilled it, and it's now just a gravel surface.

16 Q. Did they dismantle that area of the plant?

17 MR. SABETTA: Object to the form.

18 Q. Let me withdraw it. Was that area of the
19 plant that contained the units that manufactured PCBs
20 contained in masonry or some form of walls?

21 A. No. These are open structures.

22 Q. Who did the cleanup at the site there in
23 Anniston after the discontinuance of operation of the
24 PCBs?

25 A. I don't know.

1 Q. Do you know if it was done in-house by
2 Monsanto, or did they retain an outside contractor?

3 A. Both.

4 Q. Did the Anniston plant become unionized at
5 some time?

6 A. Yes.

7 Q. Do you know what the union was?

8 A. Independent Chemical Workers Union, ICWU,
9 Local 16.

10 Q. Do you know if that Local 16 had its own
11 office in the Anniston area?

12 A. I don't remember a physical location.

13 Q. Do you know if the parent union had an
14 office that you were familiar with?

15 A. They certainly do, but I've forgotten where
16 it's located.

17 Q. Have they got one here in St. Louis?

18 A. I don't think so.

19 Q. Is that the same union that represented the
20 workers at the Krummrich plant?

21 A. Yes. A different local.

22 Q. Thank you. You wouldn't happen to know the
23 name of that local; would you?

24 A. 12. Can we take a brief break?

25 MR. McDONOUGH: Oh, sure. I'm sorry.

1 (Whereupon, there was a brief recess.)

2 Q. Mr. Papageorge, those shrimp studies that
3 we earlier briefly discussed, do you know whether they
4 were performed with heated or vaporized PCBs?

5 A. No. PCBs were just added to the water.

6 (Reporter marked Plaintiff's Exhibits 406
7 through 415.)

8 Q. Okay. If you look at 406 for
9 identification for me, it purports to be an October 8th,
10 1969 memo from E. V. John, Public Relations Manager,
11 Organic Chemicals Division, and Paul B. Hodges, Manager
12 of Environmental Engineering, Organic Chemicals
13 Division, to Field Sales Offices, Plant Communicators,
14 Pollution Control Engineers and Plant Managers. Have
15 you got that in front of you?

16 A. Yes.

17 Q. Have you seen that document before?

18 A. Yes.

19 Q. Now, that document is copied to Mr. J. J.
20 Spano, S-P-A-N-O, Mr. R. W. Richard, Mr. E. P. Wheeler,
21 Mr. M. W. Ferrar, F-E-R-R-A-R, and Mr. D. B. Hosmer,
22 H-O-S-M-E-R; is that correct?

23 A. Correct.

24 Q. Mr. Spano appears to be in Japan? Is that
25 how I make out those initials after his name?

1 A. No. Those are parts of his name. The J
2 and S-P-A-N. Monsanto used that as a mail code.

3 Q. Do you know whether they were on some kind
4 of computer at that point that permitted e-mail or
5 something of that sort?

6 A. No. There were no programs like that.

7 Q. All right. Do you recall whether you saw
8 this as part of your tutorial in January of 1970?

9 A. It was part of that learning period early
10 on. It may not have occurred in the first three months,
11 but sometime in at least the first part of 1970.

12 Q. Now, this last paragraph on the first page
13 of 406 says, "This memo is to alert you to the procedure
14 for handling inquiries should you receive a request for
15 information concerning PCBs from any source (press,
16 government, university, or private citizens). Please
17 direct the inquiry to St. Louis. If the request comes
18 by telephone, take the name, address, return phone
19 number and the nature of the inquiry. By providing
20 information from one central source, we can project our
21 corporate position of cooperation and emphasize our
22 efforts in research and study being directed to
23 eliminating any possible contamination sources." Do you
24 see that?

25 A. Yes.

1 Q. Did Monsanto employ a practice starting in
2 1969 as to having all inquiries answered by personnel in
3 St. Louis?

4 A. Initially it took that form as it related
5 to PCBs.

6 Q. Okay. Page two indicates Mr. Elmer Wheeler
7 and Mr. Ed John were the individuals to whom inquiries
8 were to be directed; is that correct?

9 A. That is correct.

10 Q. At some point did you become the individual
11 to which inquiries were directed or were to be directed?

12 A. Well, I'm certainly one of the individuals.
13 Mr. Wheeler continued to be a contact person, and that's
14 about the way it went for a while.

15 Q. Do you know if there was any additional
16 documentation directing inquiries to be made to you
17 beyond this Exhibit 406?

18 A. Not a document, no.

19 Q. Did you handle inquiries from Monsanto
20 sales people, Monsanto plant communicators, pollution
21 control engineers and plant managers?

22 A. Certainly.

23 Q. How did they know to communicate with you?

24 MR. SABETTA: Objection to form.

25 Q. Do you know?

1 A. I don't know.

2 Q. If you turn to tab 25, it should be marked

3 Exhibit 407.

4 MR. SABETTA: It seems to be marked 408.

5 Q. Okay. I'm going to ask you to turn to tab

6 24. Did I give you --

7 MR. SABETTA: You said 25.

8 Q. Okay.

9 A. 408?

10 Q. Have you turned to tab 25 -- or 24? What's

11 the exhibit number on that?

12 MR. SABETTA: 407.

13 Q. I'm showing you Exhibit 407 for

14 identification. It purports to be a document with Elmer

15 P. Wheeler's name at the bottom and D. S. Cameron,

16 Brussels, towards the top, January 29th, 1970 date.

17 Have you ever seen that document before?

18 A. Yes. I'm listed as a recipient.

19 Q. And along with you, Mr. Barrett or

20 Dr. Barrett in London is listed, and Mr. Bergen is

21 listed?

22 A. Yes.

23 Q. And the topic is "Status of Aroclor

24 Toxicological Studies"; is that right?

25 A. Yes.

1 Q. Did you receive that document?

2 A. Yes.

3 Q. That refers to "enclosing a copy of the
4 reports from our consulting laboratory indicating the
5 status of the animal toxicity studies." Do you see
6 that?

7 A. Yes.

8 Q. Do you know what consulting laboratory that
9 was?

10 A. Industrial Bio-Test Laboratories.

11 Q. And do you know what studies that is
12 referring to as to whether they are acute studies or
13 chronic studies?

14 A. The attached report describes the studies
15 that were underway at the time.

16 Q. Attached to Exhibit 407 as part of it is a
17 document entitled "Status of Aroclor Studies at
18 Industrial Bio-Test"; is that correct?

19 A. Yes.

20 Q. Now, in the second paragraph, the first
21 page of 407, at the end it says, "I don't see why this
22 information cannot be released with discretion in
23 Britain or Europe." Do you see that?

24 A. Yes.

25 Q. Do you know if the information was released

1 in Britain or Europe?

2 A. It was.

3 Q. The next says, "Our interpretation is that
4 the PCBs are exhibiting a greater degree of toxicity in
5 this chronic study than we had anticipated." Do you see
6 that?

7 A. Yes.

8 Q. Did you discuss that with Mr. Wheeler?

9 A. Yes.

10 Q. Do you know what he was referring to?

11 A. Yes. The kinds of things that are listed
12 in the attachment, liver enlargement and so on.

13 Q. The last paragraph says, "We have
14 additional interim data which will perhaps be more
15 discouraging. We are repeating some of the experiments
16 to confirm or deny the earlier findings and are not
17 distributing the early results at this time." Do you
18 see that?

19 A. Yes.

20 Q. Did you ever see this interim data that
21 that's referring to?

22 A. I did at the time, yes.

23 Q. Were they more discouraging?

24 MR. SABETTA: Objection to form.

25 Q. Withdrawn. Did you consider the interim

1 data more discouraging than the other reports from the
2 consulting laboratory?

3 MR. SABETTA: Objection to form.

4 A. I didn't, no.

5 Q. You're not a physician; is that correct?

6 A. That's correct.

7 Q. You're not a toxicologist?

8 A. That's correct.

9 Q. Do you know if some of the experiments were
10 repeated?

11 A. Yes, they were.

12 Q. Do you know whether the results of the
13 repetition of the experiments were more favorable than
14 the interim data?

15 MR. SABETTA: Objection to the form.

16 Q. Withdrawn. Do you know whether the
17 experimental results of the repetition showed less
18 biological activity of PCBs than the interim data did?

19 MR. SABETTA: Objection to the form.

20 A. As I remember, there was no significant
21 difference.

22 Q. If you turn to tab 25, please, I believe
23 we've marked it 408; is that correct?

24 A. Yes.

25 Q. 408 purports to be correspondence on

1 Monsanto's letterhead over the signature of Donald A.
2 Olson, Director of Sales, Functional Fluids Group, with
3 the addressee blank; is that correct?

4 A. That is correct.

5 Q. Have you seen that document before?

6 A. Yes.

7 Q. It also includes an enclosure in that
8 exhibit; isn't that correct?

9 A. Yes.

10 Q. Did you participate in the preparation of
11 that document?

12 A. Yes.

13 Q. In what way?

14 A. I served as chairman of a group of Monsanto
15 individuals that were involved with the PCB
16 environmental issue, and one of the first tasks of our
17 group was to develop something to communicate to the
18 customers, and I acted as sort of a -- I'm looking for a
19 word. I pushed for this. I encouraged the development
20 of such a document.

21 Q. Did you write this exhibit or earlier
22 drafts of this exhibit, referring to Mr. Olson's letter
23 dated February 9th, 1970?

24 A. I personally didn't write it, no. There
25 were drafts available when I joined the group, and we

1 took those pencil drafts and made a composite, and this
2 is the final result of all of that effort.

3 Q. Do you know how long this process of
4 preparing drafts took place?

5 A. Several months, but I don't know exactly
6 how many.

7 Q. You mentioned that you were chairman of
8 this group. Did it have a particular name or
9 designation in Monsanto?

10 A. I don't know that it ever had a name. It
11 was just a PCB environmental issue group, and anybody
12 involved with PCBs could join it.

13 Q. Was this substantially the same group
14 called the Ad Hoc Committee?

15 A. Some of the members of the Ad Hoc Committee
16 were members of this larger group.

17 Q. The larger group was the group that you
18 were chairman of?

19 A. Correct.

20 Q. Was Dr. Keller a member of the larger
21 group? Let me withdraw that. Do you recall the names
22 of any Monsanto employees that were members of the
23 larger group that weren't employees of the ad hoc group?

24 A. Yes. I can recall a few of them.

25 Q. Would you tell me?

1 A. Dr. Richard and Dr. Ferrar. I just can't
2 recall the individual from the Corporate Engineering
3 Department that was involved with the incinerator
4 project. He was a member of this group. Even the
5 business directors, Mr. Bergen and Mr. Springgate, were
6 members of this group, and they would drop in when they
7 could.

8 Q. Were there any additional names?

9 A. Yes. There was a roomful of people. I'm
10 trying to recall. Mr. Kuhn, K-U-H-N, was a member. I
11 just can't recall any more.

12 Q. How was it determined who would be a member
13 of this group? Do you know?

14 A. Anyone involved as part of his official
15 assignment with the PCBs automatically was eligible to
16 join the group.

17 Q. How was it determined that they join? Did
18 they make the determination or --

19 A. Yeah.

20 Q. Or were they directed to?

21 A. It was an open invitation, nothing down in
22 writing anywhere, but at their group meetings they would
23 bring out the fact that this group did meet and discuss
24 PCBs in the environment, and anybody that's interested
25 can meet with them, and the next meeting is, say, next

1 week and so on.

2 Q. Were there any documents outlining the
3 duties or responsibilities or the scope of what it was
4 that this group was to do?

5 A. No.

6 Q. Were you familiar with a group at General
7 Electric called RECO? R-E-C-O?

8 A. RDCO?

9 Q. RECO.

10 A. No.

11 Q. Were you familiar with a group at General
12 Electric known as CEIP? Although there's been some
13 disagreement on the spelling, it appears to be C-E-I-P.

14 A. I am not familiar with those groups.

15 Q. Now, as part of Exhibit 408, there's
16 another correspondence from Mr. Olson, unknown
17 addressees, dated February 18th, 1970, which appears to
18 be substantially the same as the first page, the
19 February 9th, 1970 letter; is that correct?

20 A. That is correct.

21 Q. Did Monsanto maintain a list of the
22 customers to whom it sent these two letters and
23 enclosures?

24 A. Yes.

25 Q. Do you know whether GE received a copy of

1 the February 9th, 1970 or the February 18th, 1970
2 letters?

3 MR. GRONDAHL: Object to the form.

4 A. They received one of them, yes.

5 Q. At page two of the first letter, the
6 February 9th, 1970 letter of Exhibit 408, at the top it
7 says, "We have developed and are now testing new
8 formulations to replace the Aroclor 1254 and 1260
9 components in our Pydraul products. The new products
10 appear to be equal in performance and have similar
11 physical properties." Do you see that?

12 A. Yes.

13 Q. What was Pydraul used for?

14 A. Pydraul is Monsanto's trademark for its
15 industrial hydraulic fluids.

16 Q. And looking at number one on the first page
17 of Exhibit 408, it says "products such as Pydraul," and
18 then it lists a series of numbers. "Turbinol,"
19 T-U-R-B-I-N-O-L, with a registered mark, "and
20 Therminol," T-H-E-R-M-I-N-O-L, with a registered mark,
21 "are not formulated with Aroclor 1254 or 1260." Is that
22 correct? Is that correct it notes that on the letter?

23 A. Yes.

24 Q. What was Therminol used for?

25 A. That's the Monsanto registered trademark

1 for heat transfer fluids.

2 Q. And what was Turbinol used for?

3 A. Turbinol is Monsanto's trademark used for
4 fluids used in gas turbine devices that are used to
5 move, for example, gas in transmission lines.

6 Q. Does that operation make use of heat?

7 A. No.

8 Q. Was Monsanto limiting the sales of Pydraul,
9 Turbinol, and Therminol by reason of this February 9th
10 or February 18th, 1970 communication?

11 A. They were not terminating at that time, but
12 there were studies underway to look into the replacement
13 in the Pydraul line.

14 Q. Is it a fair statement that this was
15 information that Monsanto was providing to its customers
16 at this time as to this PCB issue?

17 A. Yes.

18 Q. Did you say anything about your hypothesis
19 of dibenzofurans or dioxins in this correspondence?

20 MR. SABETTA: Objection to form.

21 A. No.

22 Q. If you look at tab 26 for me, please. Have
23 we placed an exhibit number on that tab?

24 A. 409.

25 Q. We've marked Exhibit 409, a memo from a N.

1 T. Johnson, February 16, 1970, reference pollution
2 letter to quite a few individuals. Have you seen that
3 document before?

4 A. Yes, I have.

5 Q. Did you participate in the preparation of
6 that?

7 A. No.

8 Q. Who is N. T. Johnson?

9 A. He was a member of Monsanto's marketing
10 group in the Functional Fluids team.

11 Q. Did that group sell Aroclors and PCBs?

12 A. They sold them as an ingredient in their
13 hydraulic fluid products.

14 Q. So do I understand Mr. Johnson was only
15 involved in the sales of hydraulic fluids?

16 A. Yes.

17 Q. I note it's copied to Mr. Benignus about
18 halfway down the second column of CC's. Do you see
19 that?

20 A. Yes.

21 Q. Was Mr. Benignus in charge of larger sales
22 than just hydraulic fluids?

23 A. No.

24 Q. Was he in charge of hydraulic fluids?

25 A. No.

1 Q. Who was in charge, if you know, of sales of
2 transformer fluids?

3 A. Mr. Benignus.

4 Q. Was Mr. Benignus in charge of overall sales
5 of fluids using PCBs?

6 A. No.

7 Q. Who was?

8 A. Olson. Mr. Olson.

9 Q. And was Mr. Olson Mr. Benignus's boss?

10 A. Yes.

11 Q. Was Mr. Benignus Mr. Johnson's boss?

12 A. No.

13 Q. Was that a different line of reporting
14 authority?

15 A. I don't know what you mean by line.

16 Q. I'll ask you another question. Who was
17 Mr. Johnson's boss?

18 A. Mr. Olson.

19 Q. If you refer to the first page of 409, in
20 the first paragraph it says, "Attached is a list of
21 questions and answers which may be asked of you by
22 customers receiving our Aroclor-PCB letter. You can
23 give verbal answers; no answers should be given in
24 writing. If the customer asks a question you can't
25 answer or if he wants an answer in writing, then send

1 his questions to me, and we will answer it from here."

2 Do you see that?

3 A. Yes.

4 Q. Does that represent a practice of Monsanto
5 adopted at about that time of giving answers only orally
6 other than writings emanating from St. Louis?

7 MR. SABETTA: Objection to the form.

8 A. It does not.

9 Q. Was there a practice adopted by Monsanto of
10 giving answers to customers only orally?

11 MR. SABETTA: Objection to form.

12 A. No.

13 Q. What is Mr. Johnson referring to here?

14 A. You'll have to ask Mr. Johnson that.

15 Q. Was there any correspondence from these 15
16 or 20 people telling Mr. Johnson that he had
17 misunderstood how communications with customers should
18 take place?

19 MR. SABETTA: Objection to the form.

20 A. Not that I know.

21 Q. Is it your understanding that the list of
22 addressees on this Exhibit 409 was permitted to give
23 written answers on Aroclor PCBs?

24 MR. SABETTA: Objection to form.

25 A. That's my understanding, yes.

1 Q. Where does your understanding come from?

2 A. Just by being with Monsanto for about 20
3 years and knowing how we operated and how we
4 communicated, I arrived at that understanding.

5 Q. Was it your understanding that Mr. Johnson
6 had no authority to send such an exhibit as 409?

7 MR. SABETTA: Objection to form.

8 A. I'm not aware of anything that authorized
9 Mr. Johnson to develop that policy.

10 Q. Did you know Mr. Johnson?

11 A. Yes.

12 Q. Was he kind of a rogue sort of guy?

13 A. A what kind?

14 MR. SABETTA: Objection to the form.

15 A. That's so subjective. That depends on
16 who's observing.

17 Q. If you look at the second paragraph of 409,
18 it says, "We want to avoid any situation where a
19 customer wants to return fluid." Do you see that?

20 A. I do.

21 Q. Had there been discussions among this group
22 that you were the chairman of as to avoiding situations
23 where a customer wanted to return fluid?

24 A. No.

25 Q. Were there discussions about encouraging

1 customers to return fluids?

2 A. Yes.

3 Q. When did those kind of discussions take
4 place? Maybe we can use this Exhibit 409 as a
5 reference. This is February 16th, 1970. Do you know
6 whether those kind of discussions as to encouraging
7 customers to return fluid were before that memo?

8 A. Monsanto had for a decade or more a policy
9 of receiving fluids and arranging for a recovery of the
10 fluids to make them useful again.

11 Q. You say that policy was for a decade prior
12 to this February 1970 date?

13 A. At least.

14 Q. How did you become familiar with that
15 policy?

16 A. Well, some of my familiarity, of course,
17 came when I was at the Anniston, Alabama plant, and we
18 would receive these materials and run them through the
19 production system and make them usable again, and later
20 when I got this assignment in 1970, I was made aware
21 there were additional facilities in which a
22 subcontractor would clean the material.

23 Q. Did Monsanto make a charge to the customers
24 for receiving the returned fluids?

25 MR. SABETTA: Objection to form.

1 A. I'm not familiar with the financial
2 arrangements.

3 Q. Do you know as to whether Monsanto ever
4 made a charge as to return of used fluids?

5 MR. SABETTA: Objection to form.

6 A. I know of the charge that was made for
7 disposal via incineration. That was eventually
8 implemented.

9 Q. Did Monsanto charge for return of PCB
10 fluids prior to getting its incinerator up and running?

11 A. Like I said earlier, I'm not aware of these
12 financial arrangements.

13 Q. Did Monsanto charge for taking in the used
14 fluid, cleaning it, and returning it to customers?

15 A. Well, again, I don't know what arrangements
16 were made with each customer.

17 Q. Do you know whether the material that was
18 cleaned by Monsanto was sold to customers?

19 MR. SABETTA: Objection to form. You mean
20 different customers than the ones that returned it?

21 Q. Different customers, the same customers.
22 I'm interested in whether it was sold.

23 A. It was sold.

24 Q. Look at the second paragraph of Exhibit 409
25 towards the bottom, the next to the last paragraph. It

1 says, "We can't afford to lose one dollar of business.
2 Our attitude in discussing this subject with our
3 customers will be the deciding factor in our success or
4 failure in retaining all our present business. Good
5 luck." Do you see that?

6 A. I do.

7 Q. Did you receive a copy of this
8 communication?

9 A. No.

10 Q. How did it come about that you received it?
11 Let me withdraw that. At some point did you see it?

12 A. Yes, I did.

13 Q. Who gave it to you?

14 A. I don't remember. Somebody sent me a copy.

15 Q. Do you know whether -- Was it about this
16 time, February of 1970, --

17 A. Yes.

18 Q. -- that you got a copy?

19 A. Yes.

20 Q. Did you respond to Mr. Johnson or anyone in
21 writing with respect to this Exhibit 409 after you
22 received a copy?

23 A. No.

24 Q. The third page in on Exhibit 409 is
25 entitled "Possible Customer Questions on PCBs". Do you

1 see that?

2 A. I do.

3 Q. Did you receive that document as part of
4 the communication when you received it in February of
5 1970?

6 A. I did.

7 Q. Did you review it?

8 A. Yes.

9 Q. Did you agree with the proposed questions
10 and the proposed answers?

11 MR. SABETTA: Objection to form.

12 A. I agreed with some of the answers. I did
13 not judge the validity or the value of the questions,
14 and I found some of the responses could have been worded
15 differently.

16 Q. Did you make any form of document with
17 respect to your position in February of 1970 with
18 respect to this document entitled "Possible Customer
19 Questions on PCBs"?

20 A. I did not.

21 Q. Why not?

22 MR. SABETTA: Objection to form.

23 A. Gee, I don't remember the -- I suspect I
24 was too darn busy. I just never got around to it.

25 Q. You also suspect that perhaps you didn't

1 disagree too much with the questions and answers?

2 MR. SABETTA: Objection to form.

3 A. That's not true. I was not in complete
4 agreement with what was in these documents.

5 Q. Did you bring that lack of complete
6 agreement with this document to anyone's attention?

7 A. Yes.

8 Q. To whose attention did you bring it?

9 A. Mr. Johnson, Mr. Olson, Mr. Bergen.

10 Q. Were there any documents created with
11 respect to your lack of complete agreement as to this
12 particular document?

13 A. Not to my knowledge.

14 Q. If you look at Exhibit 27 -- I'm sorry.
15 Would you turn to tab 27 for me, please?

16 A. 410.

17 (Whereupon, there was an off-the-record
18 discussion.)

19 Q. You have in front of you Exhibit 410, which
20 purports to be a March 30th, 1970 memo from W. B.
21 Papageorge to a list of individuals; is that correct?

22 A. Yes.

23 Q. And that document purports to attach a copy
24 of a rough draft of a plan for managing the PCB problem;
25 is that correct?

1 A. Yes.

2 Q. Now, this particular communication asks
3 that each of the addressees review the draft and "plan
4 to meet jointly in conference room C303 on Thursday,
5 April 2nd, at 9:00 a.m. for a thorough discussion." Is
6 that correct?

7 A. Yes.

8 Q. Then it says, "Our objective will be to
9 develop a finished plan which will eventually be
10 presented to the CMC by mid April." Do you see that?

11 A. Yes.

12 Q. Who's the CMC?

13 A. The Corporate Management Committee.

14 Q. Do you know that that meeting occurred on
15 April 2nd that you refer to in this document?

16 A. Yes, it did.

17 Q. Was there a thorough discussion?

18 A. Yes.

19 Q. Were there notes made at that meeting?

20 A. Yes, there were. Marginal type notes.

21 Q. When you say marginal type notes, do you
22 mean someone wrote in the margins of your proposed
23 document?

24 A. Well, there were several of us that did
25 that. I for one did, and there were others in the room.

1 Q. Did anyone else -- Withdraw that. Do you
2 know if all of these addressees came to that meeting?

3 A. I don't recall today, no.

4 Q. The rough draft of the document is attached
5 to 410; is that correct?

6 A. I'm sorry?

7 Q. The rough draft of the management plan for
8 polychlorinated biphenyl environmental problem is
9 attached to that Exhibit 410; is that correct?

10 A. It is.

11 Q. That particular document doesn't appear to
12 have any comments in the margin; is that correct?

13 A. That is correct.

14 Q. Are there copies that have comments in the
15 margins?

16 MR. SABETTA: You mean that he possesses or
17 that exist somewhere in the world? Object to the form.

18 Q. Can you answer that?

19 A. I just am not aware of the presence or
20 existence of documents showing marginal notes on this
21 rough draft.

22 Q. You mentioned that you had written marginal
23 notes on the draft; is that correct?

24 A. Yes.

25 Q. Do you know whether your document with

1 marginal notes was retained by Monsanto?

2 A. I do not.

3 Q. Who else did you see writing marginal notes
4 on the draft?

5 A. I don't remember the particular
6 individuals. They were around the table, and many of
7 them were making notes.

8 Q. Do you know if any other individuals other
9 than the addressees came to this meeting?

10 A. I do not.

11 Q. Do you know if a finished plan was
12 developed?

13 A. Yes.

14 Q. Did that finished plan bear the same title
15 as this rough draft?

16 A. As best I recall, yes, it does.

17 Q. And did you prepare that?

18 A. Yes.

19 Q. How did you go about preparing it after
20 this meeting?

21 A. I incorporated in the document the changes
22 that appear to have been thoroughly discussed and
23 accepted by the members of the group.

24 Q. Did you after incorporating the accepted
25 comments by the group, did you prepare a draft for

1 circulation, or did you simply call that the final?

2 A. That was considered the final version.

3 Q. It was considered by you the final version?

4 A. Yes.

5 Q. Do you recall whether you incorporated many
6 comments in your final draft?

7 A. No, I don't.

8 Q. Do you recall whether your program as
9 referenced -- Withdraw it. Do you recall whether your
10 final draft included a program similar to what's set
11 forth on page 12 of this Exhibit 410?

12 MR. SABETTA: Objection to the form. You
13 can answer the question.

14 A. As best as I can recall, it did.

15 Q. Would you turn the tab 28, please? What's
16 the exhibit tab that we placed on that?

17 A. 411.

18 Q. Exhibit 411 purports to be a memorandum
19 from R. Emmet Kelly, M.D., dated March 30th, 1970 to
20 yourself; is that correct?

21 A. Yes.

22 Q. Now, that communication references that "We
23 have been in communication with a Dr. Hill of the Ohio
24 State Board of Health. He has found PCB, particularly
25 Aroclor 1254, in samples of milk from at least three

1 herds in Ohio." It then goes on and discusses this; is
2 that correct?

3 A. Yes.

4 Q. In the third paragraph of that, Dr. Kelly
5 says, "All in all, this could be quite a serious problem
6 having legal and publicity overtones. This brings us to
7 a very serious point. When are we going to tell our
8 customers not to use Aroclor in any paint formulation
9 that contacts food, feed, or water for animals or
10 humans? I think it is very important that this be
11 done." Do you see that?

12 A. I do.

13 Q. Was that done?

14 A. Yes. In fact, this is part of the open use
15 phase-out.

16 Q. What I'm interested to know is whether any
17 documents were prepared and sent to customers that told
18 them that Aroclors were not to be used in any paint
19 formulation that contacts food, feed, or water for
20 animals or humans. Was such a document prepared by
21 Monsanto?

22 A. There was a statement that was added to the
23 product labels that referred to this presence in food,
24 feed, and water.

25 Q. What product labels do you refer to?

1 A. These are labels that were affixed to
2 containers of materials that contained PCBs.

3 Q. Did they specifically reference not to be
4 used in any paint formulations that contacts food, feed,
5 or water for animals or humans?

6 A. It was not just limited to paint.

7 Q. Are you saying that a label was affixed to
8 all products containing PCBs that said it should not be
9 used in any formulation that contacts food, feed, or
10 water for animals or humans?

11 A. Words to that effect, yes.

12 Q. What's the words you recall being used when
13 you say "to that effect"?

14 A. I don't recall each and every word in this
15 sentence, but there is a sentence included in other ID's
16 or other precautions which refers to the use of PCBs in
17 situations that will result in contacting food, feed, or
18 water for animals or humans.

19 Q. When was that done?

20 A. 1970.

21 Q. Were some of those products sent to General
22 Electric with those labels?

23 A. Yes.

24 Q. Do you know whether any of that information
25 was placed on Material Safety Data Sheets?

1 A. Yes.

2 Q. Do you know whether any of that information
3 was placed on Material Safety Data Sheets for Aroclor
4 1254?

5 A. Yes.

6 Q. Was it?

7 A. As best I remember.

8 Q. And when did that occur?

9 A. 1972.

10 Q. Now, you say as best you remember. You do
11 remember that this took place, what you've just told me;
12 don't you?

13 MR. SABETTA: Objection to the form.

14 A. Sir, I was one of several people that
15 developed Material Safety Data Sheets.

16 Q. Uh-huh.

17 A. I remember the process that we went
18 through, and the only hazy recall I have is the date
19 when they were completed and available and issued.

20 Q. Would that date be as late as 1987, for
21 example, in which any reference was made to food or
22 feed?

23 MR. SABETTA: Objection to the form.

24 A. Oh, no. No. This would have to be '71,
25 '72, or '73.

1 Q. Would you turn to tab 29, please? Off the
2 record.

3 (Whereupon, there was an off-the-record
4 discussion)

5 Q. Can we turn to tab 30, please? Is there
6 a --

7 A. 413.

8 Q. We've marked as Exhibit 413 --

9 A. Yes.

10 Q. -- a document entitled "News for Release
11 Immediately, 1970," on Monsanto paper with an E. V. John
12 at the top. Have you seen that document before?

13 A. Yes, I have.

14 Q. Is this a press release that Monsanto
15 issued to the public?

16 A. Yes.

17 Q. Do you know what the date of that press
18 release was?

19 A. Yes. It's the first line, April 10th,
20 right after the word "St. Louis".

21 Q. That would be April 10th, 1970 then?

22 A. Correct.

23 Q. Was anything said in that press release as
24 to dioxins or dibenzofurans?

25 A. No.

1 Q. In the second paragraph, it says,
2 "Monsanto's statement came in response to charges by
3 Congressman William F. Ryan, R-Y-A-N, (Dem.)" --

4 A. Democrat.

5 Q. -- "of New York that discovery of PCB in
6 the ecology represented a major threat." Do you see
7 that?

8 A. Yes.

9 Q. Are you familiar with Congressman Ryan
10 introducing legislation with respect to PCBs?

11 A. Yes.

12 Q. Do you know when he did that?

13 A. 1970 or 1971.

14 Q. Do you know whether it was prior to this
15 press release referencing Congressman Ryan's charges?

16 A. I don't recall the specific timing.

17 Q. Was there eventually legislation that was
18 passed by Congress with respect to PCBs?

19 MR. SABETTA: Objection to the form.

20 A. Yes.

21 Q. Do you know about when it was passed?

22 A. 1975 or '76.

23 Q. Do you know any particular reason why it
24 took five or six years to pass?

25 A. I do not.

1 Q. Did you yourself meet personally with
2 Congressman Ryan and other government officials with
3 respect to PCBs from 1970 forward?

4 A. I did not meet with Congressman Ryan.

5 Q. You did meet with other officials?

6 A. I met with other representatives of
7 agencies of the government, regulatory agencies.

8 Q. Did you meet with any Congressmen or
9 Senators?

10 A. No.

11 Q. Did other employees of Monsanto meet with
12 Congressmen and Senators with respect to PCB
13 legislation?

14 A. Not that I know of.

15 Q. Would you have any knowledge of that in the
16 ordinary course of what you did for Monsanto?

17 MR. SABETTA: Objection to the form.

18 A. Yes.

19 Q. What about these individuals on the
20 Corporate Development Committee? Would you have
21 knowledge as to what they did in terms of meetings with
22 Congressmen and Senators?

23 MR. SABETTA: Objection to the form.

24 A. Yes.

25 Q. How would you have knowledge of that?

1 A. The individual Monsanto employee in
2 Washington would have informed me of that type of
3 activity.

4 Q. Who was this Monsanto employee in
5 Washington that you're referring to?

6 A. I forget his first name. Mr. Easley,
7 E-A-S-L E Y.

8 Q. What was Mr. Easley's title?

9 A. As best I recall, Manager, Governmental
10 Affairs.

11 Q. Was he a direct employee of Monsanto?

12 A. Yes.

13 Q. Did he have an office in Washington?

14 A. He worked out of an office, yes.

15 Q. Was that a Monsanto office?

16 A. Yes.

17 Q. Did he have other employees that worked for
18 him?

19 A. Yes.

20 Q. How big an office was that in terms of
21 number of employees? Do you remember?

22 A. I'd say half a dozen.

23 Q. Was Mr. Easley a lobbyist?

24 A. No.

25 Q. Did Monsanto employ a lobbyist about this

1 time, 1970 to 1976?

2 A. Yes.

3 Q. Who was that?

4 A. Sam Pickard, P-I-C-K-A-R-D.

5 Q. Do you know about when Mr. Pickard was
6 employed?

7 A. I do not.

8 Q. Do you know whether he worked for Monsanto
9 as a lobbyist in 1970?

10 A. Yes.

11 Q. Did he work for them in 1971?

12 A. Yes.

13 Q. '72?

14 A. Yes.

15 Q. '73?

16 A. Yes.

17 Q. '74?

18 A. Yes.

19 Q. '75?

20 A. Yes.

21 Q. '76?

22 A. Yes.

23 Q. How about '77?

24 A. I don't remember when Mr. Pickard retired,
25 so I don't know beyond that.

1 Q. Do you know about when he retired?

2 A. No, I do not.

3 Q. Do you know that the Toxic Substance
4 Control Act was passed in '76?

5 A. Yes.

6 Q. Did he retire after that?

7 A. I believe so, yes.

8 Q. Do you know about how much Monsanto paid
9 him a year for his efforts?

10 A. I do not.

11 Q. Do you know how much Monsanto paid a year
12 for his efforts with respect to PCBs?

13 A. I do not.

14 Q. Would you turn to tab 31 for me, please?
15 Have we put an exhibit number on that?

16 A. 414.

17 Q. I'm showing 414 for identification purposes
18 to be a memo by John Mason, a report on meeting with
19 Congressman Wm. F. Ryan (Dem. 20th District - New York)
20 to the file. Have you seen that document before?

21 A. Yes.

22 Q. A series of individuals are copied on that
23 particular document; is that correct?

24 A. Yes.

25 Q. It includes Mr. Eck, E-C-K?

1 A. Yes.

2 Q. Mr. Smith, Jr.?

3 A. Yes.

4 Q. Mr. Minkler, Mr. Smith, Mr. Kelly/E. P.
5 Wheeler, Mr. Bergen and Mr. Springgate, Mr. Papageorge
6 and Sam Pickard, Washington, D.C.; is that correct?

7 A. Yes.

8 Q. Did you get a copy of that document at or
9 about that time?

10 A. Yes.

11 Q. And that documents a meeting with Sam
12 Pickard and Mr. Mason with Congressman Ryan on April
13 16th, 1970; is that correct?

14 A. Yes.

15 Q. Would you turn to tab 32 for me, please?
16 Has that got a tag on it?

17 A. 415.

18 Q. I've put Exhibit 415 in front of you, which
19 purports to be a letter by John Mason, Assistant General
20 Manager, to Honorable William F. Ryan, dated April 28th,
21 1970, with copies to various individuals. It showed you
22 as one of the addressees; is that correct?

23 A. Yes.

24 Q. In the second page of that particular
25 document, at the top, first full paragraph on the page,

1 it says, "We have been investigating the relationship of
2 PCB to the environment since 1968." Do you see that?

3 A. Yes.

4 Q. Was that accurate, that statement?

5 A. Yes.

6 Q. What's your earliest recollection from
7 reviewing the records of Monsanto as to when it began
8 investigating the relationship between PCB and the
9 environment?

10 A. My recollection is that as soon as Monsanto
11 heard about the study in Sweden and the possible
12 presence of PCBs, to use the word used here,
13 investigating of the matter began, which, as best as I
14 recall, was about 1967.

15 Q. I think we looked at documents yesterday
16 showing that Ola Palm sent material to Monsanto in
17 Brussels in 1966 or thereabouts. Does that refresh your
18 recollection?

19 A. Yes. I thought that was late '66.

20 Q. And based on your knowledge with respect to
21 Monsanto records, what was the first thing that Monsanto
22 did with reference to that information being brought to
23 its attention?

24 A. The first action, as I recall, was the
25 assignment of David Wood in Brussels to contact Mr. Palm

1 in Stockholm and start the dialogue going as to what's
2 going on, what are you finding, how do you do it.

3 Q. Did Monsanto then engage in a process of
4 attempting to duplicate Dr. Jennsen's studies?

5 MR. SABETTA: Objection to form.

6 A. Yes.

7 Q. Do you know when it started that?

8 A. Sometime in 1967.

9 Q. And how did it start that process? Can you
10 tell me?

11 A. Of course, I don't know every move that was
12 made, but the assignment was initially given to the
13 people in Monsanto who do research regarding analyzing
14 for chemicals. Monsanto got a copy of the procedure
15 used by the University of Stockholm investigators and
16 began the process of applying the procedure and learning
17 how to make it accurate and reproducible. In the
18 meantime, they ordered the latest in analytical
19 equipment, and it became a matter then of improving the
20 process.

21 Q. If you look at the third page of Exhibit
22 415, in the first full paragraph it says, "In my
23 opinion, to release a complete list of uses for Aroclor
24 registration mark, names of products and manufacturers,
25 as you suggest, would only cause undue alarm to the

1 public and would make no contributions in this area."

2 Do you see that?

3 A. I do.

4 Q. Did Congressman Ryan ask for a list of uses
5 of Aroclors and the names of the products and the
6 manufacturers?

7 A. As I remember, he did, yes.

8 Q. Do you know if that material was ever sent
9 to him by Monsanto?

10 A. It was never sent.

11 Q. If you turn to tab 33 for me, please.
12 That's not marked.

13 (Luncheon recess.)

14 (Reporter marked Plaintiff's Exhibits 416
15 through 431.)

16 Q. Do you have Exhibit 416 in front of you,
17 Mr. Papageorge?

18 A. Yes (nodded).

19 Q. Exhibit 416 appears to be a letter from
20 Elmer Wheeler to Otis Fancher, Ph.D. at Industrial
21 Bio-Test, dated May 25th, 1970. Have you seen that
22 document before?

23 A. Yes.

24 Q. Did you have any direct dealings with Otis
25 Fancher?

1 A. Yes.

2 Q. How did you happen to have those direct
3 dealings?

4 MR. SABETTA: Objection to form.

5 Q. Withdrawn. Tell me about these direct
6 dealings.

7 A. I met Dr. Fancher at the laboratories when
8 I joined Mr. Wheeler in a visit to those laboratories to
9 observe the testing and to be brought up to date as to
10 the status, current findings and so on.

11 Q. Do you know about when that visit was?

12 A. I think the first one occurred in the fall
13 of 1970.

14 Q. You say first one. Did you have more than
15 one?

16 A. Yes, I did.

17 Q. How many?

18 A. I think I remember four visits to
19 laboratories of Industrial Bio-Test.

20 Q. Can you give me the approximate dates of
21 the other three visits?

22 A. This is approximate now. My second visit
23 to the Northbrook laboratories was about the first
24 quarter of 1971, and then, say, mid year 1971, and the
25 latter part of 1971 I visited the Decatur, Illinois

1 laboratory.

2 Q. The first three visits you've told me about
3 were to the Northbrook laboratory?

4 A. Yes.

5 Q. What particular study, if any, was being
6 done at Decatur?

7 A. This is the study with chickens.

8 Q. Would those be leghorn chickens?

9 A. Yes.

10 Q. The very chickens that are mentioned in
11 Exhibit 416?

12 A. I have to believe that. Yes.

13 Q. Were these arranged visits? In other
14 words, were they scheduled prior to your arrival?

15 A. Yes.

16 Q. Did you go with anyone from Monsanto other
17 than yourself?

18 A. Elmer Wheeler was my escort.

19 Q. For all four of these visits?

20 A. Yes.

21 Q. Was there a particular purpose in each of
22 these visits?

23 A. My purpose really was to get familiar with
24 the way things were being done and handled, to get a
25 report where things stood.

1 Q. Had you had in your life experience any
2 prior dealings with animal laboratories prior to these
3 visits?

4 A. I did not.

5 Q. Now, in this Exhibit 416, this purports to
6 authorize Mr. Fancher to proceed with a study with
7 leghorn chickens with Aroclor 1242, to duplicate a study
8 previously done with Aroclor 1242, except in this
9 instance you have suggested using dietary levels of two,
10 four and eight ppm. Do you see that?

11 A. I do.

12 Q. The next paragraph says, "This sample of
13 Aroclor represents our current regular production which
14 involves some cleanup instituted since the previous
15 sample was made available to you." Do you know what
16 that refers to, the "some cleanup instituted"?

17 A. Yes, I do recall it.

18 Q. What does it refer to?

19 A. This refers to the sample being of the kind
20 that is sold for the electrical applications and does
21 not include any material that's been recycled from the
22 previous use and presumably cleaned up and reused. So
23 this was an attempt to test material as produced in its
24 virgin state.

25 Q. You mean that the previous sample of

1 Aroclor 1242 given to Mr. Fancher for testing was not in
2 its virgin fashion?

3 A. Not in what, sir?

4 Q. Its virgin fashion.

5 A. It implies -- There's some question. They
6 weren't certain whether it was virgin material or a
7 blended material given a lot number and then ready for
8 sales. There was apparently some question about its I'm
9 going to call it virginity.

10 Q. There's a lot of that in the world. Is
11 this something that was told to you by Mr. Wheeler or
12 someone else, that there was a question as to the purity
13 of the previous sample that was tested by Industrial
14 Bio-Test?

15 A. Yes.

16 Q. What did he say?

17 A. Boy, I don't recall the exact words, but
18 the effect was that it didn't analyze as well as other
19 samples.

20 Q. Are you suggesting he told you that other
21 samples analyzed better in terms of biological effects?

22 MR. SABETTA: Objection to form.

23 A. We're not comparing biological effect.

24 Q. What are you comparing?

25 A. Chemical analysis.

1 Q. Comparing chemical analysis -- Withdraw it.
2 Did Mr. Wheeler tell you that the prior samples given to
3 Industrial Bio-Test were not virgin as produced in the
4 factory?

5 A. He didn't use the word "virgin". He just
6 said that the analysis of that lot number from which the
7 sample was taken was not as good as a good product
8 analyses.

9 Q. Did he show you the analysis that was done
10 on that product that was sent?

11 A. No.

12 Q. Was there a written document concerning
13 that analysis on the product that was sent to Industrial
14 Bio-Test?

15 A. Oh, there has to be. I didn't see it
16 personally, but I can't believe that the analytical
17 laboratory would not have filled out the form and
18 reported the testing results.

19 Q. Why can't you believe that?

20 A. It just isn't done.

21 Q. Withdrawn. Why should there be a test on
22 that material after it had been submitted to Industrial
23 Bio-Test and used to do animal testing?

24 A. No. This -- I misled you. The testing
25 analytically for chemical characteristics is done before

1 the material is bottled for future sampling, and in this
2 case, as best I recall, it was at the lower end of the
3 acceptable specifications.

4 Q. Was it determined that it was at the lower
5 end of the acceptable specifications after the testing
6 by Industrial Bio-Test on that sample or before?

7 A. The chemist reported the results before the
8 sample was sent to the laboratory. When the results
9 came back from the laboratory, a reanalysis was made and
10 confirms that this particular sample, although it passed
11 the industrial specifications, didn't pass the good
12 normal Monsanto spec or characteristic.

13 Q. When you say the results came back from the
14 laboratory, meaning Industrial Bio-Test Laboratory?

15 A. No. Monsanto's analytical laboratory.

16 Q. Why was the original sample sent to
17 Industrial Bio-Test if it didn't meet Monsanto's good
18 specifications?

19 A. In the sample room, the materials are on
20 shelves, if you could picture it, and when the sample is
21 requested, the people who run the sample department
22 reach up, grab a sample, and ship it, send it on. The
23 sample is on that shelf because it passed the upper or
24 lower limits. It's within limits. It does not say that
25 it's typical of the average, nor does it say it's at the

1 low end or extra pure.

2 Q. Are you telling me what you understand, or
3 are you telling me information that you have firsthand
4 knowledge about?

5 MR. SABETTA: I'll object to the form
6 because I think he's testifying about a lot of different
7 things, but if you want to zero in on something
8 specific.

9 Q. Can you answer that?

10 A. Sir, I have difficulty with your questions
11 because you keep asking me my understanding and my
12 personal involvement. I was never in a position to know
13 personally everything that took place. I had to take
14 other people's word, and 90 percent of my job was
15 accepting information others told me.

16 Q. That's exactly why I asked you that
17 question so we could find out what you know versus what
18 you've been told. Now, you've just told me, I guess,
19 what your understanding was as to how this sample of
20 lesser quality, if I can use that phrase, got sent to
21 Industrial Bio-Test in the first place. Is that
22 correct? You've told me your understanding?

23 A. Yes.

24 Q. Did Mr. Wheeler tell you that that's what
25 happened?

1 A. Yes.

2 Q. Did Mr. Wheeler tell you whether he had
3 been told that by somebody else?

4 A. He didn't have to tell me. That's normal.

5 Q. Now, was the reanalysis on that sample that
6 was taken off the shelf, as you understand it to have
7 been taken, done prior to the results coming back from
8 Industrial Bio-Test?

9 A. No.

10 Q. The reanalysis was done after the results;
11 is that correct?

12 A. That is correct.

13 Q. Now, did someone tell you how this sample,
14 second sample of Aroclor was cleaned up as referenced in
15 this Exhibit 416?

16 A. I'm not aware of any cleanup involved.

17 Q. Well, do you know what the word "cleanup
18 instituted since the previous sample was made available"
19 refers to?

20 A. I do not.

21 Q. The next sentence says, "We would hope that
22 we might find a higher 'no effect' level with this
23 sample as compared to the previous work." Do you see
24 that?

25 A. I do.

1 Q. Was there a higher "no effect" level with
2 the second sample?

3 A. I don't remember.

4 Q. With reference to the next paragraph, it
5 says, "As soon as suitable reference standards are
6 available, the research laboratory in St. Louis will
7 more carefully characterize the two samples in terms of
8 possible minute amounts of contaminants." Do you see
9 that?

10 A. Yes.

11 Q. Do you know whether the St. Louis research
12 laboratory more carefully characterized the two samples?

13 A. That's what I was led to believe.

14 Q. Who led you to believe that?

15 A. Mr. Wheeler and Mr. Tucker in the
16 analytical laboratory.

17 Q. Did you ever see any documentation of the
18 characterization of the two samples in terms of possible
19 minute amounts of contaminants?

20 A. No.

21 Q. Were you ever told that the contaminants
22 included furans?

23 A. Ever told?

24 Q. Yes.

25 A. At what point in time?

1 Q. The contaminants with respect to these
2 samples that we're talking about.

3 A. No.

4 Q. Were you ever told that the contaminants
5 contained dioxins, these samples?

6 A. No.

7 Q. Were you ever told anything as to what the
8 contaminants were if there were contaminants in these
9 two samples?

10 A. No.

11 Q. Could you turn to tab 34, please? We've
12 put an exhibit tag on that. Can you give me the number?

13 A. 417.

14 Q. Exhibit 417 purports to be correspondence
15 from yourself to Mr. Jenkins at Sprague Electric in
16 North Adams, Massachusetts, dated July 8th, 1970. It
17 appears it's the same correspondence we've already
18 marked and had testimony about as Exhibit 404; is that
19 correct?

20 A. They appear to be similar, yes, the same.

21 Q. Okay. Could you turn to tab 35, please?
22 What tag number do you have?

23 A. 418.

24 Q. I'm showing you Exhibit 418 for
25 identification. It purports to be a press release for

1 immediate release, 1970, July 16th. Have you seen that
2 document before?

3 A. Yes, I have.

4 Q. Did you participate in the preparation of
5 that?

6 A. I don't recall participating in this.

7 Q. The second page of Exhibit 418 at the top
8 says, "Commenting on a recent report that PCB can induce
9 birth defects in animals, Minkler said, 'Monsanto is not
10 aware of any scientific data that indicates
11 polychlorinated biphenyls may cause birth defects.'" Do
12 you see that?

13 A. I do.

14 Q. Were you aware of any claims that PCBs
15 cause birth defects in animals?

16 A. I recall hearing of those allegations. I
17 do not recall what animals and what defects.

18 Q. Do you recall any allegations arising out
19 of the Yusho incident that the PCB oil caused birth
20 defects in humans?

21 A. Yes.

22 Q. Do you recall when you heard those
23 allegations in terms of this press release?

24 A. I first heard of the Yusho incident in
25 early 1970. I don't know what else to add to that.

1 Q. Do you recall whether you heard contentions
2 that it wasn't the PCBs that caused birth defects after
3 Yusho but the dibenzofurans in the oil?

4 MR. SABETTA: Objection to the form.

5 A. I eventually heard of that, but to the best
6 of my recollection, it was later, about 1971 or so, when
7 I first was told that.

8 Q. Turn to tab 36 for me, please. What tag
9 number does it have on it?

10 A. 419.

11 Q. I'm showing you Exhibit 419 for
12 identification Mr. Papageorge. It purports to be a
13 memorandum between yourself and a J. R. Savage,
14 S-A-V-A-G-E, dated October 26th, 1970 with copies to
15 Mr. Bergen, Richard, Kelly, and Wheeler. Did you
16 prepare that document?

17 A. Yes.

18 Q. Now, the first sentence says, "Recent data
19 from Dr. J. P. Mieure's, M-I-E-U-R-E-'-s, work indicates
20 the presence of naphthalene, N-A-P-H-T-H-A-L-E-N-E, in
21 biphenyl and anthracene, A-N-Y-H-R-A-C-E-N-E, or
22 phenanthrene, P-H-E-N-A-N-T-H-R-E-N-E, and dibenzofuran
23 in Santowax, S-A-N-T-O-W-A-X, R used in the manufacture
24 of Aroclors." Do you see that?

25 A. Yes.

1 Q. Who is Dr. J. P. Mieure?

2 A. He was a Monsanto chemist working in
3 Dr. Keller's analytical chemistry group.

4 Q. And did he produce reports of his work?

5 A. Yes.

6 Q. Do you know whether those were narrative in
7 form as opposed to simply numbers and reports of
8 quantities of chemicals?

9 MR. SABETTA: Objection to form.

10 A. To me, they were narrative.

11 Q. Do you know how many such reports
12 Dr. Mieure produced?

13 MR. SABETTA: Objection to form.

14 A. No, I do not.

15 Q. The third paragraph says, "The
16 dibenzofurans could result from oxygen containing
17 contaminants in the benzene or, more likely, be formed
18 because of the presence of the promoter acetone,
19 A-C-E-T-O-N-E." Do you see that?

20 A. Yes.

21 Q. Where did you obtain that information from?

22 A. I don't recall the specific individual, but
23 it came out of Dr. Richard's research group.

24 Q. The last paragraph says, "The Anniston
25 plant should design and execute a program for

1 determining the source or sources of these
2 contaminants." Is that correct?

3 A. Yes.

4 Q. Did the material that was tested by
5 Dr. Mieure or Dr. Richard's group come from Anniston?

6 A. That was the only plant that made Santowax
7 R, yes.

8 Q. Was that testing that was done part of
9 ordinary product testing for quality, or was it part of
10 a particular project --

11 MR. SABETTA: Objection to form.

12 Q. -- to review contents of these chemicals?

13 A. This was part of a program to develop
14 analytical procedures for those types of chemicals.

15 Q. What's Santowax?

16 A. That's a terphenyl, a solid, waxy material.

17 Q. Who is J. R. Savage?

18 A. He is the individual that was responsible
19 for manufacturing activities, and the Anniston plant was
20 one of his assignments.

21 Q. Was it ever determined where the
22 dibenzofurans came from?

23 A. It was, but at the moment I don't recall
24 when.

25 Q. What about the determination as to where

1 they came from? Do you recall what it was?

2 A. I don't recall, no.

3 Q. If you turn to exhibit or tag 37 for me,
4 please. We've marked a series of documents Exhibit 420
5 that purport to be Material Safety Data Sheets. Would
6 you take a look through those, please?

7 A. Would you like the number, sir? 420.

8 Q. Yes. Would you look through the documents
9 gathered together there as part of Exhibit 420 and
10 ascertain if they are all Material Safety Data Sheets
11 for Aroclor?

12 A. These documents are a collection of
13 Material Safety Data Sheets for Aroclors, Inerteens, and
14 Pyranols.

15 Q. And I'll represent to you that all of the
16 documents entitled Material Safety Data Sheets bear a
17 date of May 1971. Can you tell me whether there were
18 earlier Material Safety Data Sheets than those prepared
19 in May of 1971 as to those chemicals?

20 A. Sir, the May '71 is the date of the OSHA
21 form expiration. The date of these documents is, for
22 example, March 3rd, '72.

23 MR. SABETTA: February 3rd.

24 Q. Where are you referring to?

25 A. I'm sorry. At the bottom -- At the bottom

1 right-hand corner of the second page, you will see the
2 date of issue --

3 Q. Okay.

4 A. -- of the Safety Data Sheets.

5 Q. Do you know whether any Material Safety
6 Data Sheets were prepared in 1970?

7 A. The OSHA forms weren't available till May
8 of '71.

9 Q. Did Monsanto prepare similar documents with
10 respect to product safety as to these documents prior to
11 1971?

12 MR. SABETTA: Objection to form.

13 A. When you say "similar," you're talking
14 about the format or the information?

15 Q. Any documents like that.

16 MR. SABETTA: Objection to form.

17 A. There were no documents like these prior to
18 the issuance of this set.

19 Q. Were there any documents containing such
20 information that Monsanto prepared in 1970 and given to
21 either a government agency or a customer?

22 MR. SABETTA: Objection to form.

23 A. The information that is shown on these
24 Material Safety Data Sheets was included in Monsanto's
25 literature or Monsanto's product labels, not all on one

1 form.

2 Q. Did you or the group you were chairman of
3 play any role in the preparation of Material Safety Data
4 Sheets?

5 A. Yes.

6 Q. What role was that?

7 A. It depended on the individual. I, for
8 example, sort of served as the person who looked over
9 the entire document to satisfy my interest in the areas
10 covered. Other individuals there addressed different
11 parts of the document.

12 Q. Did you review the documents gathered there
13 as part of Exhibit 420 prior to them being used or
14 furnished to anyone?

15 A. Yes.

16 Q. And in terms of the first document where it
17 has a Section V-111 on the second page, "Special
18 Protection Information," do you know who prepared that
19 information?

20 A. That would be a responsibility of Jack T.
21 Garrett.

22 Q. Was he part of the Medical Department?

23 A. Yes.

24 Q. Would it be the same answer with respect to
25 section Roman numeral IX, "Special Precautions"?

1 A. Yes.

2 Q. Now, is that true with respect to each of
3 those sections up through the document marked 1/24/72,
4 which is Bates number 3318?

5 A. Yes.

6 Q. Mr. Garrett would have been supervising
7 those operations in terms of comparing that material; is
8 that correct?

9 A. That is correct.

10 Q. If you take a look for me, please, at 3319
11 Bates number. That's a document entitled Monsanto
12 Material Safety Data, page one of four, and on the
13 fourth page it bears a date September 15th, 1980; is
14 that correct?

15 A. Yes.

16 Q. Were there other Material Safety Data
17 Sheets or Material Safety Data between January 24th,
18 1972, the last date at page number 3318, and this
19 document at page number 3319?

20 A. I don't know.

21 Q. Is there a particular department at
22 Monsanto that's in charge of that?

23 A. It's the department that is assigned this
24 group of products.

25 Q. At the time of the document at Bates number

1 3319, September 15th, 1980, you were no longer working
2 in the PCB area; is that correct?

3 MR. SABETTA: You're talking about
4 September 15, 1980; right?

5 MR. McDONOUGH: Yes.

6 MR. SABETTA: As of that date, you were no
7 longer working in the PCB area.

8 A. I thought you mentioned a period ending in
9 1980.

10 Q. No. At the time of this document
11 identified as 3319, Monsanto Material Safety Data, which
12 has a date on the fourth page of September 15th, 1980,
13 you were no longer working in the area of PCBs; correct?

14 A. That's correct.

15 Q. Can you turn to tab 39 for me, please?
16 Does that have an exhibit number on it?

17 A. 421.

18 Q. Exhibit 421 is entitled "Monsanto's PCB
19 Program, W. B. Papageorge, presented at ANSI Committee,
20 C-107, meeting September 14th, 1971". Is that correct?

21 A. Yes.

22 Q. Did you prepare that document?

23 A. Yes.

24 Q. What's the ANSI Committee C-107?

25 A. That committee was formed under the

1 auspices of the American National Standards Institute.
2 That's what the ANSI stands for. To develop the
3 necessary information on the proper handling from
4 manufacture to use to disposal of PCBs.

5 Q. Did Monsanto have representatives on this
6 ANSI Committee C-107?

7 A. Yes.

8 Q. Who was Monsanto's representatives?

9 A. Paul Benignus and I were the Monsanto
10 representatives.

11 Q. Did General Electric have representatives
12 on this committee?

13 A. Yes.

14 Q. Do you know who its representatives were?

15 A. Yes.

16 Q. Who?

17 A. Ed Raab, R-A-A-B, and Mr. Posefski. I
18 forgot his first name.

19 Q. Do you know what his title was at General
20 Electric?

21 A. I associate him as being the key man -- one
22 of the key people in the capacitor part of GE's
23 business.

24 Q. Was Mr. Raab with the transformer portion
25 of GE's business?

1 A. Yes.

2 Q. Did Westinghouse have representatives on
3 this committee?

4 A. Yes.

5 Q. Did other transformer and electrical
6 manufacturers have representatives on this committee?

7 A. Yes.

8 Q. How many representatives were on the
9 committee altogether?

10 A. I don't recall the exact number. I would
11 say about 20 or so.

12 Q. Could you turn to tab 40 for me, please?
13 I'm sorry. 41.

14 A. 422.

15 Q. We've marked as Exhibit 422 a document
16 entitled "Status Report PCB/PCT Implementation Program,"
17 which appears to be the first of three pages of what
18 we've marked Exhibit 422. Can you tell me what that is?

19 A. It's entitled "Status Report on the PCB/PCT
20 Implementation Program".

21 Q. Did you participate in the preparation of
22 that?

23 A. I'm having difficulty recalling this
24 document. I don't think I ever saw it.

25 Q. Do you know what it was prepared for?

1 A. I do not.

2 Q. There appear to be various portions of the
3 document over headings which say "certified by" and then
4 an individual's name; is that correct?

5 A. I don't know that it's a heading so much as
6 a statement about referring to the previous paragraph.

7 Q. All right. Well, let's look at the first
8 page. It says Roman numeral I, "Discontinue sales of
9 PCBs for heat transfer applications. The sales of PCB
10 heat transfer fluids in the U.S. will be terminated on
11 December 15th, 1971 with two exceptions, both covered
12 with hold harmless agreements." And then it goes on.
13 Do you see that?

14 A. Yes.

15 Q. That purports to be certified by T. L.
16 Gossage, G-O-S-S-A-G-E; is that correct?

17 A. Yes.

18 Q. Do you know who Mr. Gossage is or Miss or
19 Mrs. Gossage is?

20 A. Mr. Thomas Gossage succeeded Mr. Don Olson
21 as the Director of Marketing for the Functional Fluids
22 business.

23 Q. Now, the next sentence says, "We continue
24 to supply Goodyear Tire and Rubber Company under an
25 agreement until August 7th, 1972. We supplied fluid to

1 Bendix Corporation under an agreement, but sales were
2 terminated prior to June of 1972." Do you see that?

3 A. I do.

4 Q. What were PCBs used for by Goodyear Tire
5 and Rubber? Do you know?

6 A. Well, the whole paragraph refers to heat
7 transfer applications.

8 Q. Do you know what it was used for in terms
9 of what process they were employing it in?

10 A. I do not.

11 Q. Do you know whether they used a heat
12 transfer system to melt the rubber or make the rubber?

13 A. I don't know the process enough to know.

14 Q. Okay. Roman Numeral II, "Further sale and
15 delivery of PCBs and dielectric fluids for transformers
16 and capacitors will be made in conformance with certain
17 restrictive policies adopted by Monsanto management.
18 Sales of PCB dielectric fluids in the U.S. were
19 terminated on January 15th of 1972 except to approved
20 customers who satisfy Monsanto's special requirements."
21 Certified by T. L. Gossage. Do you see that?

22 A. I do.

23 Q. Were the sales of PCB dielectric fluids
24 terminated on January 15th, 1972 except for customers
25 who satisfied Monsanto's special requirements?

1 A. That is correct.

2 Q. What were Monsanto's special requirements?

3 A. I don't remember all of the details, but
4 the requirements included understanding of the proper
5 ways to handle PCBs, an understanding of the impact they
6 could have on the environment, if mishandled, and a
7 phrase there which implied that if there is any problem
8 that the user of PCBs will be the entity responsible for
9 any harm that might result.

10 Q. Do you know why that requirement was
11 necessary?

12 MR. SABETTA: Objection to form.

13 Q. Do you know why the latter requirement,
14 that whoever purchased the PCBs was going to be
15 responsible for them, was employed?

16 A. Again, I have to share with you my
17 understanding as explained to me. The understanding is
18 to arrive at a position where an individual in the
19 customer's organization at a very high level in that
20 organization would sign an agreement of this kind with
21 the intent to get the right level of attention by the
22 customer's organization regarding the proper use of PCBs
23 and the availability of any resources needed by the
24 facility to handle them properly.

25 Q. And as part of that, if, in fact, they

1 didn't handle them properly, if damages occurred as a
2 result of that, the customer was responsible and not
3 Monsanto; is that correct?

4 A. Yes. That's what he signed off on.

5 Q. Who explained this to you?

6 A. John Stapleton.

7 Q. John Stapleton would be an attorney
8 in-house for Monsanto?

9 A. Yes.

10 Q. Was he the head of the in-house attorneys
11 for Monsanto? Do you know?

12 A. The head, no.

13 Q. Do you know who the head was in 1970, 1971?

14 A. I can't remember his name right now.

15 Q. Tom without a last name was one of the
16 attorneys you remembered earlier. Do you happen to
17 recall that last name now?

18 A. I can't recall his name either. I just
19 cannot recall the corporate attorney.

20 Q. How many attorneys did Monsanto have in
21 1970 about? Do you know?

22 A. About? A couple dozen.

23 Q. Do you know if you had any trouble with one
24 car funerals at about that time?

25 A. I'm sorry?

1 Q. I withdraw it. Looking at Exhibit 422, the
2 first page, item three, says, "Discontinue all sales of
3 PCT's, polychlorinated terphenyls, no later than June
4 30th, 1972." Do you see that?

5 A. I do.

6 Q. What are polychlorinated terphenyls? Let
7 me ask you another question. Are polychlorinated
8 terphenyls Aroclors?

9 A. Yes. The trademark applied to them as
10 well.

11 Q. Are they PCB --

12 A. No.

13 Q. -- containing materials?

14 A. No.

15 Q. Why were sales with respect to
16 polychlorinated terphenyls discontinued? Do you know?

17 A. I don't know.

18 Q. Was it because of the effect on the
19 environment that was claimed?

20 MR. SABETTA: Objection to form.

21 A. There was no such information available.

22 Q. You didn't know of any such information; is
23 that correct?

24 A. That's true.

25 Q. If you look at the fourth page in on

1 Exhibit 422, it purports to be one-page correspondence
2 on Monsanto letterhead to "Dear Sir" without the
3 addressee. Apparently the second page, which might have
4 a signature on it, is deleted from this exhibit. I
5 don't know if it is from yours or not. Is there a
6 second page to your letter?

7 MR. SABETTA: No, there's not.

8 Q. Have you seen the first page of that letter
9 before?

10 A. Yes.

11 Q. Did you participate in its preparation?

12 A. No.

13 Q. Who did? Do you know?

14 A. I do not.

15 Q. There doesn't appear to be a date on this
16 particular document, the one page anyway. Do you know
17 about when that letter was prepared?

18 A. Late 1971, early 1972.

19 Q. Did it come out of the Legal Department of
20 Monsanto?

21 A. I do not know.

22 Q. The next page, and it's a two-page
23 document, is entitled "Special Undertaking By Purchasers
24 of Polychlorinated Biphenyls". Have you seen that
25 document before?

1 A. Yes, I have.

2 Q. Did you participate in its preparation?

3 A. No.

4 Q. And then after that two pages there appears
5 to be an article entitled "PCBs Prevalent and
6 Persistent" by Carl, with a C, Gustafson. I'll spell
7 it. G-U-S-T-A-F-S-O-N. Federal Water Quality
8 Administration, Athens, Georgia. Had you seen that
9 article before?

10 A. Yes, I have.

11 Q. Do you know whether that article was sent
12 to Monsanto's customers?

13 A. Yes.

14 Q. Do you know about when it was sent?

15 A. I just don't recall.

16 Q. Okay. Can we look at tab 42, please? I
17 believe we placed a tag on that. Can you give me the
18 number?

19 A. 423.

20 Q. We've marked as Exhibit 423 a series of
21 documents headed with a letter dated February 4 of 1972
22 on Monsanto letterhead from a Howard Bergen, Director of
23 Specialty Products Group, Monsanto Industrial Chemicals
24 Co. to addressees who are not indicated on the first
25 page of the letter. Have you seen that letter before?

1 A. Yes, sir.

2 Q. Was that a letter prepared to be sent to
3 customers of Monsanto?

4 A. Yes.

5 Q. Did you participate in the preparation of
6 that?

7 A. No.

8 Q. Do you know who did?

9 A. No.

10 Q. Do you know whether that letter was sent to
11 anyone other than Monsanto's direct customers?

12 A. It was sent only to direct customers.

13 Q. Do you know whether Monsanto issued any
14 press releases with respect to the material contained in
15 this document?

16 A. I don't recall a press release.

17 Q. Now, that Exhibit 423 also includes a
18 two-page "Special Undertaking By Purchasers of
19 Polychlorinated Biphenyls" that was part of the last
20 exhibit, and the same article by Mr. Gustafson as the
21 last exhibit; is that correct?

22 A. That is correct.

23 Q. Would you turn to tab 43 for me, please?
24 What exhibit tag is that?

25 A. 424.

1 Q. I'm showing you Exhibit 424 for
2 identification, which is a three-page letter from T.
3 Katayama, K-A-T-A-Y-A-M-A, Mitsubishi Monsanto Chemical
4 Company, M-I-T-S-U-B-I-S-H-I, Tokyo, March 22nd, 1972 on
5 the subject of PCB in Japan. Have you seen that
6 document before?

7 A. Yes.

8 Q. You're purported to be copied on that
9 document; is that correct?

10 A. That is correct.

11 Q. Did you get it at about that time?

12 A. Yes.

13 Q. Now, it's directed to Mr. P. G. Benignus
14 (pronouncing Ben-ing-gus); is that correct?

15 A. I'm sorry?

16 Q. It's sent to Mr. Benignus (pronouncing
17 Ben-ing-gus); is that correct?

18 A. Oh, Benignus (pronouncing Ben-ig-nus). I'm
19 sorry.

20 Q. It's also noted copy goes to a Mr. Corey,
21 Mr. Berger, a Mr. Patton and Mr. Gossage in St. Louis,
22 and W. R. Richard and Mr. Munch in St. Louis as well as
23 yourself; is that correct?

24 A. That is correct.

25 Q. Had Mr. Corey taken over the project from

1 some other employee of Monsanto that left the company or
2 retired or was reassigned?

3 A. It wasn't exactly taking over an
4 assignment. There was a reorganization in Monsanto, and
5 Mr. Corey was assigned the -- I forget the title of the
6 assignment, but it had to do with administrative
7 matters, which included environmental affairs.

8 Q. Did Mr. Bergen and Mr. Springgate continue
9 to be involved in this PCB matter at about this time or
10 after this time?

11 A. Mr. Bergen was still involved, and he's
12 listed here. There's a misspelling there, but that's
13 who that is.

14 Q. Oh, you were referring to something that
15 says H. S. Berber? That's supposed to be Mr. Bergen?

16 A. Correct. Mr. Springgate's group as a group
17 was no longer involved, but they are represented by
18 Mr. Paton, who is listed as a recipient of a copy.

19 Q. What area of the company did he work in?

20 A. This was the group that we called the
21 Plasticizer Group.

22 Q. What area did Mr. Gossage work in?

23 A. Gossage was the marketing director for the
24 Functional Fluids Group, and Mr. Bergen was his
25 superior.

1 Q. What about Mr. Munch? Is he a new name?

2 A. That's -- I haven't seen that name in a
3 while. Mr. Munch is a research chemist working for
4 Dr. Richard in the research involved with PCBs and
5 capacitors.

6 Q. Who is Mr. Coleman at Newport?

7 A. At that time, Mr. Coleman was the
8 individual at the Newport, Wales plant responsible for
9 the manufacture of PCBs.

10 Q. Did Monsanto perform testing in Wales with
11 respect to biodegradability of PCBs?

12 A. Yes.

13 Q. Was that under the supervision of a
14 particular individual in Wales?

15 A. Yes. I'm trying to recall his name. I've
16 forgotten the name of the individual.

17 Q. Were there any studies conducted by
18 Monsanto as to biomagnification?

19 A. No.

20 Q. Do you know what biomagnification is?

21 A. I have an understanding.

22 Q. Can you tell me what your understanding is?

23 A. It refers to the increasing presence in
24 terms of amount found in living creatures as the
25 creature is identified belonging to increasing steps in

1 the biological chain, such that the creature at the
2 bottom of the chain when consuming some PCBs retained
3 some of the PCBs and as it's consumed by the next level
4 of living creature, that next level exhibits an
5 increasing amount. So as you go up the chain, the food
6 chain, the amount of PCBs found increases.

7 Q. Have you seen estimates of biomagnification
8 with PCBs as high as 200,000?

9 A. I have seen numbers like that quoted, yes.

10 Q. Looking at Exhibit 424, --

11 A. Okay.

12 Q. -- under the first "a", it says, "No
13 electrical machinery and equipment which contains PCB
14 must be manufactured after September 1, 1972." This is
15 with reference to a Ministry of International Trade, an
16 industry notice issued in Japan; is that correct?

17 A. That is correct.

18 Q. Do you know whether these various items set
19 forth this in Exhibit 424 were all adopted as the
20 Japanese government policy with respect to PCBs?

21 A. I have no information that says they were
22 not.

23 Q. Did you receive a copy of this letter?

24 A. Yes.

25 Q. Did you have any direct dealings with

1 Mr. Katayama?

2 A. No.

3 Q. Was this the joint venture plant that was
4 referred to yesterday to make PCBs in Japan?

5 A. Yes.

6 Q. The last page of that letter, the fourth
7 paragraph down says, "The grand funeral of PCB in Japan
8 is close at hand. What will replace PCB in the
9 dielectric markets is yet known to nobody exactly. We
10 only are aware of a number of products ranging from
11 silicone to polyisobutane, P-O-L-Y-S-O-B-U-T-A-N-E, wax
12 and DOP are competing. The strongest candidate on the
13 longer term basis seems to me entirely new systems after
14 technological innovation."

15 A. Yes.

16 Q. Did PCB get a grand funeral in Japan that
17 you know of?

18 MR. SABETTA: Objection to the form.

19 A. That's my understanding.

20 Q. Do you know what product or number of
21 products was used to replace PCB?

22 A. I do not.

23 Q. Do you know what product or products was
24 used to replace PCBs in the United States?

25 MR. SABETTA: Objection to form.

1 A. I do not.

2 Q. Were you involved in any research or work
3 to develop replacement products?

4 A. Well, I was prodding the research
5 department to encourage and help out wherever I could in
6 terms of getting support from upper management to
7 provide funds or people or whatever it takes to do the
8 studies, so my involvement was of that type.

9 Q. When Monsanto stopped manufacturing PCBs,
10 were replacement products used by the transformer
11 manufacturers?

12 A. Certainly, yes.

13 Q. And I think you told me you don't know what
14 replacement product was used?

15 A. That is correct.

16 Q. Would that be the same answer that you
17 don't know what replacement product was used in
18 capacitors?

19 A. Yes.

20 Q. Would you look at tab 44 for me, please?

21 MR. McDONOUGH: Off the record.

22 (Whereupon, there was an off-the-record
23 discussion)

24 Q. We've turned to tab 45, which we've marked
25 Exhibit 425; is that correct?

1 A. Yes.

2 Q. And Exhibit 425 -- Withdrawn. What is
3 Exhibit 425?

4 A. It's a collection of pages of information
5 which are minutes of a PCB Effluent Standards Meeting
6 held in February -- on February 28th, 1974.

7 Q. Where was --

8 A. And attended by a dozen or so people from
9 different users of PCBs and from associations
10 representing electrical manufacturers.

11 Q. Was the General Electric Company
12 represented at that meeting?

13 A. Yes.

14 Q. It appears Mr. James Nelson, Mr. Stuart,
15 S-T-U-A-R-T, Richel, R-I-C-H-E-L --

16 A. Uh-huh.

17 Q. -- and Dr. Edward L. Simons, S-I-M-O-N-S,
18 were present; is that correct?

19 A. Yes.

20 Q. Did you know any of those individuals prior
21 to that meeting?

22 A. Now that I see their names, I do. I
23 remember a little bit about each one.

24 Q. What did Dr. Simons do for General
25 Electric?

1 A. I don't remember that kind of detail.

2 Q. Had you seen papers prepared by Dr. Simons?

3 A. I don't remember.

4 Q. What about Mr. Nelson? Do you know what he
5 did for General Electric?

6 A. No, I don't remember.

7 Q. What about Mr. Richel? Do you know what he
8 did?

9 A. If my memory is correct, Richel was an
10 attorney by training, and he became quite active in
11 representing the PCB activity as observed within GE and
12 communicating to the rest of the world, so to speak.

13 Q. Did you attend any other meetings with
14 Mr. Richel?

15 A. Well, I remember one at the University of
16 Wisconsin in Madison.

17 Q. What was the topic of that meeting?

18 A. Of course, PCBs was the main subject, and
19 it had to do, as best I remember, with the Great Lakes
20 and PCBs.

21 Q. It pertained to PCB levels in the fish in
22 the Great Lakes?

23 A. That was one of the subjects. Just the
24 lakes and PCBs and anything that was perceived to be
25 related to that.

1 Q. Was the State of Wisconsin proposing water
2 level standards with respect to PCBs?

3 A. I don't recall if that was part of the
4 topic of the meeting I had in mind.

5 Q. Was the State of Michigan proposing water
6 level standards for PCBs at about that time?

7 A. I don't remember that.

8 (Whereupon, there was an off-the-record
9 discussion)

10 Q. Do you know which of the three individuals
11 was most knowledgeable on PCBs?

12 MR. SABETTA: Objection to the form.

13 Q. I'll withdraw it. Did the three
14 individuals talk at the meeting?

15 A. I don't remember that detail, no.

16 Q. Who prepared these minutes or these pages,
17 I should say?

18 A. Well, I do not remember.

19 Q. Now, the first page of 425 indicates that
20 you chaired the meeting and that you were Manager of
21 Product Acceptability for Monsanto; is that correct?
22 That's what it says?

23 A. I'm sorry. I don't find that reference.

24 Q. Turn back to the first page in the tab,
25 please.

1 A. Oh! That's what it indicates, yes.

2 Q. Were you dealing with any other product
3 than PCBs at that time, February 28th, 1974?

4 A. Yes.

5 Q. What other products?

6 A. I can't remember them all.

7 Q. Was there more than two or three other
8 products?

9 A. Oh, yes. About a dozen.

10 Q. Okay. That's sufficient for my purposes if
11 counsel has no objections. Now, the objective of the
12 meeting is set forth here on Exhibit 25, the first page.
13 Did you prepare that objective?

14 A. I am the one that prepared the paragraph,
15 but the thought is a combination of many of the
16 participants that I talked to over the telephone to come
17 up with the description of the objective.

18 Q. Was there an agenda for this meeting?

19 A. I don't recall one.

20 Q. Do you recall anything prior to the meeting
21 actually taking place other than this first page? I'll
22 withdraw that. Do you recall whether anything was
23 circulated to the participants in the meeting prior to
24 it beginning?

25 A. I think I recall a sort of an invitation

1 letter announcing the date, the place, and the subject
2 matter.

3 Q. Had the EPA proposed modification of the
4 PCB Effluent Standards prior to this meeting?

5 A. Yes, they had.

6 Q. Do you know what standards the EPA
7 proposed?

8 A. I keep thinking of a number like two parts
9 per billion in water.

10 Q. Do you know what ultimately the Effluent
11 Standard was set in terms of that proposed modification
12 by the EPA?

13 A. I don't recall.

14 Q. Now, the third page in of Exhibit 425
15 purports to be minutes of the PCB Effluent Standards
16 Meeting. I may have already asked you, but I've
17 forgotten if I asked you who kept the minutes, who
18 actually took the minutes of this meeting.

19 A. I don't recall who it was.

20 Q. Was a tape of that meeting made?

21 A. No.

22 Q. Was there a word-for-word transcript made
23 of that meeting?

24 A. No.

25 Q. Would you turn to tab 46 for me, please?

1 I'm sorry. Can we go back to 45, please? Tab 45,
2 Exhibit 425.

3 A. I have it.

4 Q. Did Paul Wright attend that meeting?

5 A. I don't think so. No.

6 Q. Page four refers to a Mr. Wright from
7 Monsanto. I'm asking whether that's a reference to
8 Dr. Paul L. Wright.

9 A. I don't associate the items discussed on
10 that page referring to effluent load of PCBs and
11 biomagnification -- I just don't associate that with
12 Mr. Wright.

13 Q. Did you know Dr. Wright?

14 A. Yes.

15 Q. Who was Dr. Wright?

16 A. Dr. Wright was a toxicologist.

17 Q. At some time was he head of toxicology for
18 Monsanto?

19 A. No.

20 Q. Did he work as a toxicologist for Monsanto?

21 A. Yes.

22 Q. Do you know what periods of time he worked
23 for Monsanto as a toxicologist?

24 A. The middle '70's is as close as I can get.

25 Q. Do you recall whether Dr. Wright worked for

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1 Monsanto as a toxicologist -- I'll withdraw it. Do you
2 recall if during a period of time Dr. Wright worked as a
3 toxicologist for Industrial Bio-Test?

4 A. I was told that he used to work for
5 Industrial Bio-Test.

6 Q. Were you told that he used to work for
7 Monsanto before he went to work for Industrial Bio-Test?

8 A. Yes.

9 Q. Were you told after he finished work for
10 Industrial Bio-Test he went back to work for Monsanto as
11 a toxicologist?

12 A. Yes.

13 Q. If you look at page seven of that Exhibit
14 425 it references Dr. Wright speaking and talks about
15 biomagnification factors, things of that sort, including
16 shrimp. Do you associate those kind of statements with
17 Dr. Paul Wright?

18 A. Yes, I do.

19 Q. Does that refresh your recollection that he
20 was in attendance at that meeting?

21 A. The report here does indicate that, but I
22 still have trouble remembering his presence.

23 Q. Were you told that Dr. Wright was indicted
24 and convicted for falsifying Industrial Bio-Test's
25 studies for Monsanto and submitting them to government

Gateway Reporting Associates, Inc.

1 agencies?

2 MR. SABETTA: Objection to form.

3 A. I was left with an impression that
4 Dr. Wright was involved in some Industrial Bio-Test
5 reporting that was described as being improper. I don't
6 know any more than that.

7 Q. You don't know that he was indicted and
8 convicted in a federal criminal trial that ran for
9 months?

10 A. I read that in the local newspaper.

11 Q. Did you know that Mr. Calandra was
12 indicted?

13 A. I also read that in the local newspaper.

14 Q. Who was Mr. Calandra?

15 A. He was the principal individual with
16 Industrial Bio-Test Laboratories.

17 Q. Did you read in the local newspaper that
18 other individuals in Industrial Bio-Test were indicted
19 and convicted for falsifying studies of materials that
20 were submitted to the federal government?

21 A. I recall other names included.

22 Q. Do you know whether Monsanto paid for
23 Dr. Wright's legal bills in defending his criminal
24 charges?

25 A. Somehow I'm aware of that, but I don't

Gateway Reporting Associates, Inc.

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1 recall how I knew that.

2 Q. Do you know whether Monsanto paid the legal
3 bills for Mr. Calandra with respect to that indictment?

4 A. I know nothing of that.

5 Q. What about any other employees of
6 Industrial Bio-Test? Do you know whether Monsanto paid
7 the expenses of their legal bills for federal
8 indictment?

9 A. I've heard nothing on that.

10 Q. Would you turn to the next tab that we've
11 put an exhibit number, please?

12 A. 426, tab 46.

13 MR. McDONOUGH: Off the record.

14 (Whereupon, there was an off-the-record
15 discussion)

16 Q. I'm showing you Exhibit 426 for
17 identification, which purports to be a letter from
18 yourself dated March 18th, 1975 to Dan Albert, Staff
19 Supervisor, Personal Relations, Westinghouse, which
20 purports to attach responses to questions listed in your
21 letter dated February 3rd, 1975. Is that a letter that
22 you prepared?

23 A. Well, the letter in its entirety consists
24 of four pages. I prepared the first page.

25 Q. The next page starts out at the top with a

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1 number one and a question. "Does Inerteen have
2 permanent effects on the human body? If so, what type
3 of permanent damage, and how long a period of time does
4 it take for this to develop? If not, explain why, if
5 possible." That's the next page.

6 A. Yes.

7 Q. And then it has two additional pages with
8 questions and responses; is that correct?

9 A. Yes.

10 Q. Did you participate in the preparation of
11 those three pages of questions and responses?

12 A. No.

13 Q. Who did?

14 A. Elmer Wheeler.

15 Q. Did Dr. Kelly?

16 A. I don't believe Dr. Kelly did that.

17 Q. Do you recall when Dr. Kelly left the
18 company?

19 A. About 1972.

20 Q. Do you know whether Dr. Kelly continued to
21 do any consulting work on behalf of Monsanto after he
22 left the company?

23 A. Not to my knowledge.

24 Q. Does the year 1974 refresh your
25 recollection as to when Dr. Kelly left the company?

1 MR. SABETTA: Objection to form.

2 A. No, it doesn't.

3 Q. These three pages of questions and answers
4 were sent out along with your response to Mr. Albert; is
5 that correct?

6 A. Yes.

7 Q. Did you read them at the time --

8 A. Yes.

9 Q. -- that you prepared the letter? Did you
10 agree with the responses?

11 A. Yes.

12 Q. Look at tab 47 for me, please. Have we
13 placed a deposition exhibit number on it?

14 A. 427.

15 Q. Exhibit 427 purports to be correspondence
16 from J. C. Calandra, C-A-L-A-N-D-R-A, President of
17 Industrial Bio-Test, dated April 18th, 1975 to
18 Dr. George Roush, R-O-U-S-H, Jr., Monsanto Company, and
19 includes a several page enclosure entitled "Review of
20 PCB Meeting"; is that correct?

21 A. Yes.

22 Q. This letter purports to be sent to yourself
23 and George Lavinskas, L-A-V-I-N-S-K-A-S, and
24 Mr. Wheeler; is that correct?

25 A. Yes.

1 Q. Did you get this?

2 A. Yes.

3 Q. Did you attend a meeting with Mr. Calandra?

4 A. Yes.

5 Q. Was that meeting on April 18th, 1975?

6 A. Yes.

7 Q. Were any minutes of that meeting kept by

8 Monsanto?

9 A. Not to my knowledge.

10 Q. Did you take any notes of that meeting?

11 A. No..

12 Q. Did you see anybody else take any notes of

13 that meeting?

14 A. No.

15 Q. The first sentence says, "I fully

16 appreciate that the meeting on PCBs today was not

17 completely satisfactory and that many nagging questions

18 remain." Did you agree that the meeting was not

19 completely satisfactory?

20 A. Yes.

21 Q. In what regard did you feel the meeting was

22 unsatisfactory?

23 A. The reports from two studies involving rats

24 and PCBs ended up with two conclusions that did not

25 agree on the interpretation of the observations, so I as

1 an individual left the meeting frustrated, and I walked
2 out of the meeting with the feeling that this was a
3 professional disagreement between pathologists.

4 Q. Who were the pathologists who were
5 professionally disagreeing?

6 A. I forget the exact terminology, but it had
7 to do with observation of specimens taken from the test
8 animals' livers and whether or not what they observed
9 was precancerous or -- I forget all the medical terms,
10 but there was a difference in the interpretation of the
11 microscopic observations.

12 Q. Now, you mentioned the word pathologists.
13 What is a pathologist?

14 A. He's a professional in the medical field
15 who specializes in cell -- cell formation and organs
16 that developed from the proliferation of cells.

17 Q. Is such a person a medical doctor?

18 A. I believe they are listed as medical
19 people, yes.

20 Q. Do you understand a toxicologist to be
21 different than a pathologist?

22 A. Yes.

23 Q. Was there any pathologist at this meeting
24 from Monsanto or who was in Monsanto's employ?

25 A. As I remember, Dr. Calandra brought along

1 his pathologist, but my memory is not crystal clear on
2 that.

3 Q. You mentioned Dr. Calandra. What's
4 Dr. Calandra's training? Do you know?

5 A. Medical doctor is all I know.

6 Q. Did you know he was a medical doctor?

7 A. Yes.

8 Q. Was he also a toxicologist?

9 A. That I don't know.

10 Q. Were there any other pathologists at this
11 meeting other than this man you can't remember his name?

12 A. There was the pathologist that worked for
13 Dr. Renate Kimbrough. Oh, Dr. Squire was his name.

14 Q. Was Dr. Squire a medical doctor?

15 A. Pathologist.

16 Q. Why was Dr. Squire present?

17 A. He was the one that interpreted the
18 pathology review from Dr. Renate Kimbrough's work.

19 Q. Who is Dr. Renate Kimbrough?

20 A. As I understand it, she was interested in
21 toxicology and was in Atlanta, Georgia with the Center
22 for Disease Control, and at some point in time she
23 transferred to the Food and Drug Administration office
24 in Atlanta. I don't remember what year that was.

25 Q. Is your information based on what you were

1 told?

2 A. Yes.

3 Q. Did you ever meet with Dr. Kimbrough?

4 A. Yes.

5 Q. Do you know whether Dr. Kimbrough is a
6 medical doctor?

7 A. I was never left with that impression.

8 Q. Could I interpret that answer to mean you
9 don't know?

10 A. That's true.

11 Q. Do you know whether Dr. Kimbrough was a
12 pathologist?

13 A. She was not a pathologist.

14 Q. Do you know whether she was a toxicologist?

15 A. That's what I suspected all along. It was
16 never brought out in discussion.

17 Q. Do you know that Dr. Kimbrough did a study
18 in 1972 in which she said, in substance, that PCBs
19 caused cancer in the liver of rats?

20 MR. SABETTA: Objection to form.

21 MR. GRONDAHL: Objection.

22 A. I'm aware of that, yes.

23 Q. At some time do you know whether
24 Dr. Kimbrough had her work supported by Monsanto?

25 A. Not -- Never.

1 Q. You say never. How do you know that?

2 A. I believe in the position I was in I would
3 have known almost immediately.

4 Q. You referenced the position you were in up
5 until 1976? Is that what you're referring to?

6 A. Yes.

7 Q. Who paid -- Let me withdraw that. Was
8 Dr. Squires' participation in this meeting in April of
9 1975 -- Withdraw it. I forgot what my question was.
10 Was Dr. Squire paid for his attendance at this meeting
11 in April of 1975?

12 A. I do not know.

13 Q. Do you know how it came about that he
14 appeared at the meeting?

15 A. He was brought along by Dr. Kimbrough.

16 Q. Do you know why Dr. Kimbrough appeared at
17 the meeting?

18 A. As I understand it, she contacted
19 Mr. Wheeler to report to him over the telephone some
20 preliminary information regarding a recent study she had
21 completed and in a way asked for an audience with
22 Monsanto people.

23 Q. Was there any written documents pertaining
24 to this attendance at the meeting or communication with
25 Mr. Wheeler or an agenda for this meeting?

1 A. No.

2 Q. Who arranged the meeting?

3 A. Elmer Wheeler.

4 Q. With respect to Industrial Bio-Test's work
5 that led up to this meeting, were sections from livers
6 taken by Industrial Bio-Test and sent to Monsanto?

7 A. I'm confused by your reference. The study
8 by Bio-Test led to this meeting?

9 Q. Withdrawn. You mentioned that an
10 Industrial Bio-Test pathologist came to this meeting.
11 How do you know this was Industrial Bio-Test's
12 pathologist?

13 A. Because I met the people. Dr. Gordon.

14 Q. Did Monsanto have a pathologist?

15 A. Did Monsanto employ a pathologist?

16 Q. We'll start there.

17 A. No.

18 Q. Did Monsanto employ as a consultant a
19 pathologist about this time?

20 A. No.

21 Q. There seems to be indications in the record
22 and I'll represent to you that tissue samples were taken
23 by Industrial Bio-Test and sent to Monsanto. Do you
24 know why?

25 MR. SABETTA: Object to the form.

1 A. I know of Monsanto's sending samples to the
2 Food and Drug Administration.

3 Q. No. I'm referring to tissue samples taken
4 by Industrial Bio-Test in the course of animal studies
5 and sent to Monsanto. Do you have any knowledge on that
6 particular subject?

7 A. The only knowledge I know is that samples
8 of the type you're describing went from Monsanto to the
9 Food and Drug Administration for the review by their
10 pathologists.

11 Q. When did that occur?

12 A. Oh, '73 or '74.

13 Q. This next paragraph in the letter, 427,
14 says, "Please let me know of any action that you
15 contemplate in the way of seeking additional assistance
16 in pathology or in contacting federal agencies. We will
17 be pleased to be of help in any way that you may wish."
18 Do you see that?

19 A. Yes.

20 Q. Do you know whether Monsanto sought
21 additional assistance in pathology after this letter of
22 April 18th, 1975?

23 MR. SABETTA: Objection to form.

24 A. Monsanto did think of discussing this w/
25 federal agencies, and I recall joining Dr. Calandra

1 Elmer Wheeler, and I forget who else. We made a trip to
2 the Washington area and called on the Food and Drug
3 Administration people and some other federal agencies.
4 I've forgotten which ones they were now.

5 Q. Would you turn to tab 48 for me, please?
6 What exhibit number do we have on that?

7 A. 428.

8 Q. You have in front of you Exhibit 428 for
9 identification. It purports to be a July 18th, 1975
10 letter from George J. Lavinskas, L-A-V-I-N-S-K-A-S,
11 Ph.D., Manager, Environmental Assessment and Toxicology,
12 with a copy to Dr. George Roush, R-O-U-S-H, to Dr. J. C.
13 Calandra at Industrial Bio-Test regarding Aroclor two
14 year rat feeding studies. Do you have that exhibit in
15 front of you?

16 A. Yes.

17 Q. Have you seen it before?

18 A. Yes.

19 Q. In the second paragraph -- Withdraw it.
20 The first paragraph purports to attach a table
21 summarizing comparisons of three revised Aroclor
22 reports, 1242, 1254 and 1260. 1242 is circled for some
23 reason, and then the next paragraph says, "In two
24 instances, the previous conclusion of 'slightly
25 tumorigenic' was changed to 'does not appear to be

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1 carcinogenic'. The latter phrase is preferable. May we
2 request that the Aroclor 1254 report be amended to say
3 'does not appear to be carcinogenic'?" It says that; is
4 that correct?

5 A. Yes.

6 Q. Was the report amended in that fashion?

7 A. Yes.

8 Q. The next paragraph says, "The number of
9 hepatomas reported for Aroclors 1260 and 1242 have been
10 interchanged. This appears to have arisen from
11 confusion regarding the numbering of the animals. The
12 original report shows tumors in animals with numbers in
13 the 100 to 300 range with Aroclor 1260 and in the 500 to
14 800 range with Aroclor 1242. This leads me to conclude
15 that the numbering scheme shown in the second set of
16 reports is correct. With Aroclor 1254 confusion is
17 compounded. The original report shows tumors in animals
18 with numbers in the units to teens, but the revised
19 reports show animal numbers ranging from 40 to 1,000.
20 Can this be straightened out?" Do you know whether that
21 topic was straightened out?

22 A. Yes, it was.

23 Q. The next paragraph goes on to say, "I was
24 unable to reconcile the differences in the animal
25 numbers between the first supplemental report and the

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1 original reports. I had inquired as to the changes in
2 the numbers. As I recall, I was told that the sections
3 had been renumbered when the new slides were made and
4 that a key relating to the sets of numbers would be
5 supplied. This has not been done. It may not be
6 necessary for Aroclors 1260 and 1242, but Aroclor 1254
7 remains unresolved. Insofar as I can see, the remainder
8 of the reports appear acceptable." Do you know if those
9 matters were straightened out?

10 MR. SABETTA: Object to the form.

11 Q. Withdrawn.

12 A. As far as --

13 Q. Do you know if further changes were made in
14 the reports by Industrial Bio-Test along the lines
15 covered in this particular letter?

16 A. They were.

17 Q. As part of Exhibit 428, there appears to be
18 a letter from J. C. Calandra to Dr. Lavinskas, August
19 4th, 1975. Is that correct? It's part of the exhibit?

20 A. Yes.

21 Q. Had you seen that letter before?

22 A. Yes.

23 Q. Would you turn to tab 50 for me, please?

24 MR. GRONDAHL: When you get to a good spot,
25 I could use a five-minute break.

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1 MR. McDONOUGH: Okay. Go ahead.

2 (Whereupon, there was a brief recess.)

3 Q. I'm showing you Exhibit 429 for
4 identification. It purports to be a document with a
5 date stamp of October 17th, 1975, from the United States
6 Environmental Protection Agency, Stanley W. Legro,
7 L-E-G-R-O, Assistant Administrator for Enforcement, to
8 Monsanto Industrial Chemical Company and ask if you've
9 seen that document before.

10 A. Yes, I have.

11 Q. Now, the first two pages appear to be a
12 letter. The next series of pages appear to be questions
13 that Monsanto is requested to answer; is that correct?

14 A. That is correct.

15 Q. Did you participate in -- Withdraw that.
16 Did you see that document at about the time, October
17 17th, 1975?

18 A. Yes.

19 Q. Did you participate in Monsanto's response
20 to that document?

21 A. Yes.

22 Q. Who else participated in the response?

23 A. I'm trying to recall the name of the
24 accounting individual who provided the numbers that are
25 shown as being shared with EPA. Mr. David Wood was the

1 key person to sort of edit the thing and put it all
2 together to respond to the sections of the EPA request,
3 and then there were individuals in manufacturing. I
4 think at that time James Savage reviewed the numbers to
5 see that they were accurate to the best of his knowledge
6 in terms of the products produced at the two plants that
7 he was overall supervisor.

8 Q. Under question ten on page four of the
9 questions enclosed along with 429 is a question of a
10 description of any adverse health or environmental
11 effects which you know or believe to have resulted from
12 the introduction of PCB compounds or mixtures into the
13 environment. Indicate any specific occasions, including
14 dates, times, locations, amounts and parties involved
15 for which such effects are known. Do you see that
16 question?

17 A. Yes.

18 Q. Do you know whether that question was
19 assigned to any particular individual to answer?

20 A. I know it was assigned to the Corporate
21 Medical Department, but I do not know whether it was
22 Mr. Wheeler or Dr. Lavinskas.

23 Q. Who did the assignment of these questions
24 for answer at Monsanto?

25 A. I did.

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1 Q. I appreciate that. If you look at tab 51
2 for me, please.

3 A. 430.

4 Q. We've marked a document as Exhibit 430,
5 which purports to be bear a typed signature David Wood
6 on Monsanto letterhead directed to W. B. Papageorge,
7 October 30th, 1975, reference comments on EPA letter
8 received 10-17. Did you get that document?

9 A. Did I get that document?

10 Q. Yes.

11 A. That was the previous one we talked about.

12 MR. SABETTA: No. He's talking about 430.

13 Q. I'm sorry. Did you receive a copy of 430?

14 A. Oh, yes.

15 Q. Now, can you tell me what David Wood's
16 training was?

17 A. He had some sort of degree in chemistry
18 that he obtained as best I recall in England somewhere,
19 and since I don't know their degree designations, I
20 cannot pass it on to you.

21 Q. What particular job did he have at Monsanto
22 at about this time, 1975?

23 A. At this time, he had what was left of the
24 PCB marketing effort in the industrial fluids marketing
25 group, what was left in electrical applications. There

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1 wasn't anything left in hydraulic fluids or heat
2 transfer and so on. But he had the residual questions
3 that were still pouring in to answer.

4 Q. Was Mr. Benignus still involved in
5 marketing or in PCBs in 1975?

6 A. No. Mr. Benignus had retired in '74.

7 Q. Now, if you'll turn to the second page of
8 Exhibit 430, under what's numbered 12, it says "Q-10 -
9 none? Yusho? Chloracne years ago -- dangerous
10 question." Do you see that?

11 A. Yes.

12 Q. Is that with reference to the tenth
13 question that Monsanto was asked by the EPA?

14 A. Yes.

15 Q. Up to that time, had you become further
16 familiar with the Yusho incident than you had been back
17 in 1970?

18 A. Further familiar in terms of what I kept
19 hearing was consistent, and the reference to the
20 presence of chlorinated furans seemed to be gaining more
21 support by the people commenting.

22 Q. Furans were gaining more support in what
23 regard?

24 A. As being the agent or ingredient that
25 caused the effects that were reported.

1 Q. Do you know whether the Monsanto medical
2 library had gathered journal articles and articles with
3 respect to the Yusho incident up through 1975?

4 MR. SABETTA: Objection to form.

5 A. They did gather, but, unfortunately, there
6 weren't too many.

7 Q. Why do you say there weren't too many?

8 A. As I recall, most of them that I saw that I
9 was privileged to see because of my request to the
10 medical library to keep me tuned in were not in the form
11 of a scientific paper. They were column articles that
12 appeared in, say, medical journals or chemical journals
13 and environmental journals, and they were repetitive.

14 Q. Do you know if the Monsanto medical library
15 had provisions for gathering journal articles from
16 Japan?

17 A. I don't know that specifically.

18 Q. Do you know whether the Monsanto medical
19 library had any provisions for translating of articles
20 from foreign languages into English?

21 A. I don't know.

22 Q. Do you know whether Monsanto in its
23 Japanese operations translated Japanese articles for the
24 American operation?

25 A. I don't know.

1 Q. These columns you refer to, did Monsanto
2 retain a clipping service with respect to medical
3 articles?

4 A. Yes.

5 Q. What clipping service was that?

6 A. It was a service provided by entities in
7 this business to look for certain subjects in a series
8 of news magazines, newspapers, frequently issued
9 documents or journals.

10 Q. Did that clipping service retained by
11 Monsanto engage in reviewing scientific journals as well
12 as newspaper clippings and other materials of that sort?

13 A. Yes.

14 Q. Where was the clipping service located?

15 A. I don't remember that.

16 Q. You mentioned, I believe, that when you
17 would request an article of the medical library they
18 would provide it to you presumably if they had it?

19 A. Yes.

20 Q. How would it come about that you'd request
21 an article?

22 MR. SABETTA: Objection to form.

23 A. There are several ways. I could go to a
24 meeting and someone may mention it, or I could read
25 another article and in the footnotes they might refer to

1 still another article.

2 Q. In this 1975 time period, or in the three
3 or four years before it, did you ever request copies of
4 all articles dealing with the Yusho incident from the
5 medical library?

6 A. Yes.

7 Q. And do you know how many articles you were
8 supplied?

9 A. That's what I indicated earlier, there
10 weren't many.

11 Q. I'm trying to get a better handle than "not
12 many".

13 A. Half a dozen at the most.

14 Q. Do you know the names of any authors?

15 A. No. They were Japanese names that I never
16 memorized.

17 Q. How about Urabi (phonetic)? Does that name
18 ring a bell?

19 A. No.

20 Q. If you turn to the next tab, please, tab
21 52. Is there an exhibit number on that?

22 A. 431.

23 Q. You're looking at Exhibit 431. That
24 purports to be an one-page letter from yourself as
25 Manager of Product Acceptability to Mr. Earl J.

1 Stephanson, Director, Enforcement Division,
2 Environmental Protection Agency, dated December 11, 1975
3 enclosing a response to the questionnaire; is that
4 correct?

5 A. Yes.

6 Q. In the second paragraph of your letter, you
7 say, "To the best of my knowledge and belief, the
8 information contained in this response represents the
9 best information available to Monsanto." Does it say
10 that?

11 A. Yes.

12 Q. Was that true?

13 A. Yes.

14 Q. The enclosure purports to be entitled
15 "Polychlorinated Biphenyl (PCB) Compounds or Mixtures";
16 does it not?

17 A. Yes.

18 Q. That appears to be a multi-page document
19 including various exhibits attached; is that correct?

20 A. Yes.

21 Q. Do you recall how question ten was
22 answered?

23 A. Sorry?

24 Q. Do you recall how question ten as to
25 adverse health effects of PCBs was answered?

1 MR. SABETTA: Without looking at the
2 document?

3 Q. Yes.

4 A. No, I don't.

5 Q. Well, I'll be damned if I can find it in
6 the document. Do you see an answer to question ten in
7 that document?

8 MR. SABETTA: Note for the record,
9 Mr. McDonough, that at page with Bates number 4541 it
10 jumps thereafter to -- The next page in the document is
11 4864, obviously demonstrating a gap in the Bates
12 numbers, which suggests to me that some pages have been
13 omitted.

14 MR. McDONOUGH: Off the record.

15 (Whereupon, there was an off-the-record
16 discussion)

17 (Mr. McDonough marked Plaintiff's Exhibit
18 432.)

19 Q. Moving right along, would you turn to tab
20 53 for me, please? We've marked as Exhibit 432 a
21 document entitled "Mortality of PCB Workers at the
22 Monsanto Plant in Sauget, S-A-U-G-E-T, Illinois," by
23 Judith Zack, Z-A-C-K, David C. Musch, M-U-S-C-H,
24 December 14th, 1979. Have you seen that before?

25 A. It does not look familiar. I don't recall

1 seeing it.

2 Q. What's the exhibit tag on that, please?

3 430?

4 A. 432.

5 Q. Did you ever hear of any controversy

6 surrounding the methodology employed by Judith A. Zack?

7 MR. SABETTA: Objection to the form.

8 A. I don't recall any.

9 (Mr. McDonough marked Plaintiff's Exhibit

10 433.)

11 Q. Would you turn to tab 56 for me, please?

12 We've marked as Exhibit 433 a transcript of testimony

13 given by Phillip S. Smith on September 3rd, 1987. Did

14 you ever hear the name Phillip S. Smith?

15 A. Yes.

16 Q. Who is Phillip S. Smith?

17 A. He was at one time an employee of

18 Industrial Bio-Test Laboratories.

19 Q. Do you know what his position was?

20 A. Not really.

21 Q. Was Mr. Smith a toxicologist there at

22 Industrial Bio-Test?

23 A. Not to my knowledge.

24 Q. Did you ever have the opportunity to review

25 this testimony as represented in this exhibit? And I'm

1 not asking you to do it now. I'm just asking whether
2 you ever had a chance to review it in the past.

3 A. This is the Scott trial? That's what I'm
4 looking for.

5 Q. Yes.

6 A. I was present in the courtroom when he
7 testified. I did not read anything.

8 Q. Did Mr. Smith testify that an Industrial
9 Bio-Test study that had been done on request of Monsanto
10 contained falsified information?

11 MR. SABETTA: Object to the form.

12 A. I recall the insinuation or the implication
13 was in his testimony. I don't know that he used those
14 exact words, though.

15 Q. You call it an implication or insinuation.
16 Is that your characterization of what Mr. Smith said as
17 to falsification of test results on a study that he had
18 signed?

19 MR. SABETTA: Objection to form.

20 A. See, I'm not aware of him signing any
21 studies.

22 Q. Did you ever go back and look to see if he
23 did sign studies?

24 A. No, I didn't.

25 Q. Do you recall Mr. Smith stating that there

1 were two Industrial Bio-Test studies that purported to
2 bear his signature?

3 A. That I don't remember.

4 Q. Do you recall Mr. Smith testifying that one
5 of those studies did bear his signature?

6 A. I did not remember that.

7 Q. Do you recall Mr. Smith testifying that the
8 other study that purported to bear his signature did not
9 bear his signature and his name on the study was a
10 forgery?

11 A. I don't remember that either.

12 Q. Do you recall him insinuating or implying
13 that?

14 A. No.

15 Q. Did you testify in that Scott trial?

16 A. Yes.

17 Q. Do you recall testimony of Dr. Paul Wright
18 being read at that trial?

19 A. I do not.

20 Q. Do you recall statements and summaries
21 being made at that trial as to Dr. Wright being asked
22 numerous questions on falsification of Aroclor studies
23 and taking the Fifth Amendment as opposed to responding?

24 MR. SABETTA: Objection to the form.

25 A. I do not recall that at all.

1 Q. How long were you at that trial?

2 A. I've forgotten.

3 Q. Did you stay throughout it?

4 A. Throughout it?

5 Q. Throughout the trial.

6 MR. SABETTA: Objection to form. You mean
7 was he present in the courtroom, or was he in the
8 vicinity?

9 Q. Well, I meant were you present in the
10 courtroom during that trial?

11 A. A couple, three days. I didn't keep a
12 record of it, sir. I came and went.

13 Q. Were you there for Mr. Smith's testimony?

14 A. I recall I was there for some of his
15 testimony. I don't know how often he or how long he was
16 in the witness chair.

17 Q. I didn't ask you how long he was there.
18 Were you present during Mr. Smith's testimony.

19 MR. SABETTA: Objection to form.

20 A. For some of it is the best I can tell you,
21 because I don't know how long he was there.

22 Q. Since your counsel has objected to the form
23 of the question, I have to ask some more questions.
24 Were you present during the time that Mr. Smith
25 testified in that trial?

1 MR. SABETTA: Objection to form. I think
2 the confusion is whether he was present for the entirety
3 of the testimony or only a portion of it. Maybe we can
4 get at it that way. But I object to --

5 Q. What I'm asking you is whether you were
6 present during the entire portion of Mr. Smith's
7 testimony.

8 A. I don't know.

9 Q. Can you think of any reason why you would
10 have gotten up and left during the course of Mr. Smith's
11 testimony?

12 MR. SABETTA: Objection to form.

13 A. Telephone call or restroom or some other
14 business I had to attend to.

15 Q. Were you told that Mr. Smith had testified
16 that test results were falsified and his name was
17 forged?

18 A. I don't recall a discussion like that.

19 Q. After that trial, did you come back to
20 Monsanto here in St. Louis and do any form of
21 investigation into those Industrial Bio-Test studies?

22 A. No.

23 Q. Why?

24 MR. SABETTA: Objection to the form.

25 A. Because my personal observations and

1 experience led me to visualize a totally different
2 situation than what you just described.

3 Q. Well, as I understand your testimony, you
4 have no recollection of what I just described; is that
5 correct?

6 MR. SABETTA: Objection to the form.

7 A. That is true.

8 Q. Now, were you in the courtroom at the time
9 that a video was played of Wright's testimony?

10 A. There were videos shown, but I just don't
11 remember any scene with Dr. Wright in it. I don't
12 remember, no.

13 Q. You knew who Dr. Wright was at the time of
14 this trial; did you not?

15 A. Oh, yes.

16 Q. Dr. Wright had been a co-worker of yours at
17 Monsanto; is that correct?

18 A. At this time, yes.

19 Q. Was he a co-worker of yours at Monsanto at
20 the time of the trial?

21 A. That's what I meant. At that time.

22 Q. Did you hear statements made that
23 Dr. Wright was taking the Fifth Amendment rather than
24 answer any questions?

25 A. I don't remember that at all.

1 Q. Was that reported in the newspapers?

2 A. Are you talking about the Scott trial, sir?

3 Q. I'm talking about Dr. Wright taking the
4 Fifth Amendment in the course of testifying as to the
5 Aroclor tests that were done by Industrial Bio-Test.
6 Was that reported in the newspapers that you saw?

7 A. No.

8 (Mr. McDonough marked Plaintiff's Exhibit
9 434.)

10 Q. If you'll turn to tab 60 for me, please.
11 We've identified as Exhibit 434 a document entitled
12 "Minutes of Meeting of the Corporate Development
13 Committee, November 17th, 1968." Present Messrs. E. J.
14 Bock, Chairman; H. H. Bible, B-I-B-L-E; J. R. Eck,
15 E-C-K; J. L. Gillis, two L's; E. J. Putzell,
16 P-U-T-Z-E-L-L, E. H. Sommer, S-O-M-M-E-R; J. N. Ehlers,
17 E-H-L-E-R-S, Secretary. Have you ever seen those
18 minutes before?

19 A. I have seen portions of them.

20 Q. When did you see portions of them?

21 A. Early 1970.

22 Q. Were they given to you, these portions of
23 them, by anyone?

24 A. Yes.

25 Q. Who were they given to you by?

1 A. Elmer Wheeler.

2 Q. Was this part of your tutorial that you
3 told us about in the first 90 days?

4 A. Yes.

5 Q. In the course of your work from January
6 1970 up through the time that you didn't work in the
7 area of PCBs anymore, did you have any discussions or
8 conversations with any of these gentlemen identified in
9 these minutes with respect to PCBs?

10 A. Yes.

11 Q. Which ones?

12 A. Mr. Putzell, P-U-T-Z-E-L-L.

13 Q. What role did Mr. Putzell play in the
14 company?

15 A. Mr. Putzell was the general counsel of
16 Monsanto.

17 Q. When did you have discussions with
18 Mr. Putzell?

19 A. As I recall, it had to do with the subject
20 of --

21 MR. SABETTA: He's asking for the date.

22 THE WITNESS: Oh, he asked me when?

23 MR. SABETTA: When. When did you have such
24 discussions?

25 THE WITNESS: When did I have the

1 discussions?

2 MR. SABETTA: With Mr. Putzell?

3 Q. Yes.

4 A. The letter from the EPA requesting all that
5 information is dated October 17, 1975. Somehow
6 Mr. Putzell heard that we had received a copy of that,
7 and he called me to sit down with him and discuss it.

8 Q. And did you sit down and discuss it with
9 him sometime after October 17th, 1975?

10 A. Yeah. Within a week, yes.

11 Q. Was there anybody else present?

12 A. No.

13 Q. What did you discuss?

14 MR. SABETTA: Well, just a second. I think
15 we're trenching on the attorney-client privilege now,
16 and before I let my client answer any of these questions
17 I would want to have discussion with him outside the
18 presence of other counsel to see whether the privilege
19 should be asserted here, and I should direct him not to
20 answer any questions directed to the content of those
21 discussions. If you intend to ask him what they said to
22 each other at the meeting, I'm going to have that
23 discussion with him. I may instruct him not to answer.
24 If you're intending to do something other than that,
25 then I won't have to do that.

1 MR. McDONOUGH: I intend to ask him those
2 questions, and I cannot understand how the
3 attorney-client privilege would apply, but would you
4 like us to leave the room?

5 MR. SABETTA: No. I'll step outside with
6 the witness and with Mr. Peck, and we can discuss that.

7 MR. McDONOUGH: By the way, could I ask a
8 few more questions off that particular topic before you
9 leave?

10 MR. SABETTA: Sure.

11 Q. Did you have discussions with any of these
12 other gentlemen --

13 A. No.

14 Q. -- other than Mr. Putzell?

15 A. No.

16 Q. And that goes from January 1970 through
17 1986 when you left the PCB area?

18 A. '76.

19 Q. '76, I'm sorry.

20 A. That is correct.

21 MR. McDONOUGH: Okay. Thank you.

22 (Whereupon, there was a brief recess.)

23 MR. McDONOUGH: Are you going to permit the
24 witness to answer the question what did he discuss with
25 Mr. Putzell?

1 MR. SABETTA: I'll permit the witness to
2 answer only the subject matter that they discussed on
3 that occasion. I will not permit him to give any
4 testimony about what either he or Mr. Putzell said on
5 that occasion. I'm instructing him not to answer that
6 question because I've satisfied myself that that
7 information is privileged, protected, confidential by
8 reason of the attorney-client privilege. Mr. Putzell
9 was the attorney -- general counsel, rather, of the
10 company, and he was acting as such in connection with
11 this meeting with this witness.

12 Q. What subject matter did you discuss on that
13 occasion?

14 A. The letter that Monsanto received from the
15 EPA requesting information.

16 Q. Did you discuss the subject of the answer
17 to question ten?

18 MR. SABETTA: I'm going to object and
19 instruct him not to answer that question.

20 Q. Just so the record's clear, I disagree with
21 that, but we'll proceed. You have in front of you
22 Exhibit -- What is the tag number on that?

23 A. 434.

24 Q. And that's the minutes of this meeting
25 November 17, 1969. If you'll turn to the document

1 portion that has Bates number 3937 on it, it has a
2 heading "Organic Division, Law and Medical Departments
3 Report on Polychlorinated Biphenyls". Have you seen
4 that portion of the exhibit before?

5 A. Yes.

6 Q. Was this a report -- Withdraw that. Was
7 this a joint report by the Organic Division and the Law
8 Department and the Medical Department?

9 A. You mean this document is a report, or do
10 you mean the presentation, the meeting?

11 Q. Was there a presentation made at the
12 meeting that was a joint presentation by the Organic
13 Division, the Law Department, and the Medical
14 Department?

15 A. Yes.

16 Q. Now, this indicates present Messrs. C. J.
17 Smith, J. Mason, T. K. Smith, H. S. Bergen, J. E.
18 Springgate, R. E. Kelly, E. P. Wheeler, Rodney Harris,
19 Jr., D. W. Miller, W. C. Robinson; does it not?

20 A. Yes.

21 Q. Are any of those gentlemen attorneys?

22 A. No.

23 Q. Who is C. J. Smith?

24 A. C. J. Smith was an Assistant General
25 Manager of the Organic Division at that time.

1 Q. Who is T. K. Smith?

2 A. T. K. Smith was the vice president to whom
3 the Organic Division reported.

4 Q. Do you know what T. K. Smith's training
5 was?

6 A. No, I don't.

7 Q. Did you ever deal with him in this 1970
8 through 1976 time period?

9 A. Occasionally.

10 Q. Do you know what training C. J. Smith had?

11 A. He was a Bachelor's degree in Chemical
12 Engineering.

13 Q. The reference to R. E. Kelly would be
14 Dr. Kelly?

15 A. Yes.

16 Q. Who is Rodney Harris, Jr.?

17 A. He's a chemist in Monsanto's Research
18 Department in the Organic Division.

19 Q. Who's D. W. Miller?

20 A. He also is a chemist.

21 Q. Do you know whether they were Ph.D.'s,
22 Mr. Harris and Mr. Miller?

23 A. I know Mr. Miller was. I do not know about
24 Mr. Harris.

25 Q. Who is W. C. Robinson?

1 A. He's another research chemist.

2 Q. Do you know if he's a Ph.D.?

3 A. I do not.

4 Q. Do you know if any of these gentlemen are
5 still alive?

6 A. To the best of my knowledge, Mr. C. J.
7 Smith is, Mr. Mason, Mr. T. K. Smith, Mr. Springgate,
8 Rodney Harris, D. W. Miller, and W. C. Robinson.

9 Q. Do you know any of those gentlemen who
10 still are employed by Monsanto?

11 A. No.

12 Q. Do you know whether the ones that are alive
13 still live in the St. Louis area from your knowledge?

14 A. Mr. C. J. Smith is not. Mr. Springgate is
15 not.

16 Q. Where does Mr. C. J. Smith live?

17 A. I am not up to date on these. I believe
18 he's in Naples, Florida.

19 Q. Where does Mr. Springgate live to the best
20 of your knowledge?

21 A. Mr. Springgate is in California near the
22 Sacramento area. That's the best I know. It's not
23 necessarily accurate.

24 Q. If you look at the page Bates number 3938
25 under Environmental Aspects, E. P. Wheeler, there

1 appears to be an area in the middle of the page that has
2 no printing. Do you see that?

3 A. I do.

4 Q. Do you know whether material has been
5 redacted from that page?

6 A. I am told that. I have never seen the
7 material.

8 Q. Do you know what that material says?

9 A. Not having seen it, I don't know what it
10 said.

11 Q. Has anybody told you what it said?

12 A. No.

13 Q. Does it involve a report by attorneys?

14 A. I understand that it was entitled "Legal"
15 with an underline under it.

16 Q. Do you know whether an attorney was
17 identified in terms of giving the report at that portion
18 of the document?

19 A. No, I don't.

20 Q. The next heading down says "Plan of Action,
21 H. S. Bergen and J. E. Springgate". Do you see that?

22 A. Yes.

23 Q. Had you seen this page before today?

24 A. Yes.

25 Q. Did you see it at the time of your

1 tutorial?

2 A. Yes.

3 Q. Was the legal portion whited out when it
4 was shown to you?

5 A. Yes.

6 Q. Now, if you look at the next page, page
7 number 3939, it purports to be page 79 of this document,
8 there's a list of items 1 through 12; is that correct?

9 A. Yes.

10 Q. Item 1 says, "Appoint a project manager -
11 responsible for the overall management of the Aroclor
12 pollution problem. He would be assisted by a Task Force
13 from members of each business group plus Medical, Law,
14 Engineering, and Manufacturing." Do you see that?

15 A. Yes.

16 Q. Would you be that project manager?

17 A. Yes.

18 Q. And your task force never had a name?

19 A. Not officially.

20 Q. Item 2 was "Notify all Aroclor customers of
21 PCB problem." Was that part of your assignment?

22 A. Yes.

23 Q. Item 5 was "Develop and implement new
24 packaging systems for Aroclor 1254/1260." Was that part
25 of your assignment?

1 A. Yes.

2 Q. What does that mean, "new packaging
3 systems"?

4 A. It's an attempt to describe a system for
5 filling pails or drums with the 1254 and 1260 that was
6 more up to date and resulted in less spillage, and,
7 therefore, reduce the contamination at that drumming
8 spot.

9 Q. Would that new packaging system include
10 methods of packaging that would reduce vapors from the
11 shipping containers?

12 MR. SABETTA: Objection to form.

13 A. There were no visible vapors. The material
14 wasn't that hot to create vapors.

15 Q. Did you participate and perform item 5?

16 A. No. It was well underway when I finally
17 got around to addressing it.

18 Q. Who had it underway?

19 A. The Anniston plant.

20 Q. Item 6, "Introduce to market replacement
21 products for Aroclor 1254/1260," did you do that?

22 A. We attempted it, but it did not succeed.

23 Q. When you say it did not succeed, do you
24 mean up until the time you left the PCB area in 1976?

25 A. Well, even up to the time Monsanto stopped

1 producing PCBs of all kinds for anything.

2 Q. When did Monsanto stop producing PCBs of
3 all kinds for anything?

4 A. The summer of '77.

5 Q. What was the reason for that?

6 MR. SABETTA: Objection to the form.

7 Q. Do you know why Monsanto stopped producing
8 PCBs of all kinds for anything?

9 A. Well, the Toxic Substances Control Act
10 mandated that it be terminated in '79. Monsanto
11 received word from its few remaining customers that they
12 had alternative materials, and it was agreed by both
13 Monsanto and its customers that July '77 was achievable.

14 Q. Who was Monsanto's last customer of PCBs?

15 A. I do not know.

16 Q. Was GE one of its few remaining customers
17 in 1976?

18 MR. SABETTA: Objection to form.

19 A. Yes.

20 Q. Who else was a customer in 1976?

21 A. I don't propose to memorize them all.

22 Q. Do you recall any?

23 A. Of course, Westinghouse and Sprague
24 Electric and Cornell Dubilier. Might have been a half a
25 dozen more. I just don't remember the whole list.

1 Q. Do you recall from your studies who
2 Monsanto's first customer was with respect to PCBs?

3 A. Yes.

4 Q. Who was it?

5 A. Well, when I said yes, I had in mind Swann
6 Chemical Company. General Electric was the first
7 customer.

8 Q. Item 7, "Continue and expand
9 biodegradation test program with Aroclor series,
10 particularly 1242, 1248 and 1254." Were you able to do
11 that during the course of your work?

12 A. Yes.

13 Q. What was this test program?

14 A. It consisted of activities in Ruabon, Wales
15 and in St. Louis in which bacteria that were taken from
16 a municipal waste treatment plant were introduced into
17 solutions containing these three Aroclors mentioned at
18 different concentrations, and they bubbled air through
19 them just like the municipal treatment does, and to
20 analyze over given periods of time to see what was
21 happening to the Aroclors that were introduced into the
22 system.

23 Q. Item 9 says, "Accelerate present analytical
24 test program." Did you understand there was an
25 analytical test program in place at that time, at the

1 time of this meeting?

2 A. There was a --

3 Q. November of '69.

4 A. -- test program, yes.

5 Q. Was that the test program you told us with
6 respect to Dr. Keller and his group?

7 A. Yes.

8 Q. Ten was "Determine feasibility and cost of
9 eliminating 5/6 chlorines in Aroclor 1242 and 1248." Do
10 you know whether that was done?

11 A. Yes.

12 Q. What was the cost of that? Do you know?

13 A. I do not.

14 Q. 11, "Study incineration products," do you
15 see --

16 A. Yes.

17 Q. Was that study done?

18 A. Yes.

19 Q. Who did that?

20 A. Well, the laboratory work was done by
21 Dr. Richard's people, and the materials, the gases that
22 resulted from that test, were analyzed by Dr. Keller's
23 group, and the incineration products from the John Zinc
24 test were also studied by Dr. Keller's group.

25 Q. Did you discuss this study, incineration

1 products portion, with Dr. Kelly or Mr. Wheeler in the
2 course of your tutorial?

3 A. Yes.

4 Q. Was there concern about the incineration
5 products from PCB oil at that time?

6 MR. SABETTA: Objection to form.

7 A. The concern expressed involved the degree
8 or the temperature to which the operation was taken, and
9 they were supporting the high temperature approach.

10 Q. Did that concern include concern for a
11 hypothesis that furans and dioxins might be produced if
12 a high enough temperature was not used for incineration?

13 MR. SABETTA: Objection to the form.

14 MR. GRONDAHL: Object to the form.

15 A. Well, they supported that hypothesis, but
16 they were relying on the chemists to confirm that
17 hypothesis.

18 Q. Did they support that hypothesis at the
19 time of your tutorials in January 1970?

20 MR. SABETTA: Objection to form.

21 Q. "They" referring to Mr. Wheeler or
22 Dr. Kelly.

23 A. I would suggest that that came a topic of
24 more discussion really than the early three months in
25 1970. It kept coming up throughout 1970. By the time

1 the incinerator test was made, it was receiving much
2 more attention. So that would be the fall of 1970.

3 Q. So as I understand your answer, the
4 hypothesis was discussed in your tutorial in June of
5 1970 or was not?

6 A. I have a problem with the use of the word
7 "tutorial" beyond the first three months. That doesn't
8 mean we stopped talking and exchanging information.

9 Q. I was asking about the month of January
10 1970. Was the hypothetical that dioxins and
11 dibenzofurans could be released from PCBs if the
12 temperature for incineration was not high enough
13 discussed?

14 A. It did not come up.

15 Q. When did it first come up?

16 A. About the middle of 1970 was about the time
17 it started coming up.

18 Q. The next-to-last paragraph on 3939 says,
19 "Conclusion. In light of the recent and developing
20 evidence of a possible threat to certain species of bird
21 and aquatic life, we should plan to discontinue the
22 manufacture of Aroclors 1254 and 1260. The Division is
23 instructed to develop a program to discontinue these
24 products and report this to the committee." Do you see
25 that?

1 A. I do.

2 Q. Was that conclusion reported to Monsanto's
3 customers?

4 A. Yes.

5 Q. Was it reported at that time?

6 A. At what time? In '69?

7 Q. Yes. On or about November of 1969 or
8 December of 1969.

9 A. No. It was reported starting in about
10 April of 1970.

11 Q. You're telling us that it was reported
12 starting about April of 1970 that Monsanto was going to
13 discontinue the manufacture of Aroclors 1254 and 1260?

14 A. That we were planning to. We hadn't
15 arrived at the definite decision.

16 Q. Your testimony is that Monsanto told its
17 customers that it was planning to discontinue the
18 manufacture of Aroclors 1254 and 1260 starting in April
19 of 1970?

20 A. Yes.

21 Q. And were any documents employed to
22 communicate that plan?

23 A. Not to my knowledge.

24 Q. How was the communication made?

25 A. Well, we made it through our marketing

1 people. I recall at least one document that proposed
2 eliminating Aroclor 1260 and that was acceptable to the
3 customer.

4 Q. I'm talking about April of 1970 when you
5 tell me that a plan to discontinue the manufacture of
6 Aroclors 1254 and 1260 was communicated to customers,
7 were there any documents that Monsanto produced with
8 respect to that plan other than this particular exhibit
9 that we're looking at?

10 A. When I mentioned April, that was the
11 beginning of a period at which this information was
12 shared with our customers. It was not done in a mass
13 mailing. It was done in a face-to-face kind of
14 discussion.

15 Q. And you're telling me there were no written
16 documents with respect to these face-to-face discussions
17 or directions to your marketing people to have these
18 face-to-face discussions?

19 A. That is true.

20 Q. Everything was done orally?

21 A. Yes.

22 Q. Did you, meaning Monsanto, communicate to
23 the public that you were planning to discontinue the
24 manufacture of Aroclors 1254 and 1260 on or about
25 November 1969 or December 1969 or January or February or

1 March or April of 1970?

2 MR. SABETTA: Objection to the form of the
3 question.

4 Q. Withdrawn. Did Monsanto ever communicate
5 to the ultimate customers its plan to discontinue the
6 manufacture of Aroclors 1254 and 1260?

7 MR. SABETTA: Objection to the form. Asked
8 and answered.

9 A. The customers who were buying Aroclor 1260
10 were informed of the discontinuance of that product and
11 they accepted it. There was no need to go any further
12 with 1260.

13 Q. What about the public? Did Monsanto
14 communicate its plan to discontinue the manufacture of
15 Aroclor 1254 and 1260 to the public?

16 A. No.

17 Q. Did it communicate this plan to any of the
18 purchasers of transformers?

19 MR. SABETTA: Objection to the form.

20 A. No.

21 (Mr. McDonough marked Plaintiff's Exhibit
22 435.)

23 Q. Did it communicate this plan to any -- I
24 withdraw that. If you turn to the next document, I've
25 had it marked. We've marked as Exhibit 435 a document

1 that purports to be a letter over the signature of or
2 the typed signature of Elmer Wheeler, dated October
3 23rd, 1959, to Mr. Wilbur Speicher S-P-E-I-C-H-E-R,
4 Administrator, Industrial Hygiene, Westinghouse, East
5 Pittsburgh, Pennsylvania. Have you ever seen that
6 document before?

7 A. I recall it, yes.

8 Q. When did you first see that?

9 A. Part of my discussions with Mr. Wheeler.

10 Q. Was that part of this three-month tutorial
11 we've been talking about?

12 A. Yes.

13 Q. Did he give you the document?

14 A. Oh, he handed me a copy. I read it right
15 there in the room and returned it. I did not keep it,
16 no.

17 Q. Did you ever put any of these loose
18 documents that Mr. Wheeler gave you to keep in a
19 particular binder or file?

20 A. Some of them.

21 Q. Did you have a name for that finder or
22 file?

23 A. Oh, I had several names depending on the
24 subject matter.

25 Q. Do you know whether those files or binders

1 still existed when you left employment in this PCB area?

2 A. They did.

3 Q. What would you do with the others that you
4 didn't keep?

5 A. Destroy them, as long as I knew that they
6 were copies of some permanent file.

7 Q. You felt that you didn't need the documents
8 in your own files?

9 A. That's right.

10 Q. These files or binders that you did keep,
11 were they files or binders or both?

12 A. Are you referring to the three-ring
13 notebooks?

14 Q. I'm referring to whatever files or binders
15 you kept this material that Mr. Wheeler gave you, not
16 the two three-ring binders that you've earlier
17 identified.

18 A. Those were placed in files according to
19 subject matter as I defined it so that I could retrieve
20 them. They would be under "Toxicity - 1242" or
21 "Toxicity - Miscellaneous Aroclors". It varied.

22 Q. Were these files -- Did these files bear
23 your name in any fashion or any designation that they
24 were your files?

25 A. They were in my cabinets.

1 MR. McDONOUGH: That's all I have.

2 MR. GRONDAHL: I don't have anything.

3 MR. SABETTA: Okay. I guess we're done.

4

5

6 WILLIAM B. PAPAGEORGE, P.E.

7 Subscribed and sworn before me this ____ day of

8 _____, 1999.

9

10 My commission expires: _____

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Notary Public

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25 FAO/Furch, et al. vs. General Electric Company, et al.

NOTARIAL CERTIFICATE

STATE OF MISSOURI)
CITY OF ST. LOUIS)

I, FAITH A. OLLIGES, a Registered Professional Reporter and a duly commissioned Notary Public within and for the State of Missouri, do hereby certify that there came before me at the offices of Husch & Eppenberger, 100 North Broadway, St. Louis, Missouri,

WILLIAM B. PAPAGEORGE, P.E.,

who was by me first duly sworn to testify to the truth and nothing but the truth of all knowledge touching and concerning the matters in controversy in this cause; that the witness was thereupon examined under oath and said examination was reduced to writing; that the signature of the witness was not waived by agreement of all parties, and this transcript is a true and correct record of the testimony given by the witness.

I further certify that I am neither attorney nor counsel for nor related nor employed by any of the parties to the action in which this deposition is taken; further, that I am not a relative or employee of any attorney or counsel employed by the parties hereto or financially interested in this action.

IN WITNESS WHEREOF, I have hereunto set my hand and seal on May 3, 1999.

My commission expires March 21, 2001.

Notary Public

Gateway Reporting Associates, Inc.

DOC: P. G. BENIGNUS
D. A. OLSON

July 6, 1970

Mr. D. E. Cavanaugh
Espey Manufacturing Company
P. O. Box 482
Saratoga Springs, New York 12866

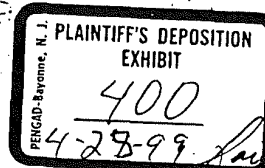
Dear Mr. Cavanaugh:

Last month when Randy Graham and I visited your plant to discuss the PCB problem, we did not intend to cause undue alarm or create any panic concerning the use and handling of polychlorinated biphenyls. We were primarily interested in sharing our current knowledge of the situation with you and offered to help wherever we could.

All studies that we are aware of indicate that PCB's, which are present in Monsanto's Arcelone, are not acute poisons to humans and other animals, but do effect some species of birds and marine life. However, since they are chlorinated hydrocarbons, personnel working with these materials should be protected from prolonged breathing of the fumes and from skin contact with the liquid. Ventilation should be provided to keep the concentration in the working area below 0.5 - 1.0 milligram per cubic meter of air.

To prevent the escape of PCB's to the environment calls for a level of control and housekeeping many of us have never been asked to achieve in the past. Every effort must be made to prevent leakage and spillage. Maintenance must be kept at a very high standard. For those areas where leakage and spills will occasionally occur, catch pans must be provided. These pans must drain to a collecting basin or be emptied by responsible employees on a scheduled basis.

FUR 001911



Mixing of Arcelors with waste water streams should be avoided since separation of PCB's from water can be costly. If mixing cannot be avoided, a catch basin and settling pond should be provided to separate the heavy Arcelor from the water.

Unusable contaminated Arcelor should be disposed by incineration which assures complete destruction to CO_2 , H_2O , and HCl. Any incineration below $800^\circ C$ will result in vaporization which will contaminate the atmosphere or in partial oxidation which may yield materials which are highly toxic.

To help our customers with their liquid disposal problems, we have offered to accept for future incineration scrap liquid Arcelors shipped to Monsanto Company, W. G. Krummrich Plant, Sauget, Illinois. Attention Supervisor, Department 245. The charge for this disposal is \$4 per pound of material. This charge is tentative pending a complete evaluation of incineration costs and does not include freight or container costs.

Contamination of the atmosphere must also be eliminated. All handling systems must be closed wherever possible. Fumes exhausted from a tank, vessel, or working area must be trapped and collected using condensers and entrainment separators.

Solids contaminated with PCB's pose a greater challenge. Until a proper incinerator is designed we are suggesting that disposal be made in an authorized, properly operated land fill away from any water systems. These solids include treatment clays, absorbing materials used to contain spills, rags, windings and containers.

In summary, control of PCB's can be achieved with equipment engineered to prevent losses and maintained properly coupled with good manufacturing practices which result in a high standard of house-keeping.

From the interest and concern which you have expressed I am certain that you will do all you can to reduce the escape of PCB's from your operation. When all of us succeed in this objective, I am certain that no regulatory agency will be compelled to take precriptive action regarding the use of PCB's in vital applications.

Sincerely,

FUR 001912

W. E. PAVASCHON, Manager
Environmental Control

cc: G.E. Graham

BCC: P. G. BENIGNUS
D. A. OLSON

July 6, 1970

Mr. Garlington Wilburn
Manager, Engineering
Westinghouse Electric Corporation
South Boston, Virginia

Dear Gary:

I have read your Process Specification 891400A "Disposition of Scrap Inerteen and Inerteen Contaminated Materials" and I found it an excellent document which reflects Westinghouse's concern about the PCB problem and is a major step forward toward improved control.

I do have one concern that I would like to pass on to you. The suggestion to burn solvent or oil contaminated with Inerteen does not refer to any minimum combustion temperature. As we discussed previously, total destruction of PCB's can only occur above 800°C. Any temperature below this minimum will result in vaporization with release to the atmosphere or worse yet, it is possible to partially oxidize PCB's into materials which can be highly toxic (e.g. dioxins or furans). Your incineration should be thoroughly reviewed.

I found our discussion and plant tour last week very interesting and informative. Your plant has excellent housekeeping and with continued emphasis on controlling loss of PCB's to the air and sewer, I am confident you can succeed in achieving a "bone dry" plant in which the leakage, spills, etc. are a rarity.

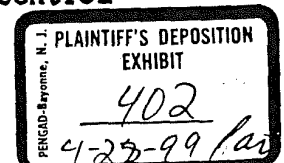
I am working with our P.R. Department on a suggested press release which I will send you soon.

Sincerely,

FUR 001908

W. B. Papageorge, Manager
Environmental Control

cc: G. R. Graham



BCC: P. G. BENIGNUS
D. A. OLSON

July 7, 1970

Mr. Gene Lewis
P. R. Mallory Company
Waynesboro, Tennessee

Dear Gene:

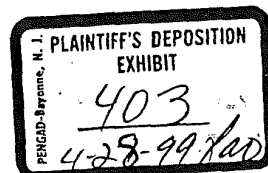
I apologize for the delay, but after further travel and a long holiday weekend I am finally sending you my comments regarding the control and disposal of Aroclors.

I appreciated the time you and your colleagues were able to spend with Randy Graham and me and I was pleased I had the opportunity to tour your plant, since this gave me a better understanding of your overall problem.

Gene, of all the plants I personally toured, yours had the biggest challenge to reach the objectives we are striving for. I tell you this not to embarrass you but, hopefully, to give you some feel for the magnitude of the problem.

First, let us consider the welfare of your employees. Aroclors, being chlorinated hydrocarbons, should not be permitted to exceed 0.5 to 1.0 milligram per cubic foot of air in the work area. In your operation, in spite of an operating ventilation system, the presence of Aroclor was noticeable by the blue haze present and insensitive as I have become, the amount was high enough to cause eye irritation which persisted for several hours after the exposure.

Another area of employee exposure is direct skin contact with the liquid Aroclor. Contact should be eliminated by operating changes or by providing protective gloves and clothing.



FUR 001905

To prevent the escape of PCB's to the environment calls for a level of control and housekeeping many of us have never been asked to achieve in the past. Every effort must be made to prevent leakage and spillage. Maintenance must be kept at a very high standard. For those areas where leakage and spills will occasionally occur, catch pans must be provided. These pans must drain to a collecting basin or be emptied by responsible employees on a scheduled basis.

Mixing of Aroclors with waste water streams should be avoided since separation of PCB's from water can be costly. If mixing cannot be avoided, a catch basin and settling pond should be provided to separate the heavy Aroclor from the water.

Unusable contaminated Aroclor should be disposed by incineration which assures complete destruction to CO_2 , H_2O , and HCl . Any incineration below 800°C will result in vaporization which will contaminate the atmosphere or in partial oxidation which may yield materials which are highly toxic.

To help our customers with their liquid disposal problems, we have offered to accept for future incineration scrap liquid Aroclors shipped to Monsanto Company, W. G. Krumarich Plant, Sauget, Illinois, Attention: Supervisor, Department 246. The charge for this disposal is 3¢ per pound of material. This charge is tentative pending a complete evaluation of incineration costs and does not include freight or container costs.

Contamination of the atmosphere must also be eliminated. All handling systems must be closed wherever possible. Fumes exhausted from a tank, vessel, or working area must be trapped and collected using condensers and entrainment separators.

Solids contaminated with PCB's pose a greater challenge. Until a proper incinerator is designed, we are suggesting that disposal be made in an authorized, properly operated land fill away from any water systems. These solids include treatment clays, absorbing materials used to contain spills, rags, windings and containers.

In summary, control of PCB's can be achieved with equipment engineered to prevent losses and maintained properly coupled with good manufacturing practices which result in a high standard of housekeeping.

FUR 001906

From the interest and concern which you have expressed, I am certain that you will do all you can to reduce the escape of PCB's from your operation. When all of us succeed in this objective, I am confident that no regulatory agency will be compelled to take precipitous action regarding the use of PCB's in vital applications.

Sincerely,

W. B. Papageorge
Manager
Environmental Control

MS:

cc: Mr. H. B. Vaught
P. R. Mallory Company

Mr. Cecil Harrod
P. R. Mallory Company

G. R. Graham

FUR 001907

BCC: P. G. BENIGNUS
D. A. OLSON

July 8, 1970

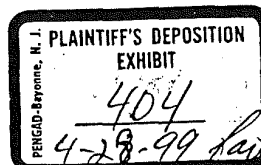
Mr. F. O. Jenkins
Vice President, Materials
Sprague Electric Company
North Adams, Massachusetts 01247

Dear Mr. Jenkins:

I was fortunately able to visit your Brown St. Plant on June 17 with Randall Graham. I personally found the discussion informative and interesting and I was most favorably impressed with the concern and interest expressed by your management personnel. We discussed briefly some of the points raised in your letter dated June 11. I will try in this letter to be more specific.

Biodegradability - Biodegradation studies conducted in our research laboratories in St. Louis, Missouri and in Ruabon, Wales using media consisting of local river waters or activated sludges acclimated to biphenyl give direct evidence that the lower chlorinated biphenyls are affected. There is some evidence that chlorine position on the biphenyl configuration does influence the degree of destruction by the microorganisms. I have enclosed a tabulation from our Ruabon laboratory which attempts to show this difference. We do not have formal information regarding the effect of sunlight or other natural influences on Aroclors. Experience gained over many years indicates Aroclors are highly stable under all known conditions present in the environment.

Toxicity - There is ample evidence from many laboratories that certain species of birds which are at the top of the marine food chain cannot reproduce properly when PCB's are present in their diets. The U. S. Fisheries laboratory at Gulfbreeze, Florida conducted a study which indicated that juvenile brown shrimp did not survive in water containing 5 parts per billion of PCB. Attached are copies of reports on these studies.



FUR 001902

Monsanto has sponsored some studies on laboratory rats and dogs. A summary of the results to date is attached.

Disposal - The preferred method for disposal is high temperature incineration. I suspect there are several commercial burners on the market which will perform well. I personally witnessed burning tests at the John Zink Company's unit in Tulsa, Oklahoma. Temperatures must exceed 1600° F to assure that complete destruction is achieved. Lower temperatures would only vaporize the Aroclors and create atmospheric pollution or, worse yet, would form, by partial oxidation, materials which could be highly toxic (e.g. furans and dioxins). With incineration HCl is formed which must be scrubbed from the stack gas and neutralized before disposal. We are planning for an initial installation in one of our plants later this year. As a service to our customers who may not have access to other incinerators, we have offered to accept scrap Aroclor for immediate storage and eventual incineration. Tentatively, Monsanto will charge 3¢ per pound of returned material. This charge does not include freight or container costs and will be reviewed when final incineration costs are established. Material which is returned for disposal should be addressed to Monsanto Company, W. G. Krummrich Plant, Sauget, Illinois, Attention: Supervisor Department 246.

Solids contaminated with Aroclors present a bigger challenge. As yet, we have not tested an incinerator with these materials. Until we get more information the best we can advise is safe burial in an authorized, properly operated land fill located away from any water systems.

We have laboratory work underway on other forms of destruction. As yet no economically feasible approach has been found.

Analytical Methodology - I have attached copies of Monsanto's analytical procedures for the determination of PCB's in water, soil, air and biological samples. We are interested in comparing our methods with those devised by other laboratories. Any comments your laboratory may have would be welcome and appreciated.

FUR 001903

I hope that the above information is useful to you.
If I can be of further service, please let me know.

Sincerely,

W. B. Papageorge
Manager
Environmental Control

ms

cc: Mr. H. Davis
Sprague Electric

G. R. Graham

FUR 001904

BCC: D. E. ROUSH

August 17, 1970

Mr. J. M. O'Leary
Technical Superintendent
Industrial Chemicals Division
Hooker Chemical Company
Niagara Falls, New York 14302

Dear Mr. O'Leary:

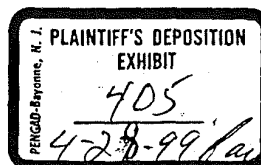
Monsanto's Don Roush informed me of your interest in receiving more information regarding polychlorinated biphenyls.

I am enclosing summaries of Monsanto's position concerning the selective markets we will supply and the status of biodegradability and chronic toxicity studies.

I have also included copies of our analytical methodology for the detection of PCB's in water, sediment, biological specimens and gases. We would appreciate any comments your laboratory may have to offer concerning these procedures.

Disposal of scrap PCB by burning can be achieved if the temperature is maintained above 800°C. Attempts to dispose at lower temperatures will result in vaporization or worse if partial oxidation to highly toxic furans or dioxins results. Stack gases from complete destruction must be scrubbed and neutralized to properly dispose of the resulting HCl gas which is formed.

We have been working with the John Zinc Company, Tulsa, Oklahoma, on the design of an incineration-scrubbing unit for installation in one of our plants within the next six months.



FUR 001900

You may be interested in the disposal service offered by Rollins-Purle, Inc., Wilmington, Delaware, James J. McLaughlin, Director of Marketing, 302-478-5150. They have an operating unit at Gloucester, New Jersey capable of incinerating chlorinated hydrocarbons.

I hope you find this information helpful. If I can be of further service, please let me know.

Sincerely,

W. B. Papageorge
Manager
Environmental Control

ms

Enclosures

Sent the following:

PCB's - Control of Escape to the Environment
PCB's - Biodegradation Studies
Summary - Interim Status Chronic Toxicity w/Aroclors
Analysis of Water & Sediment for PCB
Analysis of Biological Materials for PCB
A tentative procedure for the determination of airborne PCB
Identification of PCB by gas chromatography/mass spectrometry

FUR 001901

Monsanto

~~CONFIDENTIAL~~ Howard Bergen

FROM (NAME & LOCATION)

E. V. John - St. Louis

DATE

October 8, 1969

SUBJECT

REFERENCE

TO

Field Sales Offices
Plant Communicators
Pollution Control Engineers
Plant Managers

cc: Mr. J. J. Spano - JSPAN
Mr. W. R. Richard - WRICH
Mr. E. P. Wheeler - EWHEE
Mr. M. W. Farrar - St. Louis
Mr. D. B. Hosmer - DHOSM

C O N F I D E N T I A L

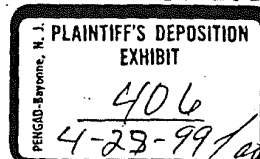
You are probably aware that for the past seven months there has been considerable interest in the possible environmental contamination by polychlorinated biphenyls (PCB). The subject first came up in the U.S. in connection with a research study done by a Dr. Robert Risebrough of the University of California. Dr. Risebrough was investigating the possibility of environmental contamination by DDT when he discovered an "interfering substance" which later was identified as PCB.

The San Francisco Chronicle published a story based on these findings. Further DDT investigations by government, state and university laboratories have substantiated that PCB's are showing up in the environment, generally in the parts-per-billion range, but occasionally in the parts-per-million range.

PCB's are manufactured by Monsanto and marketed under the trade name Aroclor. (There are other producers in Europe and Japan).

We have received numerous inquiries from the press and private, governmental and university laboratories for information about PCB. In some cases, requests have been made for samples of our Aroclor products. Monsanto's position is one of complete cooperation. A position statement has been prepared and is furnished to news media on request. To date no major national publicity has appeared. The company recently has appointed a task force to gather information and to make recommendations for future actions to protect our position in the manufacturing, marketing and customer use of Aroclor products.

This memo is to alert you to the procedure for handling inquiries. Should you receive a request for information concerning PCB's from any source (press, government, university or private citizen) please direct the inquiry to St. Louis. If the request comes by telephone, take the name, address, return phone number and the nature of the inquiry. By providing information from one central source, we can project our corporate position of cooperation, and emphasize our efforts in research and study being directed to eliminating any possible contamination sources.



FUR 003338

Field Sales Offices
Plant Communicators
Pollution Control Engineers
Plant Managers

2

October 8, 1969

Following are the individuals in St. Louis to whom inquiries may be directed for prompt action:

Mr. Elmer P. Wheeler, Medical Dept., Sta. 2196
Mr. Ed John, Public Relations Dept., Sta. 2891

Your cooperation in handling inquiries on PCB's and Aroclors as suggested will be appreciated, and hopefully will result in greater control over the flow of information.

E. V. John
Public Relations Manager
Organic Chemicals Division

Paul B. Hodges
Manager of Environmental Engineering
Organic Chemicals Division

EVJ-PBH/stw

P. S. Attached are newspaper clippings which may provide some background on the present controversy.

FUR 003339

A Menacing New Pollutant

By David Perlman
Science Correspondent

The peregrine falcon, a highly poisonous, and chemical bird of prey that once abounded all over America, is bearing a bitter warning to man:

A newly-identified chemical pollutant has arisen on our planet: It threatens not only the existence of falcons and countless other birds, but its molecules are already entering the bodies of humans.

Its long-term hazards at low levels to the human species are wholly unknown — although in concentrated gaseous form the chemical is

In California the pollutant is widespread; in the San Francisco Bay Area, where many industries use many varieties of the compound, the chemicals have concentrated heavily.

The new pollution threat is a class of organic chemicals called polychlorinated biphenyls. Few laymen have ever heard of them, yet they

See Back Page

20 San Francisco Chronicle Mon., Feb. 24, 1969

SAF FRANCISCO CHRONICLE
FEBRUARY 24, 1969

Bay Scientist's Pollutant Warning

From Page 1

are a major boon to industry: they are used in making corks, form the chemical in paints and plastics, electrical insulators and rubber tires, waxes, sealants and epoxy resins.

Despite their widespread use, in America they are made only by Monsanto Chemical Co., which markets many forms of the compounds under the trade name of Aroclors.

They apparently enter the atmosphere and marine environment by vaporizing, venting from factory stacks, by waste discharge into waterways and even by the abrasive wearing of tires on freeways.

Their chemical structure is very similar in that of DDT, the potent and long-lasting insecticide. Both DDT and the biphenyls are known as chlorinated hydrocarbons, and in the words of a Berkeley researcher they are now "the most abundant synthetic pollutants present in the global environment."

The Berkeley scientist is Dr. Robert W. Risebrough, a researcher at the Institute of Marine Resources in the University of California's Department of Nutritional Scientists.

Dr. Risebrough and a team of colleagues from Davis, San Diego and Cornell University in New York, have been alerting ecologists to the hitherto unsuspected prevalence of the biphenyl compounds and to their invasion of man's environment.

FALCON

They have published their findings in the British science journal Nature, in its American counterpart Science, and have discussed it at conferences on environmental poisons. Risebrough will be presenting more evidence on the problem at a La Jolla scientific meeting on the "Chemical Invasion of the Ocean."

In an interview with The Chronicle recently, Dr. Risebrough described the new pollution menace, and how

he came upon it.

The tale is an ironic one. It all started with the peregrine falcon. That bird, once described by an eminent ornithologist as "the embodiment of noble rapacity and lonely freedom," is now extinct as a breeding species in the eastern United States and southern Canada.

Its rapid population decline during the years right after World War II — when DDT was first introduced as a major pesticide — first served to alert ecologists that a new poison might be damaging the environment.

DDT

Investigations showed the falcon was succumbing by preying on birds that had ingested large quantities of DDT, a chemical that concentrates in animal fats. So the falcon, in a sense, was man's first messenger to carry the warning that DDT was befouling the world.

And just as Spartan kings slew their messengers who bore bad news, so the falcon is being slain today as it carries the news of the new

chemical pollutant. Eighty percent of California's breeding peregrine falcons, Dr. Risebrough estimates, have now been destroyed.

It was barely two years ago that Dr. Risebrough, on an expedition to Baja California, found an unhatched abandoned egg of a peregrine falcon. He analyzed the egg's contents, found DDT in it, and also found it contained another unidentified chemical.

PCB

Later that same chemical was found in the fat of European birds and Swedish scientists identified it as a polychlorinated biphenyl, which was to gain its scientific notoriety as PCB.

Dr. Risebrough and his colleagues then began an exhaustive hunt for PCB in birds and fish along the West Coast. They are still at it.

They have found, for example, that PCB is present in almost all birds of prey, but its quantities are largest in those birds that feed on fish or fish-eating birds. The material, like DDT, appar-

ently starts concentrating in the lowest links of the marine "food chain" — the microscopic oceanic plants and animals — and becomes more and more concentrated as tiny fish eat plankton, bigger fish eat small fish, and birds eat bigger fish.

Peregrines preying on Pacific sea birds have now virtually vanished. Dr. Risebrough reports. But small inland colonies of California falcons, which prey mostly on doves and songbirds, still appear to be reproducing normally.

In hundreds of analyses of birds and their eggs Dr. Risebrough and his colleagues have found only about a tenth as much PCB as DDT among birds from relatively uncontaminated areas. But in birds from the Farallon Islands the PCB quantities are higher — between a fifth and a half the DDT.

In birds and their eggs from polluted San Francisco Bay — falcons, gulls, terns and night herons — there is often more PCB than DDT. Dr. Risebrough and his col-

leagues point out that all the chlorinated hydrocarbons, like DDT, cause enzyme changes in animal livers and that these new-formed enzymes break down many vital hormones, including sex hormones. In laboratory experiments with pigeons, using a biphenyl compound called Aroclor 1262, made by Monsanto, Dr. Risebrough's group has found that PCB is five times more powerful than DDT in its hormone-destroying activity.

The sex hormones, according to Dr. Risebrough, play an important role in calcium metabolism, and as a result of the pollution by PCB and DDT the eggs of birds like falcons are now far thinner and more fragile than they used to be.

HUMANS

The calcium-deficient eggs break prematurely and fail to produce hatchlings. Thus the decline of the falcon — the end of its evolutionary road. It had adapted over millions of years to its natural environment but it could

not survive as a species in an environment altered by man's new chemicals.

And what of the effect of the biphenyl compounds on humans? The compounds have already been found, ominously, in the milk of mothers analyzed by Dr. J. H. Enderson and Dr. F. A. Beland at Colorado College, and Dr. Risebrough is now hoping to test for their presence among nursing mothers here.

As Dr. Risebrough has written: "They are highly toxic to man when inhaled as vapors, and the more heavily chlorinated components have greater toxicity. No tolerance limits have been set for human food supplies and their cancer-causing properties remain to be determined."

FOOD

Dr. Risebrough and his colleagues have found evidence that the biphenyls, like DDT, are carried widely across the oceans by winds and water currents. Arguments that they can be used safely be-

cause they remain localized, Dr. Risebrough says, are "misleading, irrelevant and wrong."

How the PCB compounds may affect human food supplies and human lives are questions for future research. The one certainly now is that they can be found everywhere, that they have invaded the food-producing levels of the oceans, and that their presence is rising swiftly.

Officials of the Monsanto company in St. Louis were asked for comment on Dr. Risebrough's report last week. After three days of queries a company spokesman would only say that top Monsanto scientists and sales executives were studying it.

Dr. Risebrough's fellow researchers attacking the PCB pollution problem include Dr. D. B. Peakall of Cornell; Steven G. Herman, a zoologist at Davis; Dr. Monte N. Kirven at the San Diego Natural History Museum; and Paul Heiche in Berkeley.

FUR 003340

MAY 13 1969 *5/13/69*

Some Bird Species Called DDT Victims

By QUINCY DADISMAN
Sentinel Staff Writer

— Madison, Wis. — A California biochemist testified Monday that his studies have convinced him that DDT and not another commonly found contaminant is the cause of thin eggshells which he believes will wipe out certain predatory bird species.

Robert Rischbrough, Berkeley, Calif., was called as an adverse witness by the attorney defending the pesticide at a natural resource department hearing on a petition calling for banning DDT in Wisconsin.

Testified Earlier

Rischbrough had testified in December for the petitioners — Citizens' Natural Resource association and the Wisconsin chapter of the Izaak Walton league — about DDE, a form into which DDT changes in living bodies and his conviction that DDE causes a metabolic disturbance in birds which leads to thin eggshells.

The thin shell cracks easily, causing the death of the embryo inside the egg.

Rischbrough was called by Willard S. Stafford, Madison attorney who is conducting the defense of DDT for the National Agricultural Chemicals association.

Stafford questioned Rischbrough about work he has done with polychlorinated biphenyls (PCB), a group of hy-

drocarbon compounds widely used in industry. PCB's show up in some test equipment in a way that makes separation of DDT in analysis much more difficult.

Only Few Found

Rischbrough said that while PCB's are found in large amounts in many marine birds, he had found only a few in which there were more PCB's than DDT or its metabolites (forms into which it changes in passing through living tissue).

He said that tests with eggs containing up to one part per million (p.p.m.) of PCB's and up to six p.p.m. of DDT in all forms showed mathematically, by correlation with eggshell thickness that DDE and not PCB's, were to blame. The tests were made mathematically, he said, with a statistical accuracy of 99.9%.

He said that damage to eggshells from DDT can be traced not only to the DDE in the bird's body fat, but also to the amount present in the food it eats.

"DDT may be comparatively inactive in the body fat," he concluded, explaining that peregrine falcons from Arctic areas seem to be sustaining their numbers better than those from more temperate climates because the food they eat while rearing a second clutch of eggs is "clean."

FUR 003341

New Puzzle Posed by PCB Pollution



By Bill Clede

Polychlorinated biphenals (PCB) are causing a controversial puzzle that raises many unanswered questions. And the finger of accusation may be pointing prematurely.

PCB's have been found by chemists testing fish and wildlife samples for residues of pesticides such as DDT.

"It is simply astounding that the amounts of PCB being reported could possibly be present in our environment," said Tom C. Ford of Monsanto, only commercial producer of PCB in the United States.

He explained that there just isn't the opportunity for PCB's to be introduced into nature.

Polychlorinated biphenals are a class of hydrocarbon chemicals with many industrial uses. They are used primarily as insulating fluids in electrical transformers and capacitors. They are added to a polymer to make certain plastics and adhesives or surface coatings.

Although PCB's are similar to DDT, dieldrin and other chlorinated hydrocarbon pesticides, they have no agricultural use.

"PCB's would make lousy pesticides," Ford explained. "It takes 120 milligrams of DDT per kilogram of animal weight to kill a rat. It would take 5,000 to 10,000 milligrams of PCB."

In industrial uses, PCB's are self-contained. The transformer is sealed. In heat-transfer applications, the PCB fluid functions in a closed system.

In plastics, they become part of the solid material itself.

But "plastics" is a broad term.

"Now food storage bags are virtually all made of polyethylene which contains no PCB's at all," Ford reassured us. "There is no requirement of clearance with the Food and Drug Administration."

The linking of PCB with DDT first happened about three years ago. Scientists analyzing pesticide residues in wildlife, found unidentified "interfering" substances in the same range as DDT on test equipment.

Professor Gunnar Widmark and Soren Jensen of the Stockholm University Institution of Analytical Chemistry identified the interference as PCB. It shows up a peaks on the graph of a gas chromatograph very near the peaks caused by DDT.

"The gas chromatograph is sensitive," Ford said, "but you really can't make positive identification without a mass spectrometer. We have learned that the Swedes did use one."

Since Monsanto is the sole U.S. producer of PCB, the company has launched research programs hoping to answer new questions raised by chemists.

One is seeking to identify the compounds reported to the PCB's. This involves analysis of environmental samples of air, water, soil and wildlife.

Also underway are studies to determine the biological effects of deliberate dosage of PCB's on fish, birds and mammals.

But neither is complete enough yet to draw conclusions. One chemist has done 5,000 test samples but will not assume any facts until he has finished 10,000.

Dr. Robert Riseborough, a marine biologist at the University of California at Berkeley, tends to clear PCB of blame.

Testifying at the Wisconsin's Natural Resources Department hearings on pesticides in May, Dr. Riseborough even suggested that DDT has been wrongly blamed for producing thin eggshells in some birds.

"DDE (a breakdown product of DDT) appears to be the environmental pollutant most responsible for thin eggshells despite the presence of PCB in some DDE-contaminated birds . . ."

Computer analysis, he said, showed "no significant statistical relationship" between PCB content in pelican eggs and the thickness of their shells. But as DDE contamination increased, "the shells became thinner" in both pelican and double-crested cormorant eggs.

While PCB's are found in large amounts in many marine birds, Riseborough has found only a few in which there were more PCB's than DDT or its forms changed by passing through living tissue.

But it is now a question whether the similarity of PCB's might have confused earlier tests for DDT.

According to Brainard T. Peck of the State Board of Pesticide Control, tests made prior to 1968 may not have taken PCB interference into consideration.

With the advent of the gas chromatograph, Lloyd

Keirstead of the Connecticut Agriculture Experiment Station says it is not likely that tests within the past couple of years would be confused.

But it's an even bigger question that if these findings of PCB's in fish and wildlife are accurate, where is it coming from?

Chemists have theorized that the source must be industrial wastes. Yet industry spokesmen know of no process that would release these chemicals. Monsanto has carried out a program for several years for the reclamation of used PCB's for re-use.

The only definite statement anyone will make is that these questions will surely expand the scope of research — but there won't be any quick and ready answers.

Elmer P. Wheeler, Medical Department

January 29, 1970

Status of Aroclor Toxicological Studies

J. S. Barrett, London

~~H. S. Bergen, NBERG~~

W. B. Papageorge, WPAPA

D. S. Cameron
Brussels

Enclosed is a copy of the reports from our consulting laboratory indicating the status of the animal toxicity studies. I have summarized the pertinent findings separately and as indicated in the table.

We have given copies of these data to one U. S. customer, the U. S. FDA and one or two other state agencies. I don't see why this information cannot be released with discretion in Britain or Europe.

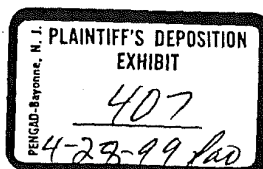
Our interpretation is that the PCB's are exhibiting a greater degree of toxicity in this chronic study than we had anticipated. Secondly, although there are variations depending on species of animals, the PCB's are about the same as DDT in mammals.

We have additional interim data which will perhaps be more discouraging. We are repeating some of the experiments to confirm or deny the earlier findings and are not distributing the early results at this time.

Elmer P. Wheeler

EPW:ju

Enclosure



FUR 003343

January 15, 1970

STATUS OF AROCLOR STUDIES

AT INDUSTRIAL BIO-TEST

Aroclor 1242

2 year rat at 1, 10 and 100 ppm:

At 90 days--possible liver enlargement. Males at 100 ppm. Histology O.K. Others O.K. Blood, urine.

2 year dog at 1, 10 and 100 ppm:

At 6 months--O.K. body weight, food consumption, reactions, mortality, hematology, blood chemistry and urine.

3 generation rat reproduction at 1, 10 and 100 ppm:

100 ppm--effect on survival--difficult to obtain pups for maturing and mating, egg production.

Chickens--egg production, hatchability, survival, etc. at 1, 10 and 100 ppm:

10 and 100 ppm levels effect hatchability. 1 ppm O.K.

Aroclor 1254

2 year rat at 1, 10 and 100 ppm:

At 90 days possible liver enlargement in males at 100 ppm. Histology O.K. Other levels O.K.

2 year dog at 1, 10 and 100 ppm:

At six months body weight effected at 100 ppm. Possibly less food consumption? Other levels O.K. Same parameters as 1242.

FUR 003344

Aroclor 1254 (Continued)

3 generation rat study at 1, 10 and 100 ppm:

100 ppm--effect on survival same as 1242.

Chicken--egg production, hatchability, survival,
etc. at 1, 10 and 100 ppm:

10 ppm O.K. but 100 effects hatchability.

Aroclor 1260

2 year rat at 1, 10 and 100 ppm:

At 90 days--possible liver enlargement in males
and females at 100 ppm. Other levels O.K.

2 year dogs at 1, 10 and 100 ppm:

At six months, body weight effect at 100 ppm,
possibly at 10 ppm. One male and one female
died--refused to eat. No other obvious reason
for fatalities by gross examination.

3 generation rat study at 1, 10 and 100 ppm:

No adverse effects.

Chicken--egg production, hatchability, survival,
etc. at 1, 10 and 100 ppm:

No effect.

FUR 003345

	<u>1242</u>	<u>1254</u>	<u>1260</u>
<u>2-year rat chronic</u>			
At 1, 10, 100 ppm	100 ppm	100 ppm	100 ppm
Status 90 days	Liver enl.	Liver enl.	Liver enl.
	<u>Males</u>	<u>Males</u>	<u>M & F</u>
	10 ppm	10 ppm	10 ppm
	O.K.	O.K.	O.K.
<u>2-year dog chronic</u>			
Status--6 months	100 ppm	100 ppm	100 ppm
	O.K.	Body wt.	1M-1F
		dec.	died
		10 ppm	refused
		O.K.	food--
			no other
			gross abn.
			10 ppm
			Possible
			body wt.
			effect
<u>3 generation rat reproduction</u>			
	100 ppm	100 ppm	100 ppm
	affects	affects	O.K.
	survival	survival	
	10 ppm	10 ppm	
	O.K.	O.K.	
<u>Chicken--Egg Production, Hatchability, Survival, etc.</u>			
	10 ppm	100 ppm	100 ppm
	affects	affects	O.K.
	<u>hatch.</u>	<u>hatch.</u>	
	1 ppm	10 ppm	
	O.K.	O.K.	

FUR 003346

Monsanto

ORGANIC CHEMICALS DIV.

Monsanto Company
800 N. Lindbergh Boulevard
St. Louis, Missouri 63188
Phone: (314) 884-1000

February 9, 1970

Dear Sir:

Recently several newspaper and magazine articles have been published indicating that Polychlorinated Biphenyls (PCBs) have been discovered at some points in some marine, aquatic and wildlife environments. The quantities detected are said to be in the parts per million and parts per billion categories.

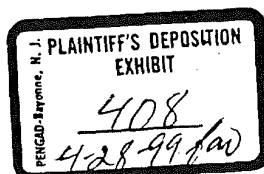
It is claimed that the PCBs found strongly resemble chlorinated biphenyls containing 54% and 60% chlorine by weight. Products which are sold by Monsanto under the trade names of Aroclor® 1254 and 1260 do contain chlorinated biphenyls. In addition to Aroclor® 1254 and 1260, Monsanto sells certain functional fluids containing Aroclor® 1254. These include Pydraul® 625, Pydraul® AC, Pydraul® AC - Winter Grade, Pydraul® 540, Therminol® FR-3 and certain dielectric formulations. Several other companies around the world also produce products containing chlorinated biphenyls.

As your supplier of Aroclor® 1254 and 1260 and formulated products containing 1254, we wish to alert you to the potential problem of environmental contamination as referred to in the newspaper and magazine articles.

We would like to point out the following additional facts.

1. Products such as Pydraul® 90, 135, 230, 312, A-200, F-9, 150 and 60, Turbinol® 153 and Therminol® FR-1 and FR-2 are not formulated with Aroclor® 1254 or 1260.
2. PCBs with a chlorine content of less than 54% have not been found in the environment and appear to present no potential problem to the environment.

FUR 004024



We have developed, and are now testing, new formulations to replace the Aroclor® 1254 and 1260 components in our Pydraul® products. The new products appear to be equal in performance and to have similar physical properties.

We feel that all possible care should be taken in the application, processing and effluent disposal of these products to prevent them becoming environmental contaminants. Of interest to you may be an article in Chemical Week, October 29, 1969 regarding water pollution standards set by each state in the Union. It is attached. This article reflects that good manufacturing practice in the future may require that no products used by any company should find their way into waterways.

Sincerely yours,

Don Olson

Donald A. Olson
Director of Sales
Functional Fluids Group

nlc
Attachment

FUR 004025

Environment

The huge water requirements of the chemical industry—now the nation's third largest user—make water quality and availability increasingly important factors for site selectors. Legislation enacted in recent years has forced planners to pay close attention to pollution control standards.

All 50 states have had their water quality standards approved entirely or in part by the Federal Water Pollution Control Administration (FWPCA). Recently a state-by-state summary of key standards was put together for the first time. Surprisingly, it was not the FWPCA that did the job. Instead it was handled by an American Public Health Assn. (APHA) subcommittee headed by TVA Health Director F. E. Gartrell, assisted by the APHA Engineering and Sanitation Section. A portion of the study, covering standards for surface industrial water, is summarized in the tables starting on p. 80.

Contrary to widely held opinions, there is considerable variation in state standards. Take the dissolved oxygen (DO) standard, for example. Minimum allowable DO (as milligrams per liter or percent saturation) is the single most important standard to chemical site evaluators. As a rough rule of thumb, a 2-mg./l. standard is considered to be one industry can live with comfortably, while a 6.0 mg./l. value is pegged "extremely tough."

California, Wyoming and Washington have set the standard at 6 mg./l. or higher. But a few states such as Connecticut, Maine, Illinois, Indiana, Massachusetts, Virginia and Wisconsin require 2 mg./l. or lower.

Other standards—notably turbidity, taste, odor, color and solids—may also be important, depending upon the nature of the chemical plant's waste effluents. These standards also exhibit state-by-state differences. Moreover, they are generally less specific than the straight numerical DO standards.

Although chemical plant site experts see little point in "running from tough standards," the criteria do make a difference: Plans for two nonferrous metals plants in Puerto Rico are now on the shelf, because of standards that call for a 4.5 mg./l. DO, no wastes that interfere with the esthetics of the waters and other specifications.

No compilation of ground water standards has yet been published. Ground water standards may prove important in the future as companies are forced to use costly deep-well disposal for wastes. Availability of ocean waste disposal services is also looming more important.

Waste Cost: The price tag for pollution control is high. A recent FWPCA study on the organic chemicals industry estimated that water waste-treatment facilities can increase installed capital equipment costs 40% or more. Between '69-'73, the organic chemical industry would have to shell out \$182.5 million to remove 10% of its biological and chemical oxygen demand waste and 65% of its suspended solids. Removal levels of 83%, 13% and 71%, respectively, for biologic oxygen demand, chemical oxygen demand and suspended solids would require \$242.6 million, while 98%, 30% and 89%, respectively, would up the ante to \$608 million.

Cleaner Air: Establishment of air quality standards is not nearly as far advanced as are water standards. The National Air Pollution Control Administration (NAPCA) is still designating regional air control regions. At last count, 16 regions had been formally designated and another 41 had been proposed. NAPCA has issued air quality criteria and control

technology data for sulfur oxides and particulate matter, will follow with similar studies for other pollutants.

Once criteria and control data have been issued for a pollutant and control regions have been designated, a complicated process involving standards, hearings and implementation and enforcement plans will be initiated that can take over a year to produce standards.

So far, no firm sulfur oxide or particulate standards have emerged. But NAPCA's criteria for setting the standards suggest they'll be tough. The oxide criteria report, for example, emphasizes that there are deleterious effects to man at concentrations as low as 0.04 ppm.

NAPCA's control data reports present detailed appraisals of various methods and equipment, along with estimated costs. As in the case of water, the costs will be high, although some pollutants—mainly sulfur dioxide—will have recovery values. NAPCA is sponsoring a number of research projects to improve technology. Pollution control is being spurred by financial assistance programs (mandated by state law) now operative in the following 28 states:

Arizona, Arkansas, California, Connecticut, Florida, Georgia, Idaho, Illinois, Indiana, Maine, Massachusetts, Michigan, Missouri, New Hampshire, New Jersey, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Tennessee, Vermont, Virginia, Washington, Wisconsin and West Virginia.

In addition, Pennsylvania offers financial aid sanctioned by administrative regulation. Several states, including Utah and Maryland have legislative studies under way.

The incentives take a variety of forms. Most common are exemption from personal property taxes (e.g., Arkansas), fast depreciation (Arizona), exemption from ad valorem equipment and structures taxes (Connecticut), exemption from local taxes for stated period of time (New Hampshire), operating loss deductions (New York); credit against state income tax (Oregon).

Quantity: The large chemical complexes now in vogue make water—and lots of it—a major site criterion. The cooler the water is, the better, for it can reduce the investment in heat-exchange equipment. Occasionally, plants can manage on ground water, but usually surface water is required. That means location on or near the big, drought-resistant rivers. There are less than 200 rivers in the U.S. with minimum flows over 50 cu. ft. per second (*CW Oct. 5, '68, pp. 94-95*). For companies whose plant needs at least 100 cu. ft/second, the list numbers only 150 (excluding Alaska). Sea water is generally avoided because of high equipment corrosion costs.

Piping water in is expensive. Duval, now opening a 1.5 million tons/year sulfur mine in the arid Northwest area, was forced to install a 36-in., 38-mile-long water line and a 40-million-gal. reservoir. Cost of the water supply system hasn't been disclosed, but it is estimated that the tab was at least several million dollars.

The adequacy of domestic water resources in the year 2000 has recently been evaluated by the Geological Survey. Nationally, projected demand will be 173% of potentially assured supply. Only in three regions, New England, Ohio, and the South Atlantic Eastern Gulf, will future water requirements be easily met. Economic growth may be handicapped in nine regions: Eastern Great Lakes, Lower Mississippi, Upper Missouri-Hudson Bay, Lower Missouri, Western Gulf-Rio Grande, Pecos, Colorado, Great Basin, and Central and South Pacific.

For the first time, a summary of water quality standards set by all 50 states.

	pH Allowable		Temperature (°F) allowable		Dissolved oxygen (minimum, mg./l. or %)	Other Requirements
	Range	Deviation	Maximum	Increase above ambient		
Alabama	6.0-8.5	1.0	90° (24 hrs.) 93° (any 8 hrs.) 93° (cooling water)	10% — 10%	2.0 at 5 ft. or middepth if less than 10 ft.	Radioactivity, Color, Taste and Odor, Toxic Substances: Only in amounts that would not render waters unsuitable for industrial-cooling and process-water supply purposes. Solids: Free from waste materials that cause unsightly or putrescent conditions or interfere directly or indirectly with industrial use.
Alaska	7.0-8.0	0.5	70°	—	5.0	Radioactivity: Not to exceed limits of PHS Drinking Water Standards. Turbidity: No imposed values that would interfere with established levels of treatment. Color: True color less than 50 color units. Taste and Odor: Shall not unreasonably impair esthetic considerations. Solids: No dissolved solids above natural conditions causing corrosion or scaling problems. No visible evidence of other floating solids or sludge deposits. No imposed sediment loads that would interfere with established treatment levels. Toxic Substances: Chemical constituents should be below concentrations found to be of public health significance.
Arizona	6.5-8.6	0.5	93°	5°	—	Radioactivity: Not to exceed 1/30 of the MPC _w value given for continuous occupational exposure in NBS Handbook 69. Turbidity: 50 JCU (streams); 25 JCU (lakes). Color: Free from waste materials in amounts sufficient to change existing color enough to interfere with industrial use or to create a nuisance. Taste and Odor: Free from wastes in amounts sufficient to produce enough taste and odor to create a nuisance or interfere with industrial use. Solids: Free from wastes that would be unsightly, putrescent, odorous or in amounts that would interfere with industrial use. Toxic Substances: Free from wastes toxic to human, animal, plant or aquatic life or in amounts that would interfere with industrial use.
Arkansas	6.0-9.0	1.0 (24 hrs.)	95°	5°	4.0 (average for any cross section)	Radioactivity: "Rules and Regulations for the Control of Ionizing Radiation," Arkansas Board of Health, apply. Turbidity: No distinctly visible increases due to wastes. Color: Shall not be increased to the extent that it interferes with industrial use, present or future. Taste and Odor: Must not cause offensive odors or otherwise interfere with industrial use. Solids: No distinctly visible persistent solids, bottom deposits or sludge banks due to wastes. Toxic Substances: Must not be present in amounts toxic to human, animal, plant or aquatic life.
California	6.5-8.6 7.0-8.6 (Coastal waters)	—	71.6° (fresh water)	None that would cause ecological change or harm aquatic life (coastal waters)*	6.0 Coastal water; 5.0 (unless naturally lower)	Radioactivity: Shall not exceed 1/10 of the MPC _w values given for continuous occupational exposure in NBS Handbook 69. Turbidity: Free from wastes that could alter water's existing turbidity. Color: Free from substances attributable to wastes that produce detrimental color. Taste and Odor: No substances that impart foreign taste or odor. Solids: Dissolved solids in fresh water must not exceed 300 mg./l. at any time; annual mean: 175 mg./l. Settlesable solids must not be able to change nature of stream bottom or harm aquatic environment. Toxic Substances: At all times free from concentrations harmful to humans, aquatic life or wild or domestic animals.
Colorado	5.0-9.0	—	93°	—	3.0	Radioactivity: Not to exceed 1/30 of the 168-hr.-week values in NBS Handbook 69. Turbidity: Must not interfere with established levels of treatment. Color: Wastes present must not cause appreciable change in color or interfere with industrial use. Taste and Odor: Free from wastes that cause odor or appreciable change in taste. Solids: Free from wastes that are unsightly, putrescent or odorous or would interfere with use. Toxic Substances: Free from wastes in concentrations or combinations sufficient to harm human or animal life.
Connecticut	6.0-9.0	—	—	None unless it does not exceed recommended limits for industrial use	2.0	Radioactivity: Limits to be approved by appropriate state agency. Turbidity, Color, Taste and Odor: None in such quantities that would impair industrial use. Solids: Limited to small amounts that may result from discharge of appropriately treated wastes. Toxic Substances: Free from chemical constituents in concentrations or combinations harmful to human, animal or aquatic life.
Delaware	6.5-8.5	—	—	5°	50%* or 4.0	Radioactivity: Alpha emitters limited to 3 pc/l.; beta emitters, to 1,000 pc/l. Color, Taste and Odor: None in concentrations that cause color, taste or odor. Solids: Free from unsightly and malodorous nuisances due to floating solids or sludge deposits. Toxic Substances: None in concentrations harmful (synergistically or otherwise) to humans, fish, shellfish, wildlife or aquatic life.
Florida	6.0-8.5	1.0	—	—	4.0	Radiation: Gross beta—1,000 pc/l. (in absence of Sr-90 and alpha emitters). Turbidity: 50 JCU. Color: Must not render water unfit for industrial-cooling or process-water supply purposes. Taste: Must not render water unfit for industrial use; phenols 0.001 maximum. Solids: Dissolved solids must not exceed 1,000 mg./l.; monthly average: 500 mg./l. Must be free from floating wastes that are unsightly or deleterious or other wastes that settle to form putrescent or objectionable sludge deposits. Toxic Substances: Free from wastes harmful to human, animal or aquatic life. Cu, 0.5 mg./l.; Zn, 1.0; Cr, 0.05; Pb, 0.05; Fe, 0.3; As, 0.05; F, 10.0; Cn, none detectable.

State	pH Allowable		Temperature (°F) allowable		Dissolved oxygen		Other Requirements
	Range	Deviation	Maximum	Increase above ambient	(minimum mg./l. or %)	(maximum mg./l. or %)	
Georgia 6.0-8.5	—	—	93.2°	10° (above intake)	3.0 (daily average)	2.5	Radioactivity: Must conform to state statutes. Turbidity, Color, Taste and Odor: Free from wastes that cause objectionable conditions or interfere with industrial use. Solids: Free from wastes that are unsightly, putrescent or otherwise objectionable or would interfere with industrial use. Toxic Substances: No wastes in concentrations that would prevent fish survival or interfere with industrial use.
Hawaii 6.5-8.5	—	—	—	—	—	4.5	Radioactivity: Not to exceed 1/30 of the values given by MRS Handbook 69. Turbidity: Free from soil particles from erosion caused by land development or agricultural use. Taste and Odor: Wastes, after dilution and mixture, must not interfere with industrial use. Toxic Substances: Free from substances in concentrations harmful to human, animal, or marine life or that make waters unsuitable for industrial use.
I Idaho 6.5-9.0	0.5°	—	—	2° Only if water 65° or less	75% (at seasonal low)	—	Radioactivity: Not to exceed limits of '62 PHB Drinking Water Standards. Turbidity: No objectionable turbidity that can be traced to a point source. Solids: No floating or submerged material; no sludge deposits that could adversely affect industrial use. Toxic Substances: No wastes of other than natural origin in concentrations of public health significance or that could adversely affect industrial use.
Illinois 6.0-9.0	—	—	95°	—	2.0 (for 16 hrs. in any 24-hr. period)	—	Color, Taste and Odor: Free from wastes that produce color, odor or taste in such a degree as to create a nuisance. Solids: Free from floating wastes that settle and form unsightly, deleterious or putrescent deposits. Toxic Substances: Free from wastes in concentrations or combinations harmful to human, animal, plant or aquatic life.
Indiana 6.0-9.0	—	—	95°	—	1.0 (daily average)	2.0	Color, Taste and Odor: Free from wastes that produce color, taste or odor in such a degree as to create a nuisance. Solids: Dissolved solids must not exceed 1,000 mg./l.; monthly average, 750 mg./l. Must be free from unsightly, putrescent, deleterious or otherwise objectionable wastes. Toxic Substances: Free from wastes in concentrations or combinations harmful to human, animal, plant or aquatic life.
Iowa —	—	—	—	—	—	—	Color, Taste and Odor: Free from wastes that produce color, taste or odor in such a degree as to be detrimental to industrial use. Solids: Free from floating wastes in amounts that would be unsightly or deleterious or other wastes that settle to form putrescent or objectionable sludge deposits. Toxic Substances: No wastes in concentrations or combinations detrimental to human, animal or aquatic life or to industrial use.
Kansas 6.5-9.0	—	—	90°	—	4.0°	—	Turbidity: No increase that causes substantial visible contrast with natural appearance or that is detrimental to industrial use. Color: Discharges of color-producing substances limited to concentrations not detrimental to industrial use. Taste and Odor: Concentrations limited to those that would not result in noticeable offensive odors or otherwise interfere with industrial use. Solids: Free from floating debris or material in amounts that would be unsightly or detrimental to industrial use. Toxic Substances: Pollutants substances must be maintained below concentrations detrimental for industrial use.
Kentucky 6.0-9.0	—	—	93° (Dec.-Feb.)	2°/hr 10°/day	—	—	Color, Taste and Odor: Wastes must not create a nuisance. Solids: Dissolved solids must not exceed 1,000 mg./l.; monthly average: 750 mg./l. No floating wastes in unsightly or deleterious amounts; no other wastes that settle to form putrescent or objectionable sludges. Toxic Substances: No wastes in concentrations or combinations harmful to human, animal, plant or aquatic life.
Louisiana 6.0-9.0	—	—	96.8°	5.4°	50%	—	Radioactivity: Specific limits set for all radioactive isotopes released as waste. Solids: None that would produce floating masses, sludge banks or beds on bottom, either organic or inorganic. Toxic Substances: No wastes in concentrations or combinations harmful to animal or plant life.
Maine 6.0-9.0	0.5°	—	90°	—	2.0°	—	Radioactivity: Not to exceed '62 PHB Drinking Water Standards. Turbidity, Color, Taste and Odor: Free from wastes that impair turbidity, color, taste or odor or impair industrial use. Solids: Free from sludge deposits, solid refuse and floating solids. Toxic Substances: No chemical constituents from waste sources harmful to humans or that adversely affect industrial use.
Maryland 6.0-9.0 (unless natural)	—	—	100°	—	4.0 (unless naturally lower)	—	Color, Taste and Odor: Free from waste materials that change existing color or produce taste and odor to such a degree as to create a nuisance or interfere with industrial use. Solids: Free from wastes that float, settle to form deposits, create a nuisance or interfere with industrial use and are unsightly, putrescent or odorous. Toxic Substances: Free from toxic wastes that interfere with industrial use or that are harmful to human, plant, animal or aquatic life.
Massachusetts 6.0-9.0	—	—	90°	—	2.0	—	Radioactivity: None in concentrations harmful to human, animal or aquatic life. Turbidity, Color, Taste and Odor: None in concentrations that would impair industrial use. Solids: None allowed except that which may result from the discharge from waste-treatment facilities providing appropriate treatment. Toxic Substances: None in concentrations or combinations harmful to human, animal or aquatic life.

Range Deviation Maximum above ambient (mL/min) (mg/L or %)

FUR 004029

Water quality standards

	pH Allowable		Temperature (°F) allowable		Dissolved oxygen (minimum) mg./l. or %	Other Requirements
	Range	Deviation	Maximum	Increase above ambient		
North Carolina	Normal for area, usually 6.0-8.5; as low as 4.3 in swamps	—	95°	7°	3.0	Color: Must not render water unfit for industrial cooling. Solids: Must not, after dilution and mixture, make water unfit for industrial cooling. Toxic Substances: Must not make water unfit for industrial cooling.
North Dakota	6.0-9.0	0.5	93°	10°	3.0 5.0 (for 16 hrs./day)	Radioactivity: No discharge allowed unless materials are readily soluble or dispersible and of quantities acceptable to state health department. Color, Taste and Odor: No wastes that color water or result in objectionable odors to a degree that impairs industrial use. Solids: No unsightly floating wastes that would adversely affect industrial use or wastes that settle to form putrescent or objectionable deposits. Toxic Substances: No concentrations or combinations harmful to human, animal or aquatic life.
Ohio	6.0-9.0	—	95°	—	1.0 2.0 (daily average)	Color, Taste and Odor: Free from wastes that produce color or odor to a degree that creates a nuisance. Solids: Dissolved solids must not exceed 1,000 mg./l.; monthly average: 750 mg./l. Must be free from floating or other wastes that settle to form putrescent or objectionable deposits or that are unsightly or deleterious. Toxic Substances: No wastes in concentrations or combinations harmful to human, animal or aquatic life.
Oklahoma	6.5-8.5	—	93°	5°	4.0	Radioactivity: Average concentration at points of controlled release shall not exceed State Board of Health Radiation Protection Regulations. Turbidity: None that causes visible contrast with natural conditions. Color: None that is persistent in concentrations detrimental to industrial use. Taste and Odor: No concentrations that would cause offensive odors in vicinity of water or otherwise interfere with industrial use. Solids: Free from floating debris, bottom deposits or other materials. Toxic Substances: None in quantities that make water toxic to human, animal, plant or aquatic life.
Oregon	6.5-9.0	—	—	2° (only if water 70° or less)	5.0	Radiation: Shall not pose external hazard. Turbidity: 5 JCU above natural. Color, Taste and Odor: No objectionable discoloration or conditions esthetically offensive to human senses of taste or smell. Solids: No floating solids, organic or inorganic deposits injurious to industry. Toxic Substances: No conditions injurious to public health.
Pennsylvania	6.0-9.0	—	93°	2°/hr.	4.0 5.0 (daily average)	Color, Taste and Odor: No wastes that produce colors, tastes or odors in amounts harmful to industrial use. Solids: Dissolved solids must not exceed 750 mg./l.; monthly average: 500 mg./l. No floating wastes or substances that settle to form sludge in amounts harmful to industrial use. Toxic Substances: None in amounts harmful to industrial use.
Rhode Island	6.0-8.5	—	—	4°	3.0° 5.0° (16 hrs./day)	Radioactivity, Toxic Substances: No concentrations or combinations harmful to human, animal or aquatic life. Turbidity, Taste and Odor: None in concentrations that would impair industrial use. Solids: No solid refuse, floating solids or sludge deposits.
South Carolina	6.0-8.5 8.0-8.5 (swamps)	—	93.2°	10°	3.0° 2.5° (swamps)	Turbidity, Color, Taste and Odor: Free from wastes that change the existing turbidity or color or that produce taste or odor to such a degree as to cause a nuisance or interfere with industrial use. Solids: None from waste sources in amounts that are unsightly, putrescent, odorous or that cause a nuisance or interfere with industrial use. Toxic Substances: Free from wastes harmful to human, animal, plant or aquatic life or that interfere directly or indirectly with industrial use.
South Dakota	6.0-9.5	1.0	—	—	—	Radioactivity: None permitted in water unless readily soluble or dispersible and in quantities allowed by federal or state agencies. Color, Taste and Odor: No wastes that produce material discoloration or undesirable odors. Solids: Dissolved solids must not exceed 2,000 mg./l. No wastes producing floating solids, sludge deposits or other offensive effects. Toxic Substances: None in concentrations toxic to human, animal or aquatic life.
Tennessee	6.0-9.0	1.0 (24 hrs.)	93°	10° Rate: 3°/hr.	Enough to prevent offensive conditions	Radioactivity: None that could adversely affect industrial use. Turbidity, Color: None in amounts or concentrations that could not be reduced to acceptable levels by conventional treatment. Taste and Odor: None that would result in taste or odor that would prevent use for industrial processing. Solids: Dissolved solids must not exceed 500 mg./l. No distinctly visible solids, bottom deposits or sludge banks that could be detrimental to industrial use. Toxic Substances: None that produces toxic conditions that would adversely affect water for industrial use.
Texas	6.0-8.5 8.0-9.0 (cooling water)	—	—	—	4.0	Radioactivity: Regulated by Texas Radiation Control Act and Texas Regulations for Control of Radiation. Turbidity: No substantial increase due to wastes. Color: No substantial visible contrast with natural appearance of receiving waters after wastes receive best practical treatment. Taste and Odor: No concentrations that produce offensive odors. Solids: Dissolved solids must not exceed 1,000 mg./l., unless water used only for cooling. Must be essentially free from floating or settleable suspended solids that would adversely affect industrial use. Toxic Substances: Shall not show acute or chronic toxicity to humans, animals or aquatic life to such an extent as to interfere with industrial use.

Water quality standards

	pH Allowable Temperature (°F) allowable			Dissolved oxygen (minimum mg./l. or %)	Other Requirements
	Range	Deviation	Maximum Increase above ambient		
Utah 6.5-9.0	—	—	—	—	Radioactivity: Shall not exceed 1/30 of MPCw values for continuous occupational exposure in NBS Handbook 69. Turbidity, Color: No wastes in amounts that would change existing turbidity or color enough to create public nuisance or interfere with industrial use. Taste and Odor: No wastes in amounts that would produce taste or odor. Solids: No floating wastes that are unsightly or that interfere with industrial use; no wastes that settle to form unsightly or odorous sludge or bottom deposits. Toxic Substances: No wastes in concentrations or combinations toxic to human, animal, plant or aquatic life or that would interfere with industrial use.
Vermont 6.0-8.5	—	—	4*	3.0* 5.0* (16 hrs./day)	Radioactivity: To be approved by appropriate state agency. Turbidity, Color, Taste and Odor: None in concentrations that would impair industrial use. Solids: No floating solids, sludge deposits or solid refuse. Toxic Substances: No chemical constituents in concentrations or combinations harmful to human, animal or aquatic life.
Virginia 5.0-9.0 (swamps as low as 4.5)	—	95* (unless naturally higher)	No sudden changes that could harm aquatic life	1.0* 2.0* (daily average)	Color, Taste and Odor: No wastes that change existing color or produce odor to such a degree as to create a nuisance or interfere with industrial use. Solids: No floating wastes that are unsightly or create a nuisance or other wastes that settle to form unsightly, putrescent or odorous deposits. Toxic Substances: No wastes in concentrations or combinations that would interfere directly or indirectly with industrial use.
Washington 6.5-8.5	0.5	70*	T = 110/(T-15)†	6.5 or 70%	Radioactivity, Toxic Substances: Below concentrations that could adversely affect industrial use. Turbidity: Less than 10 JCU over natural conditions. Color, Taste and Odor, Solids: Dissolved, suspended, floating or submerged matter shall not reduce esthetic values so as to affect industrial use.
West Virginia Process water: 5.5-9.0 Cooling water: 5.0-9.0	—	Cooling water: 93* (May-Nov.) 73* (Dec.-Apr.) Process water must permit fish passage	5* Rate: 2*/hr. (Dec.-Apr.)	1.0 2.0 (daily average)	Color: None that is objectionable. Taste and Odor: No objectionable odors in vicinity of the water. Solids: No distinctly visible floating, settleable or suspended solids of unreasonable kind or quantity. No objectionable bottom deposits or sludge banks. Toxic Substances: No concentrations of materials poisonous to human, animal or fish life.
Wisconsin 6.0-9.0	0.5	69*	—	1.0 2.0 (daily average)	Color, Taste and Odor: No materials producing color, taste or odor in amounts that would create a nuisance. Solids: Dissolved solids must not exceed 1,000 mg./l.; daily average: 750 mg./l. No floating or submerged debris or waste substances that would cause objectionable deposits in amounts to create a nuisance. Toxic Substances: None in concentrations or combinations toxic to humans or of public health significance.
Wyoming 6.5-8.5	—	—	4* (for streams where temp. not over 70°)	6.0	Radioactivity: Not to exceed 1/30 of NBS Handbook 69 values. Turbidity: No more than 15 JCU above natural (when turbidity is 150 JCU or less); otherwise, no more than 10% above natural. Color: Essentially free of wastes that visibly alter natural color of water or impart color to vessels or structures. Taste and Odor: Essentially free from substances that would produce detectable odor at site of use. Solids: Essentially free from floating or settleable solids that are unsightly or settle to form sludge, bank or bottom deposits. Toxic Substances: Free from toxic substances in concentrations or combinations toxic to human, animal or aquatic life.

* Standard reserved from Federal Water Pollution Control Administration approval.
† T = total cumulative heat addition allowed from unnatural waste sources, at any point throughout the given stream reach. T = highest occurring temperature for a given period, in a specific stream reach.
Abbreviations: PHS—Public Health Service; NBS—National Bureau of Standards; JCU—Jackson Candle Units; pc/l.—picocuries per liter.
Source: Water Quality Standards of the United States, Territories, and the District of Columbia, American Public Health Assn., Subcommittee on Water Quality Control, and Engineering and Sanitation Section.
Note: Specific limits for coliforms, biologic oxygen demand, plant nutrients, oil, grease, scum, bottom deposits, pesticides, specific conductance, carbon chloroform extract, synthetic detergents not included. Some states set standards for each stream reach or river basin; in such cases, table shows least stringent requirement.

This reprint is an excerpt from the "Plant Sites, '69" report that appeared in the October 29, 1969 issue of CHEMICAL WEEK

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FUR 004031

Monsanto

ORGANIC CHEMICALS DIV

Monsanto Company
800 N. Lindbergh Boulevard
St. Louis, Missouri 63186
Phone: (314) 894-1000

February 18, 1970

Dear Sir:

Recently several newspaper and magazine articles have been published indicating that Polychlorinated Biphenyls (PCBs) have been discovered at some points in some marine, aquatic and wildlife environments. The quantities detected are said to be in the parts per million and parts per billion categories.

It is claimed that the PCBs found strongly resemble chlorinated biphenyls containing 54% and 60% chlorine by weight. Products which are sold by Monsanto under the trade names of Aroclor® 1254 and 1260 do contain chlorinated biphenyls. In addition to Aroclor® 1254 and 1260, Monsanto sells certain functional fluids containing Aroclor® 1254. These include Pydraul® 625, Pydraul® AC, Pydraul® AC - Winter Grade, Pydraul® 540, Therminol® FR-3 and certain dielectric formulations. Several other companies around the world also produce products containing chlorinated biphenyls.

As your supplier of Aroclor® 1254 and 1260 and formulated products containing 1254, we wish to alert you to the potential problem of environmental contamination as referred to in the newspaper and magazine articles.

We would like to point out the following additional facts:

1. Products such as Pydraul® 90, 135, 230, 312, A-200, F-9, 150, and 60, Turbinol® 153 and Therminol® FR-1 and FR-2 are not formulated with Aroclor® 1254 or 1260.
2. PCBs with a chlorine content of less than 54% have not been found in the environment and appear to present no potential problem to the environment.

FUR 004032

We have developed, and are now testing, new formulations to replace the Aroclor® 1254 and 1260 components in our Pydraul® products. The new products appear to be equal in performance and to have similar physical properties.

We feel that all possible care should be taken in the application, processing and effluent disposal of these products to prevent them becoming environmental contaminants. Of interest to you may be an article in Chemical Week, October 29, 1969, regarding water pollution standards set by each state in the Union. It is attached. This article reflects that good manufacturing practice in the future may require that no product used by any company should find their way into waterways.

We realize that you have marketed or may now market transformers and other electrical equipment containing dielectric fluids which include Aroclor® 1254 and 1260. Although these fluids are sealed into such equipment it is recognized that occasionally the fluid may be lost through leaks resulting from equipment misuse or equipment repair necessitating replacement of the fluid. Since the dielectric fluid contained in this equipment is only an incidental part of the over-all unit manufactured by you, we are not notifying the purchasers of such equipment of the potential environmental contamination problem described in this letter. We do recommend, however, that you notify such equipment users of this problem.

Sincerely yours,

Don Olson
Donald A. Olson
Director of Sales
Functional Fluids Group

1b

Attachment

FUR 004033

Environment

The huge water requirements of the chemical industry—now the nation's third largest user—make water quality and availability increasingly important factors for site selectors. Legislation enacted in recent years has forced planners to pay close attention to pollution control standards.

All 50 states have had their water quality standards approved entirely or in part by the Federal Water Pollution Control Administration (FWPCA). Recently a state-by-state summary of key standards was put together for the first time. Surprisingly, it was not the FWPCA that did the job. Instead it was handled by an American Public Health Assn. (APHA) subcommittee headed by TVA Health Director F. E. Gartrell, assisted by the APHA Engineering and Sanitation Section. A portion of the study, covering standards for surface industrial water, is summarized in the tables starting on p. 80.

Contrary to widely held opinions, there is considerable variation in state standards. Take the dissolved oxygen (DO) standard, for example. Minimum allowable DO (as milligrams per liter or percent saturation) is the single most important standard to chemical site evaluators. As a rough rule of thumb, a 2-mg./l. standard is considered to be one industry can live with comfortably, while a 6.0 mg./l. value is pegged "extremely tough."

California, Wyoming and Washington have set the standard at 6 mg./l. or higher. But a few states such as Connecticut, Maine, Illinois, Indiana, Massachusetts, Virginia and Wisconsin require 2 mg./l. or lower.

Other standards—notably turbidity, taste, odor, color and solids—may also be important, depending upon the nature of the chemical plant's waste effluents. These standards also exhibit state-by-state differences. Moreover, they are generally less specific than the straight numerical DO standards.

Although chemical plant site experts see little point in "running from tough standards," the criteria do make a difference: Plans for two nonferrous metals plants in Puerto Rico are now on the shelf, because of standards that call for a 4.5 mg./l. DO, no wastes that interfere with the esthetics of the waters and other specifications.

No compilation of ground water standards has yet been published. Ground water standards may prove important in the future as companies are forced to use costly deep-well-disposal for wastes. Availability of ocean waste disposal services is also looming more important.

Waste Cost: The price tag for pollution control is high. A recent FWPCA study on the organic chemicals industry estimated that water waste-treatment facilities can increase installed capital equipment costs 40% or more. Between '69-'73, the organic chemical industry would have to shell out \$182.5 million to remove 10% of its biological and chemical oxygen demand waste and 65% of its suspended solids. Removal levels of 83%, 13% and 71%, respectively, for biologic oxygen demand, chemical oxygen demand and suspended solids would require \$242.6 million, while 98%, 30% and 89%, respectively, would up the ante to \$608 million.

Cleaner Air: Establishment of air quality standards is not nearly as far advanced as are water standards. The National Air Pollution Control Administration (NAPCA) is still designating regional air control regions. At last count, 16 regions had been formally designated and another 41 had been proposed. NAPCA has issued air quality criteria and control

technology data for sulfur oxides and particulate matter, will follow with similar studies for other pollutants.

Once criteria and control data have been issued for a pollutant and control regions have been designated, a complicated process involving standards, hearings and implementation and enforcement plans will be initiated that can take over a year to produce standards.

So far, no firm sulfur oxide or particulate standards have emerged. But NAPCA's criteria for setting the standards suggest they'll be tough. The oxide criteria report, for example, emphasizes that there are deleterious effects to man at concentrations as low as 0.04 ppm.

NAPCA's control data reports present detailed appraisals of various methods and equipment, along with estimated costs. As in the case of water, the costs will be high, although some pollutants—mainly sulfur dioxide—will have recovery values. NAPCA is sponsoring a number of research projects to improve technology. Pollution control is being spurred by financial assistance programs (mandated by state law) now operative in the following 28 states:

Arizona, Arkansas, California, Connecticut, Florida, Georgia, Idaho, Illinois, Indiana, Maine, Massachusetts, Michigan, Missouri, New Hampshire, New Jersey, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Tennessee, Vermont, Virginia, Washington, Wisconsin and West Virginia.

In addition, Pennsylvania offers financial aid sanctioned by administrative regulation. Several states, including Utah and Maryland have legislative studies under way.

The incentives take a variety of forms. Most common are exemption from personal property taxes (e.g., Arkansas), fast depreciation (Arizona), exemption from ad valorem equipment and structures taxes (Connecticut), exemption from local taxes for stated period of time (New Hampshire), operating loss deductions (New York); credit against state income tax (Oregon).

Quantity: The large chemical complexes now in vogue make water—and lots of it—a major site criterion. The cooler the water is, the better, for it can reduce the investment in heat-exchange equipment. Occasionally, plants can manage on ground water, but usually surface water is required. That means location on or near the big, drought-resistant rivers. There are less than 200 rivers in the U.S. with minimum flows over 50 cu. ft. per second (*CW Oct. 5, '68, pp. 94-95*). For companies whose plant needs at least 100 cu. ft./second, the list numbers only 150 (excluding Alaska). Sea water is generally avoided because of high equipment corrosion costs.

Piping water in is expensive. Duval, now opening a 1.5 million tons/year sulfur mine in the arid Northwest area, was forced to install a 36-in., 38-mile-long water line and a 40-million-gal. reservoir. Cost of the water supply system hasn't been disclosed, but it is estimated that the tab was at least several million dollars.

The adequacy of domestic water resources in the year 2000 has recently been evaluated by the Geological Survey. Nationally, projected demand will be 173% of potentially assured supply. Only in three regions, New England, Ohio, and the South Atlantic Eastern Gulf, will future water requirements be easily met. Economic growth may be handicapped in nine regions: Eastern Great Lakes, Lower Mississippi, Upper Missouri-Hudson Bay, Lower Missouri, Western Gulf—Rio Grande, Pecos, Colorado, Great Basin, and Central and South Pacific.

Water quality standards

	pH Allowable		Temperature (°F) allowable		Dissolved oxygen (minimum mg./l. or %)	Other Requirements
	Range	Deviation	Maximum	Increase above ambient		
Utah	6.5-9.0	—	—	—	—	Radioactivity: Shall not exceed 1/30 of MPC values for continuous occupational exposure in NBS Handbook 69. Turbidity, Color: No wastes in amounts that would change existing turbidity or color enough to create public nuisance or interfere with industrial use. Taste and Odor: No wastes in amounts that would produce taste or odor. Solids: No floating wastes that are unsightly or that interfere with industrial use; no wastes that settle to form unsightly or odorous sludge or bottom deposits. Toxic Substances: No wastes in concentrations or combinations toxic to human, animal, plant or aquatic life or that would interfere with industrial use.
Vermont	6.0-8.5	—	—	4*	3.0* 5.0* (16 hrs./day)	Radioactivity: To be approved by appropriate state agency. Turbidity, Color, Taste and Odor: None in concentrations that would impair industrial use. Solids: No floating solids, sludge deposits or solid refuse. Toxic Substances: No chemical constituents in concentrations or combinations harmful to human, animal or aquatic life.
Virginia	5.0-9.0 (swamps as low as 4.3)	--	95** (unless naturally higher)	No sudden changes that could harm aquatic life	1.0* 2.0* (daily average)	Color, Taste and Odor: No wastes that change existing color or produce odor to such a degree as to create a nuisance or interfere with industrial use. Solids: No floating wastes that are unsightly or create a nuisance or other wastes that settle to form unsightly, putrescent or odorous deposits. Toxic Substances: No wastes in concentrations or combinations that would interfere directly or indirectly with industrial use.
Washington	6.5-8.5	0.5	70*	1 - 110/ (T-15)†	6.5 or 70%	Radioactivity, Toxic Substances: Below concentrations that could adversely affect industrial use. Turbidity: Less than 10 JCU over natural conditions. Color, Taste and Odor, Solids: Dissolved, suspended, floating or submerged matter shall not reduce esthetic values so as to affect industrial use.
West Virginia	Process water: 5.5-9.0 Cooling water: 5.0-9.0	--	Cooling water: 93° (May-Nov.) 73° (Dec.-Apr.) Process water must permit fish passage	5* Rate: 2°/hr. (Dec.-Apr.)	1.0 2.0 (daily average)	Color: None that is objectionable. Taste and Odor: No objectionable odors in vicinity of the water. Solids: No distinctly visible floating, settleable or suspended solids of unreasonable kind or quantity. No objectionable bottom deposits or sludge banks. Toxic Substances: No concentrations of materials poisonous to human, animal or fish life.
Wisconsin	6.0-9.0	0.5	89*	—	1.0 2.0 (daily average)	Color, Taste and Odor: No materials producing color, taste or odor in amounts that would create a nuisance. Solids: Dissolved solids must not exceed 1,000 mg./l.; daily average: 750 mg./l. No floating or submerged debris or waste substances that would cause objectionable deposits in amounts to create a nuisance. Toxic Substances: None in concentrations or combinations toxic to humans or of public health significance.
Wyoming	6.5-8.5	—	—	4* 2* (for streams where temp. not over 70°)	6.0	Radioactivity: Not to exceed 1/30 of NBS Handbook 69 values. Turbidity: No more than 15 JCU above natural (when turbidity is 150 JCU or less); otherwise, no more than 10% above natural. Color: Essentially free of wastes that visibly alter natural color of water or impart color to vessels or structures. Taste and Odor: Essentially free from substances that would produce detectable odor at site of use. Solids: Essentially free from floating or settleable solids that are unsightly or settle to form sludge, bank or bottom deposits. Toxic Substances: Free from toxic substances in concentrations or combinations toxic to human, animal or aquatic life.

* Standard reserved from Federal Water Pollution Control Administration approval.
† t - total cumulative heat addition allowed from unnatural waste sources, at any point throughout the given stream reach. T - highest occurring temperature for a given period, in a specific stream reach.
Abbreviations: PHS—Public Health Service; NBS—National Bureau of Standards; JCU—Jackson Candle Units; pc/l.—picocuries per liter.
Source: Water Quality Standards of the United States, Territories, and the District of Columbia, American Public Health Assn., Subcommittee on Water Quality Control, and Engineering and Sanitation Section.
Note: Specific limits for coliforms, biologic oxygen demand, plant nutrients, oil, grease, scum, bottom deposits, pesticides, specific conductance, carbon chloroform extract, synthetic detergents not included. Some states set standards for each stream reach or river basin; in such cases, table shows least stringent requirement.

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FUR 004039

EDUCATION: N. T. Johnson St. Louis

DATE February 16, 1970

SUBJECT

REFERENCE

TO :

POLLUTION LETTER

*Aroclor
Toxicity* → *ms*
PI
P. Craska - Wilmington
C. Clay - St. Louis
J. H. Davidson - Los Angeles
R. A. Damiani - Chicago
G. F. Fague - Detroit
R. A. Garcia - Akron
R. Garnsworthy - Melbourne
J. A. Heilala - Akron
R. Irwin - Houston
J. S. Pullman - New York
J. J. Roder - Chicago
R. Giles - Melbourne

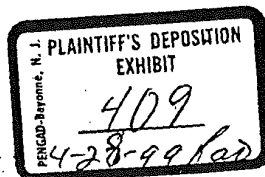
P. J. A. Marsh - Brussel
R. Enhardt - New York
T. W. Oneson - Montreal
J. N. Haggart - Brussels
V. Morse - St. Louis
J. Brydon - Montreal
R. Graham - New York
P. G. Benignus
J. G. Bryant
D. E. Roush
J. R. Fallon
D. A. Hall
D. R. Pogue
D. F. Smith
D. A. Olson

Attached is a list of questions and answers which may be asked of you by customers receiving our Aroclor-PCB letter. You can give verbal answers; no answers should be given in writing. If the customer asks a question you can't answer or if he wants an answer in writing, then send his questions to me and we will answer from here.

We want to avoid any situation where a customer wants to return fluid. The new reformulated products will be available within a month. We would prefer that the customer use up his current inventory and purchase Pydraul 625A, Pydraul ACA, Pydraul ACA Winter Grade and Pydraul 540A when available. He will then top off with the new fluid and eventually all Aroclor 1254 and Aroclor 1260 will be out of his system. We don't want to take fluid back. Sell him the replacement.

We must be very positive in our approach with each customer relative to our decision to eliminate the use of Aroclor 1254 and Aroclor 1260 in our Pydraul products. We (your customer and Monsanto) are not interested in using a product which may present a problem to our environment. We certainly have no reason to be defensive or apologetic about making this change. The decision to change makes good sense and our customers should commend us, not criticize our actions. No one has forced us to make this

IN-10 REV 11-69



FUR 004010

change. We have done it to keep our customers out of possible trouble. They should appreciate our effort, and stay with us as a customer on the reformulated Pydrauls. To make this change has cost us research monies and time. Fortunately, we possess the technical skills to make a change in our formulations without affecting the performance of products. Be positive. Take the offense. Don't let a customer or competitor intimidate you. I doubt if our competitors know whether their product could present a problem to our environment. You might ask your customer. if he has ever asked Houghton or Stauffer, Carbine, etc. about the effects of their products.

We should also recognize (point this out to your customer) we must clean-up. The Chemical Week article gives him an idea of laws in effect in his state. Read this yourself. Be familiar with the data on each state in which your customers are located. Use this in your discussions.

We have no replacement products for Aroclor 1254 and Aroclor 1260. We will continue to make these products; however, customers will have to use their own judgement on continued use.

We can't afford to lose one dollar of business. Our attitude in discussing this subject with our customer will be the deciding factor in our success or failure in retaining all our present business. Good luck.

(We have also attached a copy of the letter sent to transformer customers.)

N. T. Johnson

1b

FUR 004011

POSSIBLE CUSTOMER QUESTIONS ON PCBs

PUBLICITY

Question 1

What articles have appeared on the PCB problem?
Will you send me copies?

Answer:

In the U. S., newspaper articles have appeared in the San Francisco Chronicle on Feb. 24, 1969, the San Francisco Examiner on Feb. 25, 1969, and the Hartford Times on Aug. 3, 1969. Numerous articles were generated by the Wisconsin "DDT Hearings" in May, 1969. At the hearings, witnesses discussed the problem of PCBs as "interfering substances" in their search for DDT in the environment. PCBs, they said, produced peaks on a gas chromatograph similar to the peaks produced by DDT. In no case was PCB indicted at the Wisconsin hearings.

Copies of the articles will be made available on request. Regional managers should contact E. V. John, Public Relations Manager Organic Chemicals Division, in St. Louis and copies will be forwarded to the customer through the regional manager's office.

In addition to the newspaper articles mentioned above, there have been radio broadcasts. At the time of the San Francisco Chronicle and Examiner articles, radios in the San Francisco area also carried the story. In August, the sports editor of the Hartford Times syndicated a radio broadcast on the subject of PCBs, and in Dec., 1969, the Canadian Broadcasting Co. (radio) carried an interview they taped with a member of our medical department.

Question 2

Were Monsnato's Aroclors specifically mentioned in these articles?
If so, which ones?

FUR 004012

Answer

Monsanto's Aroclors were mentioned in some of the articles but only in the San Francisco Chronicle story in Feb., 1969, was Aroclor 1262 specifically mentioned by number. In several of the articles, Monsanto was also identified as the sole U. S. producer of polychlorinated biphenyls, marketed under the tradename of Aroclor.

Question 3

What did the articles on the PCB problem say?

Answer

Since the outset of the "PCB problem", when the first article appeared in the U. S. press in Feb., 1969, the whole question has been closely interwoven with the question of DDT as a possible environmental contaminant.

The San Francisco Chronicle article carried a headline, "A Menacing New Pollutant." In rather sensational style, it identified PCB as a threat to birds and humans, highly toxic in a gaseous state and related to known cancer-causers. PCB presence in the environment is rising swiftly, the article stated.

The Examiner article called PCB a "plastic pollutant in the Bay and Mothers' Milk." This article called PCB an "alarming" new chemical pollutant that is playing a role in the declining peregrine falcon population, has been found in mothers' milk, and is the "latest addition to a growing list of chemicals in the ocean---- the newest symptom of man's chemical invasion of the ocean."

These two articles quoted Dr. Robert Risebrough, a researcher at the Institute of Marine Resources in the University of California's Department of Nutritional Scientists, on the detrimental effects of PCBs. Later Dr. Risebrough said he had been misquoted in some newspaper stories.

The Hartford Times story called PCB pollution a "new puzzle." Less sensational than the San Francisco articles, the Times gave an account of PCBs being found in the environment and the studies under way to determine their biological effects. This article, says Dr. Risebrough, tends to clear PCB of blame.

FUR 004013

Articles generated by the Wisconsin DDT hearings generally discussed PCB as an interfering substance discovered in scientists' search for DDT in the environment. Dr. Risebrough said at the hearings that there was no proof at the moment that PCB alone can cause thin eggshells, one of the phenomenon that he had discovered in studying the declining population of the peregrine falcon.

LEGISLATION

Question 1

Are there any Federal/State/local laws under which the use or discharge of Aroclors could be prohibited?

Answer:

No existing Federal, State, or local laws prohibit the discharge of Aroclors. However, in a number of states the basic water pollution control legislation is so broad that state agencies can prohibit chemicals, deemed necessary, from being discharged.

Question 2

Is the DDT and the PCB problem related?

Answer:

We are not a manufacturer of DDT or other chlorinated hydrocarbon pesticide and, therefore, have no knowledge of the seriousness of the charges against DDT other than what has been so widely publicized on TV, in the press and in technical journals. To the extent that both DDT and PCB are chlorinated hydrocarbons, then there is a similarity. They are sufficiently different in their chemical structures, however, that it would be entirely wrong to assume that both behave in the same way in the environment. There is another and more obvious difference. DDT and other chlorinated hydrocarbon pesticides were specifically designed for a job that obviously leads to their being scattered in wide spread fashion across the countryside. Rain, birds, wind, insects further scatter these pesticides in an uncontrollable manner. PCBs are not used in this fashion and

FUR 004014

Monsanto has never sought to promote this. This, we believe, is an important distinction that should not be overlooked if DDT and PCB are linked as a common pollutant of the environment. To our knowledge PCBs have never been identified in the absence of DET or other chlorinated hydrocarbon pesticides.

Question 3

Could it be PCB that's causing the environmental problems and not DDT?

Answer:

We believe that present-day GLC and mass spectrometric techniques are sufficiently accurate to be able to differentiate between DDT, related pesticides, their metabolites and PCB.

Question 4

What authority do State and local governments have in banning/controlling the use of PCBs.

Answer:

They do have authority to ban or control use of any substances they consider harmful.

EFFLUENT AND ITS CONTROL

Question 1

How do I dispose of Aroclor 1254/1260, etc. effluent from my plant?

Answer:

We would suggest collecting all process effluent, equipment washings, tank or drum washings and then regularly taking to the nearest toxic materials dump. You may also be able to use a sanitary landfill if permits are issued for this in your locality. We don't recommend feeding this material to local sewage treatment plants or taking out to sea in drums for dumping. These methods do not

FUR 004015

solve the problem of contamination. We are working on the disposal of these materials by incineration and biodegradation. Our work in these areas has not yet reached the stage where we can offer practical suggestions. It is of interest to note, however, that research is underway to find catalysts to make DDT self-destructive. The possibility exists that we could find catalysts that would destroy PCBs in settling tanks constructed to catch all your effluents.

Question 2

Can I test my effluent to see if my effluent has no Aroclor 1254, etc.?

Answer:

Yes. ~~Analytical equipment is~~ available that can do this if the proper technique is used. The basis of the method is GLC or gas liquid chromatography. Are you or anyone in your company familiar with this? Do you have GLC equipment? If you do, we can send you a description of a method that could identify PCB. If not, there may be a good analytical testing laboratory in the vicinity where you could send samples and rely on the results if you want to test your effluent.

Question 3

What is a "safe" PCB level for effluent leaving my plant?

Answer:

As our letter points out, parts per million (ppm) and parts per billion (ppb) have been mentioned in the published articles. There is still a lot of doubt as to how absolute any quoted values are. To bring this into the realms of reality, this definition of ppm and ppb may help clarify things.

To give you a practical example, the escape of one-two gallons per day could lead to samples in a stream beside the plant showing 10-50 ppb on analysis.

FUR 004016

Question 4

You must have quite a control problem at your plants--I would think Monsanto's Aroclor plants are the major polluters--how are you handling control?

Answer:

The Aroclor products we make to sell at a profit, so economics dictate maximum housekeeping, minimum losses. The Aroclor process is a "dry process" or closed system.

Question 5

How does Monsanto think Aroclors can get into the environment and cause so much pollution?

Answer:

Disposal, leakage from systems using it, spills, etc.

Question 6

If I analyze my effluent stream and find ppb there, how do I know it didn't come from air-borne contamination or was present in the process water that I pump from the XYZ river into my plant?

Answer:

Analyze water entering your plant and compare. There is a method available for sampling air.

Question 7

You seem to think from the tone of your letter that the source of pollution is from effluent disposal into streams. In my process, Aroclor 1254, 1260, etc. vapors escape. What precautions can I take to prevent (a) employee problems and (b) escape of vapors into the atmosphere?

FUR 004017

Answer (7):

Articles on PCB interference with pesticides analysis have mentioned the possibility of loss to the atmosphere from vaporization when Aroclors are heated. We find this hard to believe and it warrants considerable investigation.

TOXICITY

Question 1

If PCB is a danger to fish and birds, how about humans?

Answer:

The amounts being found in the environment are not considered a danger to humans or fish. The whole question on chlorinated pesticides relates to birds.

Question 2

Are Aroclor 1254/1260, etc. more toxic than other Aroclors? Why?

Answer:

There is a difference in toxicity depending on degree of chlorination. This is not to say that higher chlorination is more toxic than lower chlorination. The alleged PCB problem is not really related to degree of toxicity.

DIFFERENCES BETWEEN AROCLORS

Question 1*

In your letter, you state that Aroclor [®] 5060, 5442 and 5460 are not PCBs. What are they?

Answer:

They are chlorinated terphenyls.

FUR 004018

Question 2*

What's the difference between a chlorinated biphenyl and a terphenyl?

Answer:

A terphenyl has three benzenes linked together and biphenyl only two. They are, therefore, similar but different, just as naphthalene is different from benzene.

Question 3*

Why should PCB be an environmental contaminant and chlorinated terphenyls not?

Answer:

I don't think there is any positive answer on this and I can't give you any theories. However, I would emphasize that not all PCBs appear to be contaminants. Those such as Aroclor 1221, 1232, and 1242 haven't been identified in marine, aquatic and wildlife environments. Chlorinated terphenyls - at least those made by Monsanto - have not been identified in the environment either.

Question 4

Since you sell other PCBs beside Aroclor 1254 and 1260, why are they not found in the environment?

Answer:

One reason could be that they biodegrade and hence never build up to a level where they can be labelled persistent contaminants. Therefore, although you would find it in an effluent stream if you analyzed it just after you poured PCB into it, its absence when a river, for example, is analyzed downstream at a later date would indicate degradation by bacterial organisms.

We are actively working on this aspect of biodegradability in our laboratories at this time. Results of this type of work won't come to hand quickly but our preliminary work on PCBs of less than 54% chlorine looks promising.

FUR 004019

Question 5

In your letter, you make no mention of Aroclor 1262 and 1268. What is their status?

Answer:

It could be that their semi-solid/solid water insoluble nature means they are far, far less likely to become "mobile" contaminants. It could be that their structural differences from Aroclor 1254 and 1260 are responsible for the apparent lack of a problem. In any event, they have not been identified by scientists in the environment and--believe me-- a lot of scientists seem to be looking for PCBs.

Question 6*

Both Aroclor 5460 and 1260 contain 60% chlorine. Why is one a problem (1260) and apparently not the other (5460)?

Answer:

A terphenyl has three benzenes linked together and biphenyl only two. They are, therefore, similar but different, just as naphthalene is different from benzene.

I would emphasize that not all PCBs appear to be contaminants. Those such as Aroclor 1221, 1232, and 1342 haven't been identified in marine, aquatic and wildlife environments. Chlorinated terphenyls--at least those made by Monsanto-- have not been identified in the environment either.

Question 7*

Does this PCB problem mean that you have discontinued efforts to get Aroclor 5460 approved by FDA?

...

...

FUR 004020

Question 8*

Is the reason for not resubmitting your petition to the FDA for approval of Aroclor 5460 due to this PCB publicity?

Answer:

No.

Question 9

What's the problem then?

Answer:

We are bringing a new solid Aroclor plant on-stream in the next two-three months. We want to make sure it produces the same quality Aroclor 5460 we used in our feeding studies for the FDA. Once we're sure that's O.K. -- and we feel it will be -- then we'll get the petition moving again, but FDA clearances do take time.

Question 10

Does this PCB publicity mean that FDA approval of Aroclor 5460 is not going to be obtained?

Answer:

We have no reason to think the two things are related. Aroclor 5460 is not chemically a PCB. The delay resulted from the need to set up certain analytical methods to satisfy FDA. This involved analytical instrumentation and is being completed now. It is my understanding we plan to resubmit our petition although I personally don't know the exact date.

CONTAINERS

Question 1

Joe Doe buys all my used Aroclor drums without me having to wash them. I get \$3.00 a piece. I can't afford to wash them out. Even if I did, what would I do with the washings?

FUR 004021

(Question 1 con't)

What should I do? Should I tell Joe Doe? Will Monsanto take them back or pay me \$3.56 plus my costs to take them to a dump?

Answer:

Don't have an answer at this time. We just don't know.

APPLICATIONS

Question 1*

Could Aroclor 1254/1260 escape from my sealant/adhesive/coating whatever into the environment?

Answer:

This will depend entirely on the final use to which your product is used--its ultimate disposition.

Question 2*

My product X contains Aroclor 1254/1260. What should I tell my customers?

Answer:

Tell your customer--We want to advise you of a possible environmental problem. Without knowing what your customer does with product X, this is hard to answer. (We would say that it would not seem wise to use Aroclor 1254 or 1260 for keeping dust down on the roads, for use in dental sealing compounds or as carriers for pesticides.)*

*Only if you suspect or are told this is what the application is.

Question 3

Does Monsanto intend to continue manufacture of Aroclor 1254/1260, etc.?

FUR 004022

12

Answer (3):

I have been given no indication otherwise.

Question 4:

Should I look for replacement for Aroclor 1254/1260, etc. ?

Answer:

I think only you can decide this. How easy would this be for you? Do you have any other replacement product in mind?

Question 5:

Does Monsanto have replacement products for Aroclor 1254 and 1260?

Answer:

As you know, we have over eighty plasticizers in our line and there's quite a bit of product interplay so it is possible that there is another product in our line that might replace them. What resin do you use? Perhaps we could look at these resin/plasticizer Selector Charts in the back of the Blue Book. I've got it with me.

Question 6:

Is Monsanto working on replacements for Aroclor 1254 and 1260?

Answer:

These research fellows are always busy on things like that. To some people Aroclor 1254 and 1260 have draw-backs--quite apart from present publicity on PCB. Aroclor 1254 is fairly volatile. Aroclor 1260 is very viscous and difficult to handle. For polysulfide sealants, for example, the technical people in St. Louis have just sent us data on products that will behave better than Aroclor 1254 in polysulfide sealants. Maybe there's something here for you to look at. Let's go over it.

FUR 004023

Monsanto

FROM (NAME & LOCATION)

W. B. PAPAGEORGE - ST. LOUIS

MARCH 30, 1970

cc

SUBJECT

REFERENCE

TO

H. S. BERGEN
M. W. FARRAR - SECOND STREET
E. V. JOHN
R. E. KELLER
D. A. OLSON
P. S. PARK
C. PATON
W. R. RICHARD
J. E. SPRINGGATE
E. P. WHEELER

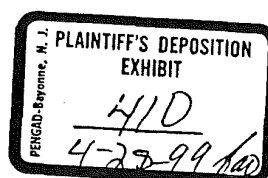
Attached is a copy of a rough draft of a plan for managing the PCB problem. I realize much of the information is known to you, but I hope to consolidate in one document a summary of all of our activities. I also recognize that I have probably missed some important activities or approaches.

Will each of you review this draft and plan to meet jointly in Conference Room C-303 on Thursday, April 2, at 9:00 A.M. for a thorough discussion. Our objective will be to develop a finished plan which will eventually be presented to the CMC by mid-April.

W. B. Papageorge
W. B. PAPAGEORGE

ms

Attachment



FUR 003347

R O U G H D R A F T

MANAGEMENT PLAN

POLYCHLORINATED BIPHENYL ENVIRONMENTAL PROBLEM

I. THE PROBLEM

The presence of materials identified as polychlorinated biphenyl (PCB) in marine environments was first noted by Professors G. Widmark and S. Jensen of the Institute of Analytical Chemistry, Stockholm, Sweden and reported in November, 1966. Since then and with increasing frequency, other investigators have identified PCB in marine and animal life. Increasing evidence has been noted that indicates PCB is ubiquitously present in the environment and is resulting in damage to the ecological system. Monsanto is a major producer of PCB (Aroclors) worldwide and has been mentioned in many of the reports.

II. BASIC STRATEGY

With the growing evidence of the presence of PCB and the apparent damage it can do to the world environment, Monsanto must respond as a responsible member of the business world genuinely concerned with the welfare of our environment, yet not take premature action which would compromise its responsibilities to its customers, shareholders or employees. Finding ourselves on the

FUR 003348

defensive, lacking considerable information to help in arriving at sound business decisions and with no real influence regarding the timing of any precipitous action by the press, competitors, public or governmental agency, we are forced to commit our limited resources in several directions. Some of our efforts are being expended seeking information to help better understand and control the problem and some effort is being expended to find alternate products which we may or may not require as indicated by new research data or other developments.

Early reports had indicated that the polychlorinated biphenyls with 5 and 6 chlorines were being identified in environmental samples. From this information it was surmised that the lower chlorinated biphenyls were being degraded and probably were not a problem. Consequently, a decision was made to plan to discontinue the manufacture of Aroclors 1254 and 1260. Recent data, although still very preliminary, indicates that not enough information is available to justify this action. It appears that in those uses where control of spillage and disposal can be rigidly exercised and the Aroclors are in sealed containers; e.g. transformers, the manufacture of Aroclor 1254 and 1260 should be continued. The advantages of using these Aroclors, particularly where safety is a prime consideration, far outweigh

FUR 003349

the potential threat to the environment.

III. OBJECTIVES

The overall objective of this plan is to manage the PCB pollution problem to prevent it from adversely affecting the established Return-on-Investment objectives of the Functional Fluids and Plasticizers Groups, while maintaining the corporate image of Monsanto as a responsible and respected member of industry worldwide.

Objectives supporting the overall objective are as follows:

1. Reduce and effectively control the PCB content of all effluent from Monsanto plants.
2. Inform customers of the PCB problem and the importance of preventing environmental pollution both at their plants or by their products.
3. Develop products to replace Aroclors for those uses in which Aroclors have been demonstrated to be harmful to the environment and cannot be prevented from escaping into the environment.

FUR 003350

4. Develop reliable analytical procedures for determining PCB content of liquids, gases, or solids.
5. Develop methods for effective disposal of wastes containing PCB without contaminating the environment.
6. Develop methods for reclaiming and reusing off-grade fluids containing PCB.
7. Determine effects of PCB's on birds, aquatic life, animals and humans.
8. Establish and maintain favorable relationships with the press, governmental agencies, the public and the universities.

IV. ACTION PLAN

1. Objective - Reduce and effectively control the PCB content of all effluent from Monsanto plants.

Status - A tentative target of 10 ppb of PCB in plant liquid effluent has been established. Plants at Anniston, Alabama, Newport, Wales and Sauget, Illinois have monitored plant effluents and taken action to lower PCB's in the effluent. Target of 10 ppb not yet achieved.

FUR 003351

Action - All plants to continue emphasis on control to achieve target of 10 ppb in effluent.

Responsibility - Manufacturing Manager

Date - By September 1, 1970

2. Objective - Inform customers of the PCB problem and the importance of preventing environmental pollution both at their plants or by their products.

Status - All Functional Fluid and Plasticizer customers in the U.S. have been informed. Customers in Canada, U.K., South America and Continental Europe have not been informed.

Action - Inform customers in Canada and U.K. Customers in Europe will not be informed until consensus is reached by all PCB producers in Europe. Notification of South American customers to follow.

Responsibility - Sales Directors - Functional Fluids and Plasticizer Groups

Date - Canada and U.K. by May 1, 1970

Europe and South America - as indicated.

FUR 003352

3. Objective - Develop products to replace Aroclors for those uses in which Aroclors have been demonstrated to be harmful to the environment and cannot be prevented from escaping to the environment.

Status - Work on product substitutes has been directed primarily at Industrial Fluids applications, and NCR Paper coating. Water-glycol mixtures, brominated Aroclors, brominated biphenyl, silicates, blends using chlorinated terphenyls with lower chlorinated biphenyls, terphenyls with phosphate esters, phenyl ether with biphenyl, chlorinated paraffins, and fractionated Aroclor 1242 are all under study for Functional Fluids application. Alkylated biphenyls and HB-40 (hydrogenated terphenyls) appear promising for NCR Paper applications.

Action - Accelerate efforts to develop acceptable substitute products.

Responsibility - Managers, Research and Development, Functional Fluids and Plasticizer Groups.

Date - Major needs by year end.

FUR 003353

4. Objective - Develop reliable analytical procedures for determining PCB content of liquids, gases and solids.

Status - Procedures have been developed. Copies have been offered to university and governmental laboratories. Comments regarding our procedures and comparison of results with other procedures have been solicited. Arrangements have been made for exchange of samples to verify analytical results.

Action - Continue to refine methodology until we reach a level of competence which will provide data whose accuracy will not be challenged.

Responsibility - Section Manager, Applied Sciences

Date - July 1, 1970

5. Objective - Develop methods for effective disposal of wastes containing PCE without contaminating the environment.

Status - Studies are being conducted on biodegradability, incineration and removal from water solutions.

FUR 003354

Biodegradability studies with acclimatized micro-organisms are being conducted at Ruabon. Data to date indicates that the monochlor and some of the di- and trichlor biphenyls degrade; remaining PCB's are highly resistant. Studies in St. Louis in river water indicate high resistance to degradation.

Incineration tests of 1242, 1260 and Inerteen PPO indicate combustion can be sustained with minimum fuel requirements. Stack gas samples were taken for analysis to determine degree of destruction.

Recovery of Aroclors from dilute water solutions is being studied at Anniston and by MRC at Dayton. At Anniston, adsorption on carbon is being evaluated. At Dayton, the use of acid clays is being studied.

At the W. G. Krummrich plant, the removal of Aroclors from HCl gas streams by high temperature cracking are being studied.

Action - Continue biodegradation work at both Ruabon and St. Louis to establish degree of degradation possible and optimum conditions required.

Responsibility - Manager, Research and Development - Functional Fluids Group

FUR 003355

Date - October 1, 1970

Action - Evaluate alternate methods of disposal by incineration - Monsanto operated vs. contract.

Responsibility - Engineering Manager, Functional Fluids, CED

Date - July 1, 1970

Action - Continue the work at Anniston, Krummrich and Dayton on the removal of PCB from water streams.

Responsibility - Manager, Research and Development Functional Fluids Group

Date - September 1, 1970

6. Objective - Develop methods for reclaiming and re-using off-grade fluids containing PCB.

Status - Limited reclaiming has been achieved by Findett, Inc. Arrangements have been made for the reworking of a tank car of material at W. G. Krummrich plant. Initial efforts will be concentrated on returned material from large electrical customers. Meanwhile, customers are holding material for further instructions or are dumping in authorized

FUR 003356

land fills.

Action - Develop procedure for processing of returned material.

Responsibility - Manager, Research and Development Functional Fluids Group.

Date - May 1, 1970

Action - Select and modify as necessary, the required equipment at the W. G. Krummrich plant.

Responsibility - Manufacturing Manager

Date - September 1, 1970

7. Objective - Determine effects of PCB's on birds, aquatic life, animals and humans.

Status - Toxicity studies are being made for Monsanto by Industrial Bio-Test Laboratories. Studies include two year oral toxicity on rats, three generation reproduction study on rats, two year oral toxicity on dogs and studies on egg production, hatchability and survival on chickens. The Aroclors used in these studies are Aroclor 1242, Aroclor 1254 and Aroclor 1260.

FUR 003357

Results to date indicate the following: Liver enlargement in male rats at 100 ppm; body weight loss in dogs by higher chlorinated Aroclors; rat reproduction effected by 100 ppm Aroclor 1242 or Aroclor 1254; chicken reproduction effected by lower chlorinated Aroclors.

Studies on fish were attempted, but were discontinued when cross contamination was discovered. These studies will be resumed.

Action - Continue studies now underway. Evaluate need for extending studies. Resume fish toxicity studies.

Responsibility - Medical Department

Date - Complete by mid-1971.

8. Objective - Establish and maintain favorable relationships with the press, governmental agencies, the public and the universities.

Status - Relationships are excellent. We have expressed interest in studying the problem and indicated that we wish to cooperate to help identify and solve it. Pressure to divulge more information

FUR 003358

will continue to increase.

Action - Appropriate Monsanto personnel will continue to participate in activities related to the PCB problem in a manner which will maintain our excellent relationship.

Responsibility - All personnel

Date - Continuing

V. COSTS

Costs for the program for 1970 have been budgeted as follows:

<u>Program</u>	<u>Budget</u> <u>\$ M</u>
Develop Analytical Procedures	\$ 80
Toxicity Studies	100
Plant Effluent Studies	105
Biodegradability Studies	40
Develop disposal methods	50
Reclaiming Systems design	30
Substitute Products	150
Overall Administration	<u>115</u>
	\$670

FUR 003359

Monsanto

FROM (LOCATION) St. Louis

cc: H. S. Bergen - HBERG
H. L. Minckler - HMINC.
P. S. Park - PPARK
J. E. Springgate - JSPRI

DATE : March 30, 1970

SUBJECT :

REFERENCE :

TO : W. B. Papageorge
WPAPA

We have been in communication with a Dr. Hill of the Ohio State Board of Health. He has found PCB, particularly Aroclor 1254, in samples of milk from at least three herds in Ohio. He has traced this contamination back to silage from three different silos. Dr. Hill reported concentrations of 0.2 ppm of PCB in the silage in the center of the silo and up to 20 ppm in the material next to the walls. He also stated that concentrations in the milk were between 0.1 ppm and 0.6 ppm and that some of the milk had been destroyed.

The silos are concrete silos whose interior surfaces were painted in 1967 using a formulation that contained 1254. I don't know if there was any other Aroclor in the formulation nor do we know the coating manufacturer; although, this could be found out if important. The presence of PCB in the silage came from flaking off of the material and possibly from leaching out during the silage storage. At present they will have to destroy about 150 tons of silage which is valued at about \$30 per ton. As a rough guess, they consider there may be 50 other silos involved in Ohio that were painted with the same formulation. They are also looking into the fat contamination of the cows themselves.

All in all, this could be quite a serious problem, having legal and publicity overtones.

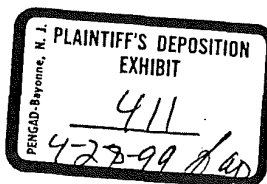
This brings us to a very serious point. When are we going to tell our customers not to use any Aroclor in any paint formulation that contacts food, feed, or water for animals or humans? I think it is very important that this be done. It may be that some of the customers will assure themselves on the basis of non-extractability that a particular formulation might be safe but I think we should make a blanket recommendation against these uses.

R. E. Kelly

R. Emmet Kelly, M. D.

REK/ln

FUR 003323



NEWS

Monsanto

FOR RELEASE IMMEDIATELY 1970

E. V. John
(314) 694-2891
PUBLIC RELATIONS DEPARTMENT
Monsanto Company
800 N. Lindbergh Boulevard
St. Louis, Missouri 63168

MONSANTO REPLIES
TO CHARGE THAT PCB
THREATENS ENVIRONMENT

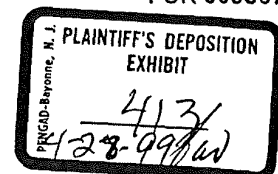
ST. LOUIS, April 10 -- Monsanto Company said today it was well aware of the concern over possible environmental contamination by polychlorinated biphenyl (PCB), an industrial chemical made by the company. The company began a six-point program in 1968 to properly identify and measure PCB in the environment. Steps have been taken to strictly control use of the chemical and replace those grades of PCB which linger in nature.

Monsanto's statement came in response to charges by Congressman William F. Ryan (Dem.) of New York that the discovery of PCB in the ecology represented a major threat.

Howard L. Minckler, Monsanto vice president and general manager of its Organic Chemicals Division, said, "We have and will continue to cooperate fully with governmental agencies investigating this problem. We also have been in close contact with our customers. Monsanto has spent over \$1 million to verify or correct scientific reports, monitor the use of PCB and search for substitute products where needed. This program will be successfully concluded this year.

-more-

FUR 003367



--2 MONSANTO: REPLY TO PCB CHARGE xxx year.

"It is unfortunate that Congressman Ryan evidently did not have all this information at his disposal. Just last month we participated in a U.S. Department of the Interior meeting where we exchanged ideas with some 40 scientists and told them of our findings and actions," Minckler said.

The Monsanto executive also noted that the use of PCB is misunderstood by some investigators. "For example, we do not know of any current use of PCB in insecticides. Even so, we are asking the U.S. Department of Agriculture to reject any insecticide which has PCB as an inert carrier," Minckler said.

"PCB is not a household product, as some have suggested," Minckler continued. "To our knowledge, it is not used in plastic food wraps, house paints, cellophane, asphalt or tires. The principal market is electrical applications where the chemical performs a vital function as an insulating fluid. In this use, PCB is completely sealed in a metal container. Other major markets employ similar closed systems."

Monsanto's PCB program was initially directed at proper identification of chlorinated hydrocarbons appearing in the environment. This research, confirmed by others, found only the higher chlorinated materials. At the same time, Monsanto undertook animal feeding studies which show PCB is not a highly toxic material.

FUR 003368

-more-

--3 MONSANTO: REPLY TO PCB CHARGE xxx material.

The second part of Monsanto's investigation was coordination with all customers and a rigid critique of its PCB manufacturing units. Although loss of PCB during manufacturing was negligible, production techniques were further modernized and new pollution abatement devices are continually being upgraded.

Monsanto has concentrated its further research on those few PCB compounds which degrade slowly. Alternate products for these grades, which retain the functional properties of PCB and present no potential threat, will be introduced later this year.

Minckler concluded, "Monsanto is seeking the best solution to this potential environmental problem. Action not based on reason and scientific facts can only result in greater problems. For example, we have been advised by one electrical equipment manufacturer that an immediate ban on PCB would result in major power failures throughout the world. This is not the answer. Proper use of this vital chemical and substitution, where appropriate, is the answer."

-oOo-

FUR 003369

Monsanto

FROM (NAME & LOCATION) St. Louis - General Offices

DATE April 21, 1970

SUBJECT

REFERENCE PCB's

TO : FILE

cc J. R. Eck
T. K. Smith, Jr.
H. L. Minckler
C. J. Smith
R. E. Kelly/E. P. Wheeler
H. S. Bergen
J. E. Springgate
W. B. Papageorge
Sam Pickard, Wash., D.C.

REPORT ON MEETING WITH
CONGRESSMAN WM. F. RYAN (DEM.)
20th DISTRICT - NEW YORK

Washington, D.C., April 16, 1970

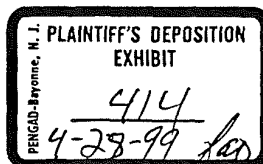
Sam Pickard and I met with Congressman Ryan this afternoon. We told Mr. Ryan that the purpose of our visit was to enable him to raise any questions he might have in relation to Monsanto's involvement in the manufacture of PCB's and also we hoped that he would give us an opportunity to clarify some of the points which he had made during his press conference. He explained that he was extremely short of time but he was quite willing to discuss the situation with us, emphasizing that he hoped that he would still receive a formal response to his letter to Mr. Bock. We assured him that this would be replied to in due course.

We were impressed with Ryan's apparent understanding of the problem although he disclaimed any abilities in the scientific area. His questions led us to the conclusion that at his press conference he was not simply reading something that someone else had written for him. He assured us that on at least two occasions that his total interest in the matter was to safeguard the health of the public and we confirmed that we also had a similar concern.

The following is my recollection of the issues that were raised by Ryan and ourselves.

1. Referring to his press release, we explored the question of the toxicity of Aroclors in more detail. We indicated to him that we were extremely concerned that the stories in the press would cause undue concern in the public mind. He was advised that based on the work we have done on toxicity of the Aroclors we believe these materials are only mildly toxic and compare favorably with many other industrial chemicals. We pointed out that the information he had given to the press obviously came from one of our technical bulletins and was extracted from a standard warning issued to operatives processing Aroclors in large quantities and usually at high temperatures. We indicated that any PCB's currently being found in the environment were at extremely low levels and there was absolutely no danger to the health of the public. Ryan

FUR 003364



April 21, 1970

industry primarily in transformers where the material was operating in closed systems. We made the point that the use of Aroclors for this type of application was extremely important to the nation as a whole in view of their fire resistant properties and the fact that Aroclor-containing transformers are much smaller in size than transformers using other forms of coolant which made them particularly suitable for use in heavily built up areas such as New York.

5. Ryan raised the use of PCB's as pesticide carriers and we advised him we had already written to the USDA requesting that they refuse registration of pesticide formulations containing Aroclors. He was advised that current usage in this application was extremely small and like many recommendations made in our old bulletins no real market had developed.
6. Emissions from our manufacturing plants were queried by Ryan and we made it clear that it had been Monsanto's practice for many years to control such emissions from all of our manufacturing operations. We also advised him that in view of the current concern over PCB's in the environment we had made significant improvements and had a program in hand which would ensure that any such emissions were completely controlled.

Congressman Ryan's time was somewhat limited and the meeting was terminated after about 30 minutes. However, he expressed himself as being interested in a more detailed discussion with Monsanto emphasizing that he would like to have a scientist present with him and also underlining once again that his real interest here was in protecting the safety of the public. We gained the impression that Ryan was genuinely concerned that some of the statements he had made to the press were not strictly accurate and he appeared to be a man who wants to be certain that any statement he makes is true and factual.

We recommend that Mr. Bock reply to Congressman Ryan's letter giving definite answers to the questions raised, and also mentioning our willingness to hold further discussions at a suitable time.



JOHN MASON

g1

FUR 003366

April 28, 1970

Hon. William F. Ryan
House of Representatives
Washington, D. C.

Dear Congressman Ryan:

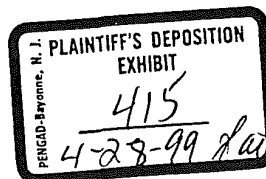
Mr. Bock has asked me to respond to your letter of April 9 concerning PCB's. Please accept my sincere apologies for the delay in responding.

Mr. Sam Pickard and myself are extremely grateful for the opportunity of meeting with you to discuss this matter and I hope that we were able to convey to you Monsanto Company's deep concern about the environment and responsible actions we are taking towards pollution abatement.

I can assure you that our commitment to pollution abatement has not been generated by recent public interest in this subject. Our record shows we have always attempted to conduct our operations in a manner consistent with the best interest of the public. We implemented positive pollution control programs long before the word ecology became fashionable.

In view of our activity in total pollution control programs and the special measures we have taken and are continuing to take to regulate PCB, we feel any accusation or implication of irresponsible action by Monsanto is unjustified.

As you know, only recently tremendous strides in science and technology have perfected analytical techniques which make it possible to detect and measure extremely minute quantities of an item in other substances. Our own scientists have made a significant contribution in these developments and we are constantly working to utilize these techniques to further the degree of control exercised by our plants and those of our customers. Monsanto Company fully recognizes its responsibility and will continue to develop and produce products which contribute to the public well being, but at the same time we



FUR 003360

will take every precaution to protect the environment in which we all live.

We have been investigating the relationship of PCB to the environment since 1968. We can only assume that the other manufacturers of PCB materials are doing likewise. We have contacted scientists and agencies around the world. Most recently, we attended a U. S. Department of the Interior meeting where some 40 scientists from throughout the country gathered to exchange information on PCB's and recommend actions. On April 29, we are participating in a meeting of the Office of Science and Technology of the Executive Office of the President to discuss the toxicity of PCB's. When we first became aware of the possible threat to the environment by PCB, our immediate action was to cooperate fully with scientists and government agencies to properly identify and measure PCB in the environment. Since then, we have taken other major steps directed toward strictly monitoring the manufacture, use and disposal of PCB-containing products which could possibly build up in the ecological system.

It should be emphasized that the apparent PCB problem relates only to the possible effects on some species of birds. Manufacturing and use experience for thirty years, earlier animal toxicity studies, and the interim reports on current extensive toxicological studies with various species of animals indicate that there is no threat to the public health.

You will recall that during our meeting with you we discussed the very important distinction between various Aroclor® products and the fact that not all Aroclors® are PCB's. Scientific evidence indicates that only the higher chlorinated biphenyls--those containing more than 54 percent chlorine--are being found in the environment. These materials appear to be presenting a possible threat to certain species of birds. As we also discussed, Monsanto manufactures several products under the trade name Aroclor® which are not polychlorinated biphenyls and which pose no threat to the environment.

References to the toxicity of the Aroclors® made in your press release were of course extracted from our safety instructions directed towards the protection of the health and safety of workers using large quantities of these materials in industrial processes, often at elevated temperatures. As you will appreciate, there are many chemicals which require careful handling during processing operations, and such instructions and definitions of possible hazards are standard practice in the chemical and allied industries. When used in other products the Aroclors® are usually present in only very small quantities or when used

FUR 003361

alone they are normally in closed systems and consequently represent no hazard to human health. It is therefore incorrect to assume that the PCB's presently being found in the environment in parts per billion or parts per million represent a health hazard to the public.

In my opinion, to release a complete list of uses for Aroclor®, names of products and manufacturers, as you suggest, would only cause undue alarm to the public and would make no contributions in this area.

We have repeatedly stressed the major markets for PCB-containing products are in electrical applications, where the fluid is sealed into an electrical component, and in closed system heat-transfer usages. In the early stages of market development for the Aroclors®, we recommended many usages for these products based on their chemical properties. Not all of these proposed applications proved satisfactory, however. In addition, we have become much more selective in recommending usages for these products bearing in mind the additional information now available to us due to the recent developments in analytical techniques and technology.

Recently it came to our attention that PCB was being used as an inert carrier by two small insecticide formulators. We have notified our distributors to discontinue all sales of our products for this usage and we have also requested the U. S. Department of Agriculture to refuse to register any insecticide formulation containing PCB as a component.

In a related action, we have already alerted our customers to the possible environmental problem and are assisting them in switching from PCB-containing compounds to other Monsanto products in applications where we believe that the chemical could be a threat to the environment.

With regard to our manufacturing operations, we have stated clearly our total commitment to pollution abatement. Production of polychlorinated biphenyls came under even stricter scrutiny when it appeared as a possible environmental hazard. We have improved production techniques and are continually upgrading pollution abatement devices in our plants. In the very near future all of our PCB-containing products will carry a new shipping label stressing the possible environmental hazard.

Finally, Congressman Ryan, I am sure you are aware that Monsanto's production and sales figures are confidential information, as they are in most companies. We are ready to cooperate fully.

FUR 003362

Hon. William F. Ryan
April 28, 1970
Page 4

with you or any responsible government agency when we receive assurance that these figures will be kept confidential.

I hope you will consider this letter a responsive reply to your questions. In my opinion, Monsanto Company is taking a responsible position and is using corrective action in dealing with the PCB situation.

Sincerely,

John Mason
Assistant General Manager

JM/gd

bcc: Messrs. E. J. Bock
J. R. Eck
E. V. John
W. B. Papageorge
P. S. Park
S. Pickard
E. J. Putzell, Jr.
F. C. Rehfeld
E. P. Wheeler
H. S. Bergen
J. E. Springgate

FUR 003363

WATER_PCB-SD0000071407

May 25, 1970

Otis E. Fancher, Ph.D.
Director
Industrial Bio-Test Laboratories, Inc.
1810 Frontage Road
Northbrook, Illinois 60062

Dear Otis:

This letter will authorize you to proceed with a study with the leghorn chickens with the Aroclor 1242, lot number AL-55. This should duplicate the study you did previously with Aroclor 1242, lot number AK-255, except in this instance you have suggested using dietary levels of 2, 4, and 8 ppm.

This sample of Aroclor represents our current regular production which involves some clean-up instituted since the previous sample was made available to you. We would hope that we might find a higher "no effect" level with this sample as compared to the previous work.

As soon as suitable reference standards are available, the research laboratory in St. Louis will more carefully characterize the two samples in terms of possible minute amounts of contaminants.

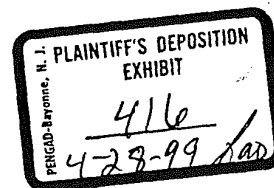
Best personal regards.

Sincerely,

Elmer P. Wheeler
Manager, Environmental Health

EPW:ju

FUR 004040



BCC: P. G. BENIGNUS
D. A. OLSON

July 8, 1970

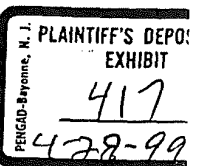
Mr. F. G. Jenkins
Vice President, Materials
Sprague Electric Company
North Adams, Massachusetts 01247

Dear Mr. Jenkins:

I was fortunately able to visit your Brown St. Plant on June 17 with Randall Graham. I personally found the discussion informative and interesting and I was most favorably impressed with the concern and interest expressed by your management personnel. We discussed briefly some of the points raised in your letter dated June 11. I will try in this letter to be more specific.

Biodegradability - Biodegradation studies conducted in our research laboratories in St. Louis, Missouri and in Ruabon, Wales using media consisting of local river waters or activated sludges acclimated to biphenyl give direct evidence that the lower chlorinated biphenyls are affected. There is some evidence that chlorine position on the biphenyl configuration does influence the degree of destruction by the microorganisms. I have enclosed a tabulation from our Ruabon laboratory which attempts to show this difference. We do not have formal information regarding the effect of sunlight or other natural influences on Aroclors. Experience gained over many years indicates Aroclors are highly stable under all known conditions present in the environment.

Toxicity - There is ample evidence from many laboratories that certain species of birds which are at the top of the marine food chain cannot reproduce properly when PCB's are present in their diets. The U. S. Fisheries laboratory at Gulfbreeze, Florida conducted a study which indicated that juvenile brown shrimp did not survive in water containing 5 parts per billion of PCB. Attached are copies of reports on these studies.



FUR 004041

Monsanto has sponsored some studies on laboratory rats and dogs. A summary of the results to date is attached.

Disposal - The preferred method for disposal is high temperature incineration. I suspect there are several commercial burners on the market which will perform well. I personally witnessed burning tests at the John Zink Company's unit in Tulsa, Oklahoma. Temperatures must exceed 1600°F to assure that complete destruction is achieved. Lower temperatures would only vaporize the Aroclors and create atmospheric pollution or, worse yet, would form, by partial oxidation, materials which could be highly toxic (e.g. furans and dioxins). With incineration HCl is formed which must be scrubbed from the stack gas and neutralized before disposal. We are planning for an initial installation in one of our plants later this year. As a service to our customers who may not have access to other incinerators, we have offered to accept scrap Aroclor for immediate storage and eventual incineration. Tentatively, Monsanto will charge 3¢ per pound of returned material. This charge does not include freight or container costs and will be reviewed when final incineration costs are established. Material which is returned for disposal should be addressed to Monsanto Company, W. G. Krummrich Plant, Sauget, Illinois, Attention: Supervisor Department 246.

Solids contaminated with Aroclors present a bigger challenge. As yet, we have not tested an incinerator with these materials. Until we get more information the best we can advise is safe burial in an authorized, properly operated land fill located away from any water systems.

We have laboratory work underway on other forms of destruction. As yet no economically feasible approach has been found.

Analytical Methodology - I have attached copies of Monsanto's analytical procedures for the determination of PCB's in water, soil, air and biological samples. We are interested in comparing our methods with those devised by other laboratories. Any comments your laboratory may have would be welcome and appreciated.

FUR 004042

I hope that the above information is useful to you.
If I can be of further service, please let me know.

Sincerely,

W. B. Papageorge
Manager
Environmental Control

ms

cc: Mr. H. Davis
Sprague Electric

G. R. Graham

FUR 004043

NEWS

Monsanto

FOR RELEASE IMMEDIATELY 1970

E. V. John
(314) 694-2891
PUBLIC RELATIONS DEPARTMENT
Monsanto Company
800 N. Lindbergh Boulevard
St. Louis, Missouri 63168

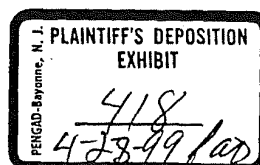
MONSANTO CITES
ACTIONS TAKEN ON
ENVIRONMENTAL ISSUE

ST. LOUIS, July 16 -- Monsanto Company, sole U.S. producer of an industrial chemical called polychlorinated biphenyl (PCB), today said recent political charges and sensational headlines about the chemical causing "a major ecological crisis" completely ignore voluntary actions the company has taken to restrict use of the material.

"Our program began back in 1968 with the proper identification and measurement of PCB in the environment and will conclude this year by our unilateral action to restrict its use," Howard L. Minckler, company vice president and general manager of its Organic Chemicals Division, said.

He added that Monsanto had not been pressured into action by any legislation or organized group. "We have taken decisive action based on evidence that PCB is a persistent chemical which builds up in the environment."

-more-



FUR 003384

--2 MONSANTO: MINCKLER'S REPLY TO PCB CHARGES xxx environment."

Commenting on a recent report that PCB can induce birth defects in animals, Minckler said, "Monsanto is not aware of any scientific data that indicates polychlorinated biphenyls may cause birth defects. The results of comprehensive toxicity studies, sponsored by Monsanto and using the usual species of laboratory animals, have failed to produce such effects.

"Scare tactics and sensational reporting do not serve the public interest nor solve ecological problems," he said.

"Only a few reports have stated why PCBs were ever developed and why they are used today. Nor have the consequences of not using PCB been explained.

"What should be emphasized," Minckler continued, "is that PCB was developed over 40 years ago primarily for use as a coolant in electrical transformers and capacitors. It is also used in commercial heating and cooling systems. It is not a 'household' item.

"Anyone who lives in a large city is familiar with power failures. During periods of peak power needs, air conditioning and refrigeration fail, lights go out and commuters are stranded. If power companies were to remove PCB from equipment, we have been told that major blackouts would occur throughout the world.

FUR 003385

-more-

--3 MONSANTO: MINCKLER'S REPLY TO PCB CHARGES xxx world.

"PCB is used in electrical equipment as a safety fluid. It has replaced combustible oil products which have, on many occasions, exploded and burned, causing deaths and injury to human life. Today state and local laws all over the country require the use of non-flammable fluids in certain electrical equipment as a safety feature. At the moment, there are no substitutes available which equal the safety performance of PCB."

Monsanto said it intends to continue selling PCB for "closed-system" uses such as electrical components and heat-transfer systems. "With rigid control over where the product goes, how it is handled and disposed of, we believe the safety functions of the product can continue to serve society and the environment can be protected," Minckler said. "We are discontinuing sales into 'open systems' -- adhesives, sealants, chlorinated rubber, specialty paints, etc."

"For other uses, such as fire-resistant hydraulic fluids, where PCB cannot be strictly controlled, we have reformulated some fluids and they are on the market. The new products contain other fire-resistant ingredients. We will continue to develop alternate formulations which do not contain persistent PCB. We will not abandon hydraulic fluid users," Minckler commented, "as has been reported."

FUR 003386

-more-

--4- MONSANTO: MINCKLER'S REPLY TO PCB CHARGE xxx reported."

Monsanto has also established a new system for disposal or recycle of spent PCB. A special high-temperature incinerator will break down PCB into harmless materials. The company also regenerates spent fluids for reuse. The incinerator will be offered to customers who cannot otherwise destroy or regenerate their old fluids.

"Although loss of PCB from our manufacturing plants has been negligible, we have further tightened up our production techniques and installed new pollution abatement devices," the Monsanto executive said.

"I repeat," Minckler concluded, "our program was initiated and conducted by Monsanto alone. It will be concluded this year. We believe it is a position any responsible company would take."

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FUR 003387

W. B. PAPAGEORGE

October 26, 1970

H. S. Bergen
W. R. Richard
R. E. Keller
E. P. Wheeler

J. R. Savage

Recent data from Dr. J. P. Mieure's work indicates the presence of naphthalene in biphenyl and anthracene or phenanthrene and dibenzofuran in Santowax R used in the manufacture of Aroclors.

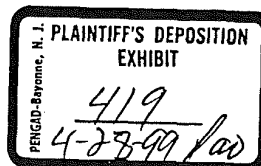
The naphthalene, anthracene or phenanthrene could be present in the benzene used in the diphenyl unit or could be co-produced with the biphenyl, terphenyl and quaterphenyl.

The dibenzofuran could result from oxygen containing contaminants in the benzene or, more likely, be formed because of the presence of the promoter, acetone.

The Anniston Plant should design and execute a program for determining the source or sources of these contaminants.

W. B. PAPAGEORGE

ms



FUR 004044

Form Approved OMB
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July 30, 1972

U.S. DEPARTMENT OF LABOR

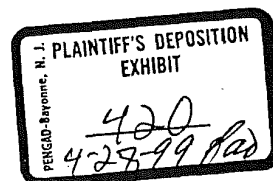
Form No. OSHA-2
May, 1971

81111

MATERIAL SAFETY DATA SHEET

SECTION I						
MANUFACTURER'S NAME MONSANTO COMPANY			EMERGENCY TELEPHONE NO. (314) 694-1000			
ADDRESS (Number, Street, City, State, and Zip Code) 800 North Lindbergh Boulevard, St. Louis, Missouri 63166						
CHEMICAL NAME AND SYNONYMS Mixture			TRADE NAME AND SYNONYMS Reclaimed Aroclor			
CHEMICAL FAMILY Chlorinated Aromatic			FORMULA Mixture			
SECTION II HAZARDOUS INGREDIENTS						
PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)	
PIGMENTS			BASE METAL			
CATALYST			ALLOYS			
VEHICLE			METALLIC COATINGS			
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX			
ADDITIVES			OTHERS			
OTHERS						
HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES					%	TLV (Units)
SECTION III PHYSICAL DATA						
BOILING POINT (°F) at 40 mm		200-400°C		SPECIFIC GRAVITY (H ₂ O = 1) (15/15°C) 1.25-1.55		
VAPOR PRESSURE (mm Hg.) at 20°C		<1 mm		PERCENT VOLATILE BY VOLUME (%) N.A.		
VAPOR DENSITY (AIR = 1)		Not Avail		EVAPORATION RATE (BuAc = 1) <1		
SOLUBILITY IN WATER at 20°C negligible		<0.02				
APPEARANCE AND ODOR colorless to yellow oil sharp aromatic odor						
SECTION IV FIRE AND EXPLOSION HAZARD DATA						
FLASH POINT (ASTM D 93)			FLAMMABLE LIMITS		Lol Uol	
			Not Avail.			
EXTINGUISHING MEDIA						
SPECIAL FIRE FIGHTING PRECAUTIONS Respiratory protection when fighting fires where exposure to vapors or gases is possible.						
UNUSUAL FIRE AND EXPLOSION HAZARDS Highly toxic gases (chlorides and chlorine) can be evolved in fires of this product.						

FUR 003275



Reclaimed
Aroclor

SECTION V HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE

EFFECTS OF OVEREXPOSURE

Skin irritation in the form of chloracne, systematic intoxication, leads to nausea, vomiting, loss of weight, edema and abdominal pain.

EMERGENCY AND FIRST AID PROCEDURES

Remove from exposure. Remove contaminated clothing. Wash contacted area with large amounts of water and soap. Refer to physician.

SECTION VI REACTIVITY DATA

STABILITY

UNSTABLE

STABLE

X

CONDITIONS TO AVOID

INCOMPATIBILITY (Materials to avoid)

HAZARDOUS DECOMPOSITION PRODUCTS

CO, CO₂, smoke, soot, chlorides and chlorine

HAZARDOUS
POLYMERIZATION

MAY OCCUR

WILL NOT OCCUR

CONDITIONS TO AVOID

X

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Absorb on clay, sawdust or other absorbant material. Place in drums. Bury in approved chemical landfill in accordance with local and state regulations.

WASTE DISPOSAL METHOD

Burn in an approved incinerator in accordance with local and state regulations.

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type)

Bureau of Mines approved respirator for organic vapors.

VENTILATION

LOCAL EXHAUST

Yes - for vapors

MECHANICAL (General)

SPECIAL

OTHER

PROTECTIVE GLOVES

Rubber

EYE PROTECTION

Chemical goggles

OTHER PROTECTIVE EQUIPMENT

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING

Avoid skin and eye contact, avoid inhalation of vapors

OTHER PRECAUTIONS

While the information and recommendations set forth herein are believed to be accurate as of the date hereof, MONSANTO COMPANY MAKES NO WARRANTY WITH RESPECT THERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON.

JAC:NON:JTG:WBP

FUR 003276

2/3/72

July 30, 1972

MATERIAL SAFETY DATA SHEET

SECTION I

MANUFACTURER'S NAME MONSANTO COMPANY		EMERGENCY TELEPHONE NO. (314) 604-1000
ADDRESS, Street, City, State, and ZIP Code 800 North Lindbergh Boulevard, St. Louis, Missouri 63166		
CHEMICAL NAME AND SYNONYMS Mixture		TRADE NAME AND SYNONYMS Aroclor 1015, MCS 1015
CHEMICAL FAMILY Chlorinated aromatic	FORMULA Mixture	

SECTION II HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					
HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES				%	TLV (Units)

SECTION III PHYSICAL DATA

BOILING POINT (°F.) 760 mm	325°C	SPECIFIC GRAVITY IN H ₂ O ¹¹ (25/15.5°C)	1.367
VAPOR PRESSURE (mm Hg.) (155-195°C)	3 mm	PERCENT VOLATILE BY VOLUME (%)	N.A.
VAPOR DENSITY (AIR=1)	Not Avail	EVAPORATION RATE 1. Pinta 2. Lbs/Lb	<1
SOLUBILITY IN WATER 20°C negligible	<0.01%		
APPEARANCE AND ODOR colorless oil		slight aromatic odor	

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (MILBURN METHOD) C.O.C.	180°C	FLAMMABLE LIMITS	LOI	UOI
EXTINGUISHING MEDIA Water, foam, CO₂ or dry chemical				
SPECIAL FIRE FIGHTING PROCEDURES Respiratory protection when fighting fires where exposure to vapors or gases is possible.				
UNUSUAL FIRE AND EXPLOSION HAZARDS Highly toxic gases (chlorides and chlorine) can be evolved in fires of this product.				

FUR 003277

SECTION V HEALTH HAZARD DATA

EFFECTS OF OVEREXPOSURE
Skin irritation in the form of chloracne, systematic intoxication leads to nausea, vomiting, loss of weight, edema and abdominal pain.

EMERGENCY AND FIRST AID PROCEDURES

SECTION VI REACTIVITY DATA

STABILITY	UNSTABLE	CONDITIONS TO AVOID
	STABLE	X

INCORPATABILITY (Materials to avoid)

HAZARDOUS DECOMPOSITION PRODUCTS CO, CO₂, smoke, soot, chlorides and chlorine

HAZARDOUS POLYMERIZATION	MAY OCCUR	CONDITIONS TO AVOID
	WILL NOT OCCUR	X

SECTION VII SPILL OR LEAK PROCEDURES

Absorb on clay, sawdust or other absorbant material. Place in drums. Bury in approved chemical landfill in accordance with local and state regulations.

WASTE DISPOSAL METHOD Burn in an approved incinerator in accordance with local and state regulations.

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION Bureau of Mines approved respirator for organic vapors.

VENTILATION	LOCAL EXHAUST Yes - for vapors	SPECIAL
	MECHANICAL (General)	OTHER

PROTECTIVE GLOVES rubber EYE PROTECTION chemical goggles

OTHER PROTECTIVE EQUIPMENT

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE

Avoid skin and eye contact. Avoid inhalation of vapors.

OTHER PRECAUTIONS

FUR 003278

While the information and recommendations set forth herein are believed to be accurate as of the date hereof, MONSANTO COMPANY MAKES NO WARRANTY WITH RESPECT THERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON.

JAG:HOH:JTC:WBP

1/25/72

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No. 44-R1387
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July 30, 1972

U.S. DEPARTMENT OF LABOR

Form No. OSHA
May, 1971

MATERIAL SAFETY DATA SHEET

SECTION I					
MANUFACTURER'S NAME MONSANTO COMPANY				EMERGENCY TELEPHONE NO. (314) 604-1000	
ADDRESS (Number, Street, City, State, and ZIP Code) 800 North Lindbergh Boulevard, St. Louis, Missouri 63166					
CHEMICAL NAME AND SYNONYMS				TRADE NAME AND SYNONYMS Aroclor 1221	
CHEMICAL FAMILY Chlorinated Aromatic				FORMULA Mixture	
SECTION II HAZARDOUS INGREDIENTS					
PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Unit)	ALLOYS AND METALLIC COATINGS	%	TLV (Unit)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					
HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES				%	TLV (Unit)
SECTION III PHYSICAL DATA					
BOILING POINT (°F)	760 mm	275-320	SPECIFIC GRAVITY (H ₂ O = 1) (25/15.5°C)	1.18	
VAPOR PRESSURE (mm Hg.)	at 100°F	> 0.05	PERCENT VOLATILE BY VOLUME (%)	N.A.	
VAPOR DENSITY (AIR = 1)	Not Avail.		EVAPORATION RATE (P.E.A.C. = 1)	< 1	
SOLUBILITY IN WATER	at 25°C negligible	< 0.01%			
APPEARANCE AND ODOR	colorless oil		aromatic odor		
SECTION IV FIRE AND EXPLOSION HAZARD DATA					
FLASH POINT (MATERIAL HANDLED)	Not Avail.		FLAMMABLE LIMITS	(LFL)	(UFL)
			Not Avail.		
EXTINGUISHING MEDIA Water, foam, CO ₂ , or dry chemical.					
SPECIAL FIRE FIGHTING PROCEDURES Respiratory protection when fighting fires where exposure to vapors or gases is possible.					
UNUSUAL FIRE AND EXPLOSION HAZARDS Highly toxic fumes (chlorides and chlorine) can be evolved in fires of this product.					

FUR 003279

Aroclor 1221

SECTION V

HEALTH HAZARD DATA

TOXICITY DATA	Not Available
EFFECTS OF OVEREXPOSURE Skin irritation in the form of chloracne, systematic intoxication leads to nausea, vomiting, loss of weight, edema and abdominal pain.	
EMERGENCY AND FIRST AID PROCEDURES Remove from exposure. Remove contaminated clothing. Wash contacted area with large amounts of water and soap. Refer to physician.	

SECTION VI

REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	
INCOMPATIBILITY (Materials to avoid)			
HAZARDOUS DECOMPOSITION PRODUCTS CO, CO ₂ , smoke, soot, chlorides and chlorine			
HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	

SECTION VII

SPILL OR LEAK PROCEDURES

IF IT IS DETERMINED THAT MATERIAL IS RELEASED OR SPILLED Absorb on clay, sawdust or other absorbant material. Place in drums. Bury in approved chemical landfill in accordance with local and state regulations.	
WASTE DISPOSAL METHOD Burn in an approved incinerator in accordance with local and state regulations.	

SECTION VIII

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION Bureau of Mines approved respirator for organic vapors.		
VENTILATION	LOCAL EXHAUST	Yes - for vapors
	MECHANICAL (General)	
PROTECTIVE GLOVES		rubber
EYE PROTECTION		chemical goggles
OTHER PROTECTIVE EQUIPMENT		

SECTION IX

SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE Avoid skin and eye contact. Avoid inhalation of vapors.		FUR 003280
OTHER PRECAUTIONS		

While the information and recommendations set forth herein are believed to be accurate as of the date hereof, MONSANTO COMPANY MAKES NO WARRANTY WITH RESPECT THERE TO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON.

JAC:HOW:JTC:MBB

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U.S. DEPARTMENT OF LABOR

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May, 1971

MATERIAL SAFETY DATA SHEET

SECTION I	
MANUFACTURER'S NAME MONSANTO COMPANY	EMERGENCY TELEPHONE NO. (314) 604-1000
ADDRESS, Number, Street, City, State, and ZIP Code 800 North Lindbergh Boulevard, St. Louis, Missouri 63166	
COMMON NAME AND SYNONYMS	TRADE NAME AND SYNONYMS Aroclor 1232
CHEMICAL FAMILY Chlorinated Aromatic	FORMULA Mixtures

SECTION II HAZARDOUS INGREDIENTS					
PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					
HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES				%	TLV (Units)

SECTION III PHYSICAL DATA				
BOILING POINT (°F.)	760 mm	290-325°C	SPECIFIC GRAVITY IN H ₂ O ⁻¹ (25/15.5°C)	1.271
VAPOR PRESSURE (mm Hg.)		.005	PERCENT VOLATILE BY VOLUME (%)	N.A.
VAPOR DENSITY (AIR=1)		Not Avail	EVAPORATION RATE (g/m ² /hr @ 25°C)	<1
SOLUBILITY IN WATER	at 25°C negligible <0.01%			
APPEARANCE AND ODOR	colorless oil aromatic odor			

SECTION IV FIRE AND EXPLOSION HAZARD DATA			
FLASH POINT (Method used)	C.O.C., 310°F	FLAMMABLE LIMITS	Not Avail.
EXTINGUISHING MEDIA	Water, foam, CO ₂ or dry chemical.		
SPECIAL FIRE FIGHTING PROCEDURES	Respiratory protection when fighting fires where exposure to vapors or gases is possible.		
UNUSUAL FIRE AND EXPLOSION HAZARDS	Highly toxic gases (chlorides and chlorine) can be evolved in fires of this product.		

FUR 003281

EXPOSURE LIMIT VALUE	Not available.
EFFECTS OF OVEREXPOSURE Skin irritation in the form of chloracne, systematic intoxication leads to nausea, vomiting, loss of weight, edema and abdominal pain.	
FIRST AID AND FIRST AID PROCEDURES Remove from exposure. Remove contaminated clothing. Wash contacted area with large amounts of water and soap. Refer to physician.	

SECTION VI REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	
INCOMPATIBILITY (Materials to avoid)			
HAZARDOUS DECOMPOSITION PRODUCTS CO, CO ₂ , smoke, soot, chlorides and chlorine			
HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	

SECTION VII SPILL OR LEAK PROCEDURES

Absorb on clay, sawdust or other absorbant material. Place in drums. Bury in approved chemical landfill in accordance with local and state regulations.	
WASTE DISPOSAL METHOD Burn in an approved incinerator in accordance with local and state regulations.	

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type) Bureau of Mines approved respirator for organic vapors.			
VENTILATION	LOCAL EXHAUST	Yes - for vapors	SPECIAL
	MECHANICAL (General)		OTHER
PROTECTIVE GLOVES		rubber	EYE PROTECTION
			chemical goggles
OTHER PROTECTIVE EQUIPMENT			

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE Avoid skin and eye contact. Avoid inhalation of vapors.		FUR 003282
OTHER PRECAUTIONS		

While the information and recommendations set forth herein are believed to be accurate as of the date hereof, MONSANTO COMPANY MAKES NO WARRANTY WITH RESPECT THERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON.

TAG-NOW-ITC-MDD

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May, 1971

MATERIAL SAFETY DATA SHEET

SECTION I					
MANUFACTURER'S NAME MONSANTO COMPANY				EMERGENCY TELEPHONE NO. (314) 694-1000	
ADDRESS (Number, Street, City, State, and ZIP Code) 800 North Lindbergh Boulevard, St. Louis, Missouri 63166					
CHEMICAL NAME AND SYNONYM Mixture				TRADE NAME AND SYNONYM Aroclor 1242	
CHEMICAL FAMILY Chlorinated Aromatic				FORMULA Mixture	
SECTION II HAZARDOUS INGREDIENTS					
PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					
HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES				%	TLV (Units)
SECTION III PHYSICAL DATA					
BOILING POINT (P.S.) 760 mm		325-360°C	SPECIFIC GRAVITY (H ₂ O=1) (25/25°C)		1.380
VAPOR PRESSURE (mm Hg.) (155-195°C)		3 mm	PERCENT VOLATILE BY VOLUME (%)		N.A.
VAPOR DENSITY (AIR=1)		Not Avail.	EVAPORATION RATE (BuAc = 1)		<1
SOLUBILITY IN WATER		20°C negligible	<0.01%		
APPEARANCE AND ODOR		colorless oil slight aromatic odor			
SECTION IV FIRE AND EXPLOSION HAZARD DATA					
FLASH POINT (MINEUSE TEST)		C.O.C. 180°C	FLAMMABLE LIMITS		Loi Uoi
					N.A. N.A.
EXTINGUISHING MEDIA Water, foam, CO ₂ or dry chemical					
SPECIAL FIRE FIGHTING PROCEDURES Respiratory protection when fighting fires where exposure to vapors or gases is possible:					
UNUSUAL FIRE AND EXPLOSION HAZARDS Highly toxic gases (chlorides and chlorine) can be evolved in fires of this product.					

FUR 003283

THRESHOLD LIMIT VALUE	1.0 mg/m ³ of air.
EFFECTS OF OVEREXPOSURE	Skin irritation in the form of chloracne, systematic intoxication leads to nausea, vomiting, loss of weight, edema and abdominal pain.
EMERGENCY AND FIRST AID PROCEDURES	Remove from exposure. Remove contaminated clothing. Wash contacted area with large amounts of water and soap. Refer to physician.

SECTION VI REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	
INCOMPATIBILITY (Materials to avoid)			
HAZARDOUS DECOMPOSITION PRODUCTS CO, CO ₂ , smoke, soot, chlorides and chlorine			
HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED	
Absorb on clay, sawdust or other absorbent. Place in drums and bury in approved chemical landfill in accordance with local and state regulations.	
WASTE DISPOSAL METHOD	
Burn in an approved incinerator in accordance with local and state laws.	

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type)			
VENTILATION	LOCAL EXHAUST	Yes - for vapors	SPECIAL
	MECHANICAL (General)		OTHER
PROTECTIVE GLOVES	Rubber	EYE PROTECTION	Chemical goggles
OTHER PROTECTIVE EQUIPMENT			

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING	
Avoid skin and eye contact, avoid inhalation of vapors.	
OTHER PRECAUTIONS	

FUR 003284

While the information and recommendations set forth herein are believed to be accurate as of the date hereof, MONSANTO COMPANY MAKES NO WARRANTY WITH RESPECT THERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON.

JAG:HOH:JTG:WBP

1/24/72

81102

MATERIAL SAFETY DATA SHEET

SECTION I

MANUFACTURER'S NAME MONSANTO COMPANY		EMERGENCY TELEPHONE NO. (314) 601-1000
ADDRESS (Number, Street, City, State, and ZIP Code) 800 North Lindbergh Boulevard, St. Louis, Missouri 63166		
CHEMICAL NAME AND SYNONYMS Mixture		TRADE NAME AND SYNONYMS Aroclor 1248
COMMON NAME Chlorinated aromatic	FORMULA Mixture	

SECTION II. HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLOW		
ADDITIVES			OTHERS		
OTHERS					
HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES				%	TLV (Units)

SECTION III PHYSICAL DATA

BOILING POINT (°F.)	760 mm	345-385°C	SPECIFIC GRAVITY IN H ₂ O @ 25/25°C	1.445
VAPOR PRESSURE (mm Hg.)	165-210°C	3 mm	PERCENT VOLATILE BY VOLUME (%)	N.A.
VAPOR DENSITY (AIR=1)		Not Avail	EVAPORATION RATE (BuAc = 1)	<1
SOLUBILITY IN WATER	20°C negligible	<0.01%		
APPEARANCE AND ODOR	colorless to yellow oil aromatic odor			

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	C.O.C. 196°C	FLAMMABLE LIMITS	Lel	Uel
			N.A.	N.A.
EXTINGUISHING MEDIA				
SPECIAL FIRE FIGHTING PROCEDURES				
Respiratory protection when fighting fires where exposure to vapor or gases is possible;				
UNUSUAL FIRE AND EXPLOSION HAZARDS				
Highly toxic gases (chlorides and chlorine) can be evolved in fires of this product.				

FUR 003285

THRESHOLD LIMIT VALUE			
EFFECTS OF OVEREXPOSURE Skin irritation in the form of chloracne. Systematic intoxication leads to nausea, vomiting, loss of weight, edema and abdominal pain.			
EMERGENCY AND FIRST AID PROCEDURES Remove from exposure. Remove contaminated clothing. Wash contacted area with large amounts of water and soap. Refer to physician.			
SECTION VI REACTIVITY DATA			
STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	
INCOMPATIBILITY (Materials to avoid)			
HAZARDOUS DECOMPOSITION PRODUCTS CO, CO ₂ , smoke, soot, chlorides and chlorine.			
HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	
SECTION VII SPILL OR LEAK PROCEDURES			
STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED Absorb on clay, sawdust or other absorbant material. Place in drums. Bury in approved chemical landfill in accordance with local and state regulations.			
WASTE DISPOSAL METHOD Burn in an approved incinerator in accordance with local and state regulations.			
SECTION VIII SPECIAL PROTECTION INFORMATION			
RESPIRATORY PROTECTION (Specify type) Bureau of Mines approved respirator for organic vapors.			
VENTILATION	LOCAL EXHAUST	Yes - for vapors	SPECIAL
	MECHANICAL (General)		OTHER
PROTECTIVE GLOVES	Rubber	EYE PROTECTION	Chemical goggles
OTHER PROTECTIVE EQUIPMENT			
SECTION IX SPECIAL PRECAUTIONS			
PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING Avoid skin and eye contact, avoid inhalation of vapors.			
OTHER PRECAUTIONS			

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JAG:HOH:JTG:WBP

1/25/72

FUR 003286

SECTION I

SECTION II HAZARDOUS INGREDIENTSSECTION III PHYSICAL DATA

SECTION IV FIRE AND EXPLOSION HAZARD DATA

Respiratory protection when fighting fires where exposure to vapors or gases is possible.

Hydrogen chloride (chlorides and chlorine) can be evolved in fires of this product.

SECTION V HEALTH HAZARD DATA									
THRESHOLD LIMIT VALUE	0.5 mg/m ³ of air								
EFFECTS OF OVEREXPOSURE									
Skin irritation in the form of chloracne, systematic intoxication leads to nausea, vomiting, loss of weight, edema and abdominal pain.									
EMERGENCY AND FIRST AID PROCEDURES									
Remove from exposure. Remove contaminated clothing. Wash contacted area with large amounts of water and soap. Refer to physician.									
SECTION VI REACTIVITY DATA									
STABILITY	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">UNSTABLE</td> <td style="width: 33%;"></td> <td style="width: 33%;">CONDITIONS TO AVOID</td> </tr> <tr> <td>STABLE</td> <td>X</td> <td></td> </tr> </table>	UNSTABLE		CONDITIONS TO AVOID	STABLE	X			
UNSTABLE		CONDITIONS TO AVOID							
STABLE	X								
INCOMPATIBILITY (Materials to avoid)									
HAZARDOUS DECOMPOSITION PRODUCTS									
CO, CO ₂ , smoke, soot, chlorides and chlorine									
HAZARDOUS POLYMERIZATION	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">MAY OCCUR</td> <td style="width: 33%;"></td> <td style="width: 33%;">CONDITIONS TO AVOID</td> </tr> <tr> <td>WILL NOT OCCUR</td> <td>X</td> <td></td> </tr> </table>	MAY OCCUR		CONDITIONS TO AVOID	WILL NOT OCCUR	X			
MAY OCCUR		CONDITIONS TO AVOID							
WILL NOT OCCUR	X								
SECTION VII SPILL OR LEAK PROCEDURES									
STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED Absorb on clay, sawdust or other absorbent material. Place in drums. Bury in approved chemical landfill in accordance with local and state regulations.									
WASTE DISPOSAL METHOD									
Burn in an approved incinerator in accordance with local and state regulations.									
SECTION VIII SPECIAL PROTECTION INFORMATION									
RECOMMENDED PROTECTIVE EQUIPMENT									
RESPIRATORY PROTECTION (Specify type)									
Bureau of Mines approved respirator for organic vapors.									
VENTILATION	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">LOCAL EXHAUST</td> <td style="width: 33%;">Yes - for vapors</td> <td style="width: 33%;">SPECIAL</td> <td style="width: 33%;">vapors.</td> </tr> <tr> <td>MECHANICAL (General)</td> <td></td> <td>OTHER</td> <td></td> </tr> </table>	LOCAL EXHAUST	Yes - for vapors	SPECIAL	vapors.	MECHANICAL (General)		OTHER	
LOCAL EXHAUST	Yes - for vapors	SPECIAL	vapors.						
MECHANICAL (General)		OTHER							
PROTECTIVE GLOVES	Rubber	EYE PROTECTION	Chemical goggles						
OTHER PROTECTIVE EQUIPMENT									
SECTION IX SPECIAL PRECAUTIONS									
PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE									
Avoid skin and eye contact, avoid inhalation of vapors									
FUR 003288									
OTHER PRECAUTIONS									

While the information and recommendations set forth herein are believed to be accurate as of the date hereof, MONSANTO COMPANY MAKES NO WARRANTY WITH RESPECT THERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON.

JAG:HOH:JTC:WDP

1/25/72

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U.S. DEPARTMENT OF LABOR

Form No. OSHA
May, 1971

81105

MATERIAL SAFETY DATA SHEET

SECTION I					
MANUFACTURER'S NAME MONSANTO COMPANY			EMERGENCY TELEPHONE NO. (314) 694-1000		
ADDRESS (Number, Street, City, State, and Zip Code) 800 North Lindbergh Boulevard, St. Louis, Missouri 63166					
CHEMICAL NAME AND SYNONYMS Mixture			TRADE NAME AND SYNONYMS Avonlor 1260		
CHEMICAL FAMILY Chlorinated aromatic			FORMULA Mixture		
SECTION II. HAZARDOUS INGREDIENTS					
PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					
HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES				%	TLV (Units)
SECTION III PHYSICAL DATA					
BOILING POINT (°F.)		760 mm 385-420°C	SPECIFIC GRAVITY (H ₂ O = 1) (25/25°C)		1.620
VAPOR PRESSURE (mm Hg.)		195-245°C 3 mm	PERCENT VOLATILE BY VOLUME (%)		N.A.
VAPOR DENSITY (AIR = 1)		Not Avail	EVAPORATION RATE (BuAc = 1)		<1
SOLUBILITY IN WATER		20°C negligible <0.01%			
APPEARANCE AND ODOR		yellow soft resin slight aromatic odor			
SECTION IV FIRE AND EXPLOSION HAZARD DATA					
FLASH POINT (Method used)		None	FLAMMABLE LIMITS		N.A.
EXTINGUISHING MEDIA					
SPECIAL FIRE FIGHTING PROCEDURES Respiratory protection when fighting fires where exposure to vapors or gases is possible.					
UNUSUAL FIRE AND EXPLOSION HAZARDS Highly toxic gases (chlorides and chlorine) can be evolved in fires of this product.					

FUR 003289

THRESHOLD LIMIT VALUE

Not avail.

EFFECTS OF OVEREXPOSURE

Skin irritation in the form of chloracne, systematic intoxication leads to nausea, vomiting, loss of weight, edema and abdominal pain.

EMERGENCY AND FIRST AID PROCEDURES

Remove from exposure. Remove contaminated clothing. Wash contacted area with large amounts of water and soap. Refer to physician.

SECTION VI REACTIVITY DATA

STABILITY

UNSTABLE

CONDITIONS TO AVOID

STABLE

X

INCOMPATIBILITY (Materials to avoid)

HAZARDOUS DECOMPOSITION PRODUCTS

CO, CO₂, smoke, soot chlorides & chlorine.

HAZARDOUS

MAY OCCUR

CONDITIONS TO AVOID

POLYMERIZATION

WILL NOT OCCUR

X

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Absorb on clay, sawdust or other absorbant material. Place in drums. Bury in approved chemical landfill in accordance with local and state regulations.

WASTE DISPOSAL METHOD

Burn in approved incinerator in accordance with local and state regulations.

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type)

Bureau of Mines approved respirator for organic vapors.

VENTILATION

LOCAL EXHAUST

Yes - for vapors

SPECIAL

MECHANICAL (General)

OTHER

PROTECTIVE GLOVES

rubber

EYE PROTECTION

chemical goggles

OTHER PROTECTIVE EQUIPMENT

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING

Avoid skin contact and eye contact.
Avoid inhalation of vapors.

OTHER PRECAUTIONS

While the information and recommendations set forth herein are believed to be accurate as of the date hereof, MONSANTO COMPANY MAKES NO WARRANTY WITH RESPECT THERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON.

JAG:HOH:JTG:WBP

FUR 003290

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MATERIAL SAFETY DATA SHEET

SECTION I						
MANUFACTURER'S NAME MONSANTO COMPANY			EMERGENCY TELEPHONE NO. (314) 604-1000			
ADDRESS, Number, Street, City, State, and ZIP Code 500 North Lindbergh Boulevard, St. Louis, Missouri 63166						
COMMON NAME AND SYNONYMS Mixture			TRADE NAME AND SYNONYMS Aroclor 1254 (A13B1)			
CLASSIFICATION Chlorinated aromatic			FORMULA Mixture			
SECTION II HAZARDOUS INGREDIENTS						
PAINTS, PRESERVATIVES, & SOLVENTS		%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
Pigments				BASE METAL		
Catalyst				Alloys		
Vehicle				Metallic Coatings		
Solvents				FILLER METAL PLUS COATING OR CORE FLUX		
Additives				OTHERS		
OTHERS						
HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES					%	TLV (Units)
SECTION III PHYSICAL DATA						
BOILING POINT (°F.)		760 mm	365-400°C	SPECIFIC GRAVITY (H ₂ O = 1) (25/25°C)		1.538
VAPOR PRESSURE (mm Hg.)		180-220°C	3 mm	PERCENT VOLATILE BY VOLUME (%)		N.A.
VAPOR DENSITY (AIR = 1)				EVAPORATION RATE (Butyl Acetate = 1)		<1
SOLUBILITY IN WATER		20°C negligible	<0.01%			
APPEARANCE AND ODOR		Yellow viscous oil aromatic odor				
SECTION IV FIRE AND EXPLOSION HAZARD DATA						
FLASH POINT (Method used)			None		FLAMMABLE LIMITS	
					LFL H.A.	
					UFL H.A.	
EXTINGUISHING MEDIA						
SPECIAL FIRE FIGHTING PROCEDURES						
Respiratory protection when fighting fires where exposure to vapors or gases is possible.						
HEALTH/SAFETY/HAZARD (Chlorides and chlorine) can be evolved in fires of this product.						

FUR 003291

0.5 mg/m ³ of air
EFFECTS OF OVEREXPOSURE Skin irritation in the form of chloracne, systematic intoxication leads to nausea, vomiting, loss of weight, edema and abdominal pain.
EMERGENCY AND FIRST AID PROCEDURES Remove from exposure. Remove contaminated clothing. Wash contacted area with large amounts of water and soap. Refer to physician.

SECTION VI REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	
INCOMPATIBILITY (Materials to avoid)			
HAZARDOUS DECOMPOSITION PRODUCTS CO, CO ₂ , smoke, soot, chlorides and chlorine			
HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	

SECTION VII SPILL OR LEAK PROCEDURES

Absorb on clay, sawdust or other absorbant material. Place in drums. Bury in approved chemical landfill in accordance with local and state regulations.
WASTE DISPOSAL METHOD Burn in an approved incinerator in accordance with local and state regulations.

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type) Bureau of Mines approved respirator for organic vapors.			
VENTILATION	LOCAL EXHAUST	Yes - for vapors	SPECIAL vapors.
	MECHANICAL (General)		OTHER
PROTECTIVE GLOVES	Rubber	Eye Protection	Chemical goggles
OTHER PROTECTIVE EQUIPMENT			

SECTION IX SPECIAL PRECAUTIONS

Avoid skin and eye contact, avoid inhalation of vapors	
OTHER PRECAUTIONS	
FUR 003292	

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JAG:HOH:JTG:WBP

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Form No. OSHA-1
May, 1971

87107

HAZARD SAFETY DATA SHEET

SECTION I

MANUFACTURER'S NAME MONSANTO COMPANY		EMERGENCY TELEPHONE NO. (314) 694-1800
ADDRESS (Street, City, State, and Zip Code) 800 North Lindbergh Boulevard, St. Louis, Missouri 63166		
CHEMICAL NAME AND SYNONYMS Mixture		TRADE NAME AND SYNONYMS Aroclor 1262
CLASSICAL FAMILY Chlorinated aromatic	FORMULA Mixture	

SECTION II. HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					
HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES				%	TLV (Units)

SECTION III PHYSICAL DATA

BOILING POINT (°F.)	760 mm	390-425°C	SPECIFIC GRAVITY (H ₂ O = 1) (25/25°C)	1.646
VAPOR PRESSURE (mm Hg.)	Not avail.		PERCENT VOLATILE BY VOLUME (%)	N.A.
VAPOR DENSITY (AIR = 1)	Not avail.		EVAPORATION RATE (H ₂ O = 1)	<1
SOLUBILITY IN WATER	20°C negligible	<0.01%		

APPEARANCE AND ODOR yellow resin slight aromatic odor

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (°F. and °C.)	None	FLAMMABLE LIMITS	LC ₅₀ (mg/l)	LD ₅₀ (mg/kg)
			N.A.	N.A.
EXTINGUISHING MEDIA				

SPECIAL FIRE FIGHTING PROCEDURES

Respiratory protection when fighting fires where exposure to vapors or gases is possible.

UNUSUAL FIRE AND EXPLOSION HAZARD (chlorides and chlorine) can be evolved in fires of this product.

FUR 003293

SECTION V HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE	Not available
EFFECTS OF OVEREXPOSURE Skin irritation in the form of chloracne, systematic intoxication leads to nausea, vomiting, loss of weight, edema and abdominal pain	
EMERGENCY AND FIRST AID PROCEDURES Remove from exposure. Remove contaminated clothing. Wash contacted area with large amounts of water and soap. Refer to physician.	

SECTION VI REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	
INCOMPATIBILITY (Materials to avoid)			
HAZARDOUS DECOMPOSITION PRODUCTS CO, CO ₂ , smoke, soot, chlorides & chlorine			
HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Absorb on clay, sawdust or other absorbant material. Place in drums. Bury in approved chemical landfill in accordance with local and state regulations.
WASTE DISPOSAL METHOD
Burn in an approved incinerator in accordance with local and state regulations

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type) Bureau of Mines approved respirator for organic vapors.		
VENTILATION	LOCAL EXHAUST	Yes for vapors
	MECHANICAL (General)	
PROTECTIVE GLOVES		Rubber
EYE PROTECTION		Chemical goggles

OTHER PROTECTIVE EQUIPMENT	
SECTION IX SPECIAL PRECAUTIONS	
PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING Avoid skin and eye contact, avoid inhalation of vapors	
OTHER PRECAUTIONS	

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JAG:HON:JTG:WBP

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U.S. DEPARTMENT OF LABOR

P. M. E. Bulchman
Form No. OSHA-20
May, 1971-

82610-RM
(Same as 81106)

MATERIAL SAFETY DATA SHEET

SECTION I					
MANUFACTURER'S NAME MONSANTO COMPANY			EMERGENCY TELEPHONE NO. (314) 604-1000		
ADDRESS (Number, Street, City, State, and ZIP Code) 800 North Lindbergh Boulevard, St. Louis, Missouri 63166					
CHEMICAL NAME AND SYNONYMS			TRADE NAME AND SYNONYMS Capacitor 21		
CHEMICAL FAMILY Chlorinated Aromatic			FORMULA Mixture		
SECTION II HAZARDOUS INGREDIENTS					
PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					
HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES					% TLV (Units)
SECTION III PHYSICAL DATA					
BOILING POINT (F.)	760 mm	275-320	SPECIFIC GRAVITY (H ₂ O = 1) (25/15.5°C)	1.187	
VAPOR PRESSURE (mm Hg.)	at 100°F	> .005	PERCENT VOLATILE BY VOLUME (%)	N.A.	
VAPOR DENSITY (AIR = 1)	Not Avail.		EVAPORATION RATE (Butyl Ac = 1)	<1	
SOLUBILITY IN WATER	at 25°C negligible	<0.01%			
APPEARANCE AND ODOR	colorless oil		aromatic odor		
SECTION IV FIRE AND EXPLOSION HAZARD DATA					
FLASH POINT (FINDING USED)	Not Avail		FLASH/EXPLOSION LIMITS	(L)	(U)
			Not Avail		
EXTINGUISHING MEDIA Water, foam, CO ₂ , or dry chemical.					
SPECIAL FIRE FIGHTING PROCEDURES Respiratory protection when fighting fires where exposure to vapors or gases is possible.					
UNUSUAL FIRE AND EXPLOSION HAZARDS Highly toxic fumes (chlorides and chlorine) can be evolved in fires of this product.					

FUR 003295

THRESHOLD LIMIT VALUE

Not Available

EFFECTS OF OVEREXPOSURE

Skin irritation in the form of chloracne, systematic intoxication leads to nausea, vomiting, loss of weight, edema and abdominal pain.

EMERGENCY AND FIRST AID PROCEDURES

Remove from exposure. Remove contaminated clothing. Wash contacted area with large amounts of water and soap. Refer to physician.

SECTION VI REACTIVITY DATA

STABILITY

UNSTABLE

STABLE

X

CONDITIONS TO AVOID

INCOMPATIBILITY (Materials to avoid)

HAZARDOUS DECOMPOSITION PRODUCTS

CO, CO₂, smoke, soot, chlorides and chlorineHAZARDOUS
POLYMERIZATION

MAY OCCUR

WILL NOT OCCUR

CONDITIONS TO AVOID

X

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Absorb on clay, sand, dust or other absorbant material. Place in drums. Bury in approved chemical landfill in accordance with local and state regulations.

WASTE DISPOSAL METHOD

Burn in an approved incinerator in accordance with local and state regulations.

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type)

Bureau of Mines approved respirator for organic

VENTILATION

LOCAL EXHAUST

Yes - for vapors

MECHANICAL (General)

SPECIAL

Vapors.

OTHER

PROTECTIVE GLOVES

rubber

EYE PROTECTION

chemical goggles

OTHER PROTECTIVE EQUIPMENT

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE

Avoid skin and eye contact.
Avoid inhalation of vapors.

OTHER PRECAUTIONS

While the information and recommendations set forth herein are believed to be accurate as of the date hereof, MONSANTO COMPANY MAKES NO WARRANTY WITH RESPECT THERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON.

JAG:HOH:JTG:WBP

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May, 1971
81092

MATERIAL SAFETY DATA SHEET

SECTION I

MANUFACTURER'S NAME MONSANTO COMPANY		EMERGENCY TELEPHONE NO. (314) 694-1000
ADDRESS (Company, Street, City, State, and ZIP Code) 800 North Lindbergh Boulevard, St. Louis, Missouri 63166		
CHEMICAL NAME AND SYNONYMS		TRADE NAME AND SYNONYMS Inerteen PFO
CHEMICAL FAMILY Chlorinated aromatics	FORMULA Mixture	

SECTION II HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					
HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES				%	TLV (Units)

SECTION III PHYSICAL DATA

BOILING POINT (P.S.I.)	760 mm 200-415°C	SPECIFIC GRAVITY (H ₂ O = 1) (15.5/15.5°C)	1.564
VAPOR PRESSURE (mm Hg.)	Not Avail	PERCENT VOLATILE BY VOLUME (%)	N.A.
VAPOR DENSITY (AIR = 1)	Not Avail	EVAPORATION RATE (BULAC = 1)	<1
SOLUBILITY IN WATER	20°C negligible	Not Avail	
APPEARANCE AND ODOR	colorless to yellow oil	aromatic odor	

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Minimum used)	None 245° F	FLASHABLE LIMITS	LC1	UC1
EXTINGUISHING MEDIA	N.A.		N.A.	N.A.
SPECIAL FIRE FIGHTING PROCEDURES Respiratory protection when fighting fires where exposure to vapors or gases is possible.				
UNUSUAL FIRE AND EXPLOSION HAZARDS Highly toxic gases (chlorides and chlorine) can be evolved in fires of this product.				

FUR 003297

Inerteen PPO SECTION V HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE	Not available.
EFFECTS OF OVEREXPOSURE	
Skin irritation in the form of chloracne, systematic intoxication leads to nausea, vomiting, loss of weight, edema and abdominal pain	
EMERGENCY AND FIRST AID PROCEDURES	
Remove from exposure. Remove contaminated clothing. Wash contacted area with large amounts of water and soap. Refer to physician.	

SECTION VI REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	
INCOMPATIBILITY (Materials to avoid)			
HAZARDOUS DECOMPOSITION PRODUCTS			
CO, CO ₂ , smoke, soot, chlorides and chlorine			
HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Absorb on clay, sawdust or other absorbant material. Place in drums. Bury in approved chemical landfill in accordance with local and state regulations.
WASTE DISPOSAL METHOD
Burn in an approved incinerator in accordance with local and state regulations.

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type)		
Bureau of Mines approved respirator for organic vapor		
VENTILATION	LOCAL EXHAUST	Yes - for vapors
	MECHANICAL (General)	
SPECIAL		
OTHER		
PROTECTIVE GLOVES	rubber	EYE PROTECTION
		chemical goggles
OTHER PROTECTIVE EQUIPMENT		

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING
Avoid skin and eye contact.
Aoid inhalation of vapors.
OTHER PRECAUTIONS

While the information and recommendations set forth herein are believed to be accurate as of the date hereof, MONSANTO COMPANY MAKES NO WARRANTY WITH RESPECT THERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON.

JAG:HON:JTG:WBP

1/26/72

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May, 1971

File with

81110-259

MATERIAL SAFETY DATA SHEET

SECTION I						
MANUFACTURER'S NAME MONSANTO COMPANY			EMERGENCY TELEPHONE NO. (314) 694-1000			
ADDRESS (Number, Street, City, State, and ZIP Code) 800 North Lindbergh Boulevard, St. Louis, Missouri 63166						
CHEMICAL NAME AND SYNONYMS			TRADE NAME AND SYNONYM			
CHEMICAL FAMILY Chlorinated aromatic			FORMULA Inerteen 54201 CM Mixture			
SECTION II HAZARDOUS INGREDIENTS						
PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)	
PIGMENTS			BASE METAL			
CATALYST			ALLOYS			
VEHICLE			METALLIC COATINGS			
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX			
ADDITIVES			OTHERS			
OTHERS						
HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES				%	TLV (Units)	
SECTION III PHYSICAL DATA						
BOILING POINT (°F.)		760 mm	325-360°C		SPECIFIC GRAVITY IN ₂ O (25/25°C)	1.380
VAPOR PRESSURE (mm Hg.)		(155-195°)		3 mm	PERCENT VOLATILE BY VOLUME (%)	N.A.
VAPOR DENSITY (AIR=1)					EVAPORATION RATE (BuAc = 1)	<1
SOLUBILITY IN WATER 20°C		negligible		<0.02%		
APPEARANCE AND ODOR		colorless oil		aromatic odor		
SECTION IV FIRE AND EXPLOSION HAZARD DATA						
FLASH POINT (ASTM D 93)			C.O.C. 180°C		FLAMMABLE LIMITS	
EXTINGUISHING MEDIA			Water foam, CO ₂ or dry chemical			
SPECIAL FIRE FIGHTING PROCEDURES						
Respiratory protection when fighting fires where exposure to vapors or gases is possible.						
UNUSUAL FIRE AND EXPLOSION HAZARDS						
Highly toxic fumes (chlorides and chlorine) can be evolved in fires of this product.						

FUR 003299

THRESHOLD LIMIT VALUE	Not available.
EFFECTS OF OVEREXPOSURE Skin irritation in the form of chloracne, systematic intoxication leads to nausea, vomiting, loss of weight, edema and abdominal pain.	
EMERGENCY AND FIRST AID PROCEDURES Remove from exposure. Remove contaminated clothing. Wash contacted area with large amounts of water and soap. Refer to physician.	

SECTION VI REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	
INCOMPATIBILITY (Materials to avoid)			
HAZARDOUS DECOMPOSITION PRODUCTS CO, CO ₂ , smoke, soot, chlorides & chlorine			
HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED Absorb on clay, sawdust or other absorbant material. Place in drums. Bury in approved chemical landfill in accordance with local and state regulations.	
WASTE DISPOSAL METHOD Burn in an approved incinerator in accordance with local and state regulations.	

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type) Bureau of Mines approved respirator for organic vapors.			
VENTILATION	LOCAL EXHAUST	Yes - for vapors	SPECIAL vapors.
	MECHANICAL (General)		OTHER
PROTECTIVE GLOVES	rubber	EYE PROTECTION	chemical goggles
OTHER PROTECTIVE EQUIPMENT			

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE Avoid skin and eye contact. Avoid inhalation of vapors	
OTHER PRECAUTIONS	

While the information and recommendations set forth herein are believed to be accurate as of the date hereof, MONSANTO COMPANY MAKES NO WARRANTY WITH RESPECT THERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON.

JAG:HOH:JTG:WBP

1/26/72

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MATERIAL SAFETY DATA SHEET

SECTION I					
MANUFACTURER'S NAME MONSANTO COMPANY		EMERGENCY TELEPHONE NO. (314) 694-1000			
ADDRESS (Name, Street, City, State, and ZIP Code) 800 North Lindbergh Boulevard, St. Louis, Missouri 63166					
CHEMICAL NAME AND SYNONYMS		TRADE NAME AND SYNONYMS			
CHEMICAL FAMILY Chlorinated aromatic		FORMULA Mixture			
SECTION II HAZARDOUS INGREDIENTS					
PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					
HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES				%	TLV (Units)
SECTION III PHYSICAL DATA					
BOILING POINT (F.)	760 mm	325-360°C	SPECIFIC GRAVITY (H ₂ O=1) (25/25°C)	1.380	
VAPOR PRESSURE (mm Hg.)	(155-195°)	3 mm	PERCENT VOLATILE BY VOLUME (%)	N.A.	
VAPOR DENSITY (AIR=1)			EVAPORATION RATE I.B.M.C. = 1	<1	
SOLUBILITY IN WATER	20°C negligible	<0.02%			
APPEARANCE AND ODOR	colorless oil		aromatic odor		
SECTION IV FIRE AND EXPLOSION HAZARD DATA					
FLASH POINT (ASTM D92)	C.O.C. 180°C		FLAMMABLE LIMITS	Lower	Upper
				N.A.	N.A.
EXTINGUISHING MEDIA	Water foam, CO ₂ or dry chemical				
SPECIAL FIRE FIGHTING PROCEDURES					
Respiratory protection when fighting fires where exposure to vapors or gases is possible.					
UNUSUAL FIRE AND EXPLOSION HAZARDS					
Highly toxic gases (chlorides and chlorine) can be evolved in fires of this product.					

FUR 003301

THRESHOLD LIMIT VALUE

Not available.

EFFECTS OF OVEREXPOSURE

Skin irritation in the form of chloracne, systematic intoxication leads to nausea, vomiting, loss of weight, edema and abdominal pain

EMERGENCY AND FIRST AID PROCEDURES

Remove from exposure. Remove contaminated clothing. Wash contacted area with large amounts of water and soap. Refer to physician.

SECTION VI REACTIVITY DATA

STABILITY

UNSTABLE

STABLE

X

CONDITIONS TO AVOID

INCOMPATIBILITY (Materials to avoid)

HAZARDOUS DECOMPOSITION PRODUCTS

CO, CO₂, smoke, soot, chlorides & chlorineHAZARDOUS
POLYMERIZATION

MAY OCCUR

WILL NOT OCCUR

CONDITIONS TO AVOID

X

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Absorb on clay, sawdust or other absorbent material. Place in drums. Bury in approved chemical landfill in accordance with local and state regulations.

WASTE DISPOSAL METHOD

Burn in an approved incinerator in accordance with local and state regulations.

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type)

Bureau of Mines approved respirator for organic

VENTILATION

LOCAL EXHAUST

Yes - for vapors

MECHANICAL (General)

SPECIAL

vapors.

OTHER

PROTECTIVE GLOVES

rubber

EYE PROTECTION

chemical goggles

OTHER PROTECTIVE EQUIPMENT

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE

Avoid skin and eye contact. Avoid inhalation of vapors

OTHER PRECAUTIONS

FUR 003302

While the information and recommendations set forth herein are believed to be accurate as of the date hereof, MONSANTO COMPANY MAKES NO WARRANTY WITH RESPECT THERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON.

JAG:HOH:JTG:WBP

1/26/72

MATERIAL SAFETY DATA SHEET

SECTION I

MANUFACTURER'S NAME MONSANTO COMPANY		EMERGENCY TELEPHONE NO. (314) 604-1000
ADDRESS: Number, Street, City, State, and ZIP Code 800 North Lindbergh Boulevard, St. Louis, Missouri 63166		
CHEMICAL NAME AND SYNONYMS		TRADE NAME AND SYNONYMS Inerteen 70-30
CHEMICAL FAMILY Chlorinated aromatic	FORMULA Mixture	

SECTION II HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					
HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES				%	TLV (Units)

SECTION III PHYSICAL DATA

BOILING POINT (P.S.I.)	760 mm	200-400°C	SPECIFIC GRAVITY (H ₂ O=1) (15.5/15.5°C)	1.523
VAPOR PRESSURE (mm Hg)	Not Avail.		PERCENT VOLATILE BY VOLUME (%)	N.A.
VAPOR DENSITY (AIR=1)	Not Avail.		EVAPORATION RATE (Bulb = 1)	<1
SOLUBILITY IN WATER	20°C negligible <0.01%			
APPEARANCE AND ODOR	colorless oil		aromatic odor	

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (B.WINDO USED)	None	FLAMMABLE LIMITS	Lo	Hi
			N.A.	N.A.
EXTINGUISHING MEDIA				
SPECIAL FIRE FIGHTING PROCEDURES Respiratory protection when fighting fires where exposure to vapors or gases is possible.				
UNUSUAL FIRE AND EXPLOSION HAZARDS Highly toxic gases (chlorides and chlorine) can be evolved in fires of this product.				

FUR 003303

THRESHOLD LIMIT VALUE	Not available.
EFFECTS OF OVEREXPOSURE Skin irritation in the form of chloracne, systematic intoxication leads to nausea, vomiting, loss of weight, edema and abdominal pain.	
EMERGENCY AND FIRST AID PROCEDURES Remove from exposure. Remove contaminated clothing. Wash contacted area with large amounts of water and soap. Refer to physician.	

SECTION VI REACTIVITY DATA.

STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	
INCOMPATABILITY (Materials to avoid)			
HAZARDOUS DECOMPOSITION PRODUCTS CO, CO ₂ , smoke, soot, chlorides and chlorine			
HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED Absorb on clay, sawdust or other absorbent material. Place in drums. Bury in approved chemical landfill in accordance with local and state regulations.	
WASTE DISPOSAL METHOD Burn in an approved incinerator in accordance with local and state regulations.	

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type) Bureau of Mines approved respirator for organic vapors.			
VENTILATION	LOCAL EXHAUST	Yes - for vapors	SPECIAL
	MECHANICAL (General)		OTHER
PROTECTIVE GLOVES rubber		EYE PROTECTION chemical goggles	
OTHER PROTECTIVE EQUIPMENT			

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE Avoid skin and eye contact. Avoid inhalation of vapors.	
OTHER PRECAUTIONS	

While the information and recommendations set forth herein are believed to be accurate as of the date hereof, MONSANTO COMPANY MAKES NO WARRANTY WITH RESPECT THERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON.

JAG:HOH:JTG:WBP

FUR 003304

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May, 1971

81110

MATERIAL SAFETY DATA SHEET

SECTION I

MANUFACTURER'S NAME MONSANTO COMPANY		EMERGENCY TELEPHONE NO. (314) 694-1000
ADDRESS (Number, Street, City, State, and ZIP Code) 800 North Lindbergh Boulevard, St. Louis, Missouri 63166		
CHEMICAL NAME AND SYNONYMS		TRADE NAME AND SYNONYMS Inerteen 100-42
COMMON NAME Chlorinated aromatic	FORMULA Mixture	

SECTION II HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	%	TLV (Units)

SECTION III PHYSICAL DATA

BOILING POINT (°F.)	760 mm	325-360°C	SPECIFIC GRAVITY (H ₂ O=1) (25/25°C)	1.380
VAPOR PRESSURE (mm Hg.)	(155-195°)	3 mm	PERCENT VOLATILE BY VOLUME (%)	N.A.
VAPOR DENSITY (AIR=1)			EVAPORATION RATE (BULAC=1)	<1
SOLUBILITY IN WATER	20°C negligible	<0.02%		
APPEARANCE AND ODOR	colorless oil		aromatic odor	

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Degrees F.)	C.O.C. 180°C	FLASHABLE LIMITS	Lo	Hi
			N.A.	N.A.
EXTINGUISHING MEDIA	Water foam, CO ₂ or dry chemical			
SPECIAL FIRE FIGHTING PROCEDURES Respiratory protection when fighting fires where exposure to vapors or gases is possible.				
UNUSUAL FIRE AND EXPLOSION HAZARDS Highly toxic gases (chlorides and chlorine) can be evolved in fires of this product.				

FUR 003305

SECTION V HEALTH HAZARD DATA

HAZARDOUS INGREDIENT VALUE	Not available.
EFFECTS OF OVEREXPOSURE	
Skin irritation in the form of chloracne, systematic intoxication leads to nausea, vomiting, loss of weight, edema and abdominal pain.	
EMERGENCY AND FIRST AID PROCEDURES	
Remove from exposure. Remove contaminated clothing. Wash contacted area with large amounts of water and soap. Refer to physician.	

SECTION VI REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	
INCOMPATIBILITY (Materials to avoid)			
HAZARDOUS DECOMPOSITION PRODUCTS CO, CO ₂ , smoke, soot, chlorides & chlorine			
HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED	
Absorb on clay, sawdust or other absorbant material. Place in drums. Bury in approved chemical landfill in accordance with local and state regulations.	
WASTE DISPOSAL METHOD	
Burn in an approved incinerator in accordance with local and state regulations.	

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type)		
Bureau of Mines approved respirator for organic vapors.		
VENTILATION	LOCAL EXHAUST	Yes - for vapors
	MECHANICAL (General)	
SPECIAL		OTHER
PROTECTIVE GLOVES	rubber	EYE PROTECTION
		chemical goggles
OTHER PROTECTIVE EQUIPMENT		

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING	
Avoid skin and eye contact. Avoid inhalation of vapors	
OTHER PRECAUTIONS	

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MATERIAL SAFETY DATA SHEET

SECTION I				
MANUFACTURER'S NAME MONSANTO COMPANY			EMERGENCY TELEPHONE NO. (314) 624-1000	
ADDRESS (Street, City, State, and ZIP Code) 800 North Lindbergh Boulevard, St. Louis, Missouri 63166				
CHEMICAL NAME AND SYNONYMS			TRADE NAME AND SYNONYMS	
Chlorinated aromatic			Inerteen 54201 KA	
CHEMICAL FAMILY			FORMULA	
Chlorinated aromatic			Mixture	
SECTION II HAZARDOUS INGREDIENTS				
PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%
PIGMENTS			BASE METAL	
CATALYST			ALLOYS	
VEHICLE			METALLIC COATINGS	
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX	
ADDITIVES			OTHERS	
OTHERS				
HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES				TLV (Units)
SECTION III PHYSICAL DATA				
BOILING POINT (°F.)	760 mm.	200-400°C	SPECIFIC GRAVITY (H ₂ O=1) (15.5/15.5°C)	1.523
VAPOR PRESSURE (mm Hg.)	Not Avail.		PERCENT VOLATILE BY VOLUME (%)	N.A.
VAPOR DENSITY (AIR=1)	Not Avail.		EVAPORATION RATE (Bulb = 1)	<1
SOLUBILITY IN WATER	20°C negligible	<0.01%		
APPEARANCE AND ODOR	colorless oil		aromatic odor	
SECTION IV FIRE AND EXPLOSION HAZARD DATA				
FLASH POINT (Degrees F/°C)	None 285°F		FLAMMABLE LIMITS	LC ₅₀ LD ₅₀
EXTINGUISHING MEDIA				
SPECIAL FIRE FIGHTING PROCEDURES				
Respiratory protection when fighting fires where exposure to vapors or gases is possible.				
UNUSUAL FIRE AND EXPLOSION HAZARDS				
Highly toxic gases (chlorides and chlorine) can be evolved in fires of this product.				

FUR 003307

THRESHOLD LIMIT VALUE Not available.

EFFECTS OF OVEREXPOSURE
Skin irritation in the form of chloracne, systematic intoxication leads to nausea, vomiting, loss of weight, edema and abdominal pain.EMERGENCY AND FIRST AID PROCEDURES
Remove from exposure. Remove contaminated clothing. Wash contacted area with large amounts of water and soap. Refer to physician.

SECTION VI REACTIVITY DATA

STABILITY	UNSTABLE	CONDITIONS TO AVOID	
	STABLE		

X

INCOMPATIBILITY (Materials to avoid)

HAZARDOUS DECOMPOSITION PRODUCTS CO, CO₂, smoke, soot, chlorides and chlorine

HAZARDOUS POLYMERIZATION	MAY OCCUR	CONDITIONS TO AVOID	
	WILL NOT OCCUR		

X

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Absorb on clay, sawdust or other absorbant material. Place in drums. Bury in approved chemical landfill in accordance with local and state regulations.

WASTE DISPOSAL METHOD Burn in an approved incinerator in accordance with local and state regulations.

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type) Bureau of Mines approved respirator for organic vapors.

VENTILATION	LOCAL EXHAUST	Yes - for vapors	SPECIAL	Vapors.
	MECHANICAL (General)		OTHER	

PROTECTIVE GLOVES rubber EYE PROTECTION chemical goggles

OTHER PROTECTIVE EQUIPMENT

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE
Avoid skin and eye contact. Avoid inhalation of vapors.

OTHER PRECAUTIONS

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81094

MATERIAL SAFETY DATA SHEET

SECTION I							
MANUFACTURER'S NAME MONSANTO COMPANY		EMERGENCY TELEPHONE NO. (314) 694-1000					
ADDRESS (Number, Street, City, State, and ZIP Code) 800 North Lindbergh Boulevard, St. Louis, Missouri 63166							
CHEMICAL NAME AND SYNONYMS Mixture		TRADE NAME AND SYNONYMS Inerteon 54201 KI					
CHEMICAL FAMILY Chlorinated Aromatic		FORMULA mixture					
SECTION II HAZARDOUS INGREDIENTS							
PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)		
PIGMENTS			BASE METAL				
CATALYST			ALLOYS				
VEHICLE			METALLIC COATINGS				
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX				
ADDITIVES			OTHERS				
OTHERS							
HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES				%	TLV (Units)		
SECTION III PHYSICAL DATA							
BOILING POINT (°F.)		760 mm	200-350°C		SPECIFIC GRAVITY (H ₂ O = 1) (25/15.5°C)	1.333	
VAPOR PRESSURE (mm Hg.)		Ndt Avail		PERCENT VOLATILE BY VOLUME (%)		N.A.	
VAPOR DENSITY (AIR = 1)		Ndt Avail		EVAPORATION RATE (BuAa = 1)		<1	
SOLUBILITY IN WATER		29°C negligible					
APPEARANCE AND ODOR		colorless oil aromatic odor					
SECTION IV FIRE AND EXPLOSION HAZARD DATA							
FLASH POINT (ASTM D 93)		None		FLAMMABLE LIMITS		LCI N.A.	UCI N.A.
EXTINGUISHING MEDIA							
SPECIAL FIRE FIGHTING PROCEDURES							
Respiratory protection when fighting fires where exposure to vapors or gases is possible.							
Highly toxic gases (chlorides and chlorine) can be evolved in fires of this product.							

FUR 003309

SECTION V HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE	Not available.
EFFECTS OF OVEREXPOSURE Skin irritation in the form of chloracne, systematic intoxication, leads to nausea, vomiting, loss of weight, edema and secondary pain.	
EMERGENCY AND FIRST AID PROCEDURES Remove contaminated clothing. Wash contacted area. Remove from exposure. Wash with large amounts of water and soap. Refer to physician.	

SECTION VI REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	
INCOMPATIBILITY (Materials to avoid)			
HAZARDOUS DECOMPOSITION PRODUCTS CO, CO ₂ , smoke, soot, chlorides and chlorine.			
HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED Absorb on clay, sawdust or other absorbant material. Place in drums. Bury in approved chemical landfill in accordance with local and state regulations.	
WASTE DISPOSAL METHOD Burn in an approved incinerator in accordance with local and state regulations.	

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type) Bureau of Mines approved respirator for organic vapors		
VENTILATION	LOCAL EXHAUST	Yes - for vapors
	MECHANICAL (General)	
PROTECTIVE GLOVES Rubber		EYE PROTECTION Chemical goggles
OTHER PROTECTIVE EQUIPMENT		

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING Avoid skin and eye contact, avoid inhalation of vapors.	
OTHER PRECAUTIONS	

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FUR 003310

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MATERIAL SAFETY DATA SHEET

SECTION I

MANUFACTURER'S NAME MONSANTO COMPANY		EMERGENCY TELEPHONE NO. (314) 694-1000
ADDRESS, Number, Street, City, State, and ZIP Code 500 North Lindbergh Boulevard, St. Louis, Missouri 63166		
COMMON NAME AND SYNONYMS Mixture		TRADE NAME AND SYNONYMS Puranol A13B3B
FORMULA Chlorinated aromatic		FORMULA Mixture

SECTION II HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					
HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES					TLV (Units)

SECTION III PHYSICAL DATA

BOILING POINT (°F.)	760 mm	210-400°C	SPECIFIC GRAVITY IN H ₂ O (15.5/15.5°C)	1.567
VAPOR PRESSURE (mm Hg.)	Not Avail		PERCENT VOLATILE BY VOLUME (%)	N.A.
VAPOR DENSITY (AIR = 1)	Not Avail		EVAPORATION RATE (P.E.A.C. = 1)	<1
SOLUBILITY IN WATER 20°C	negligible			
APPEARANCE AND ODOR	colorless oil		aromatic odor	

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	None	FLAMMABLE LIMITS	Lower	Upper
EXTINGUISHING MEDIA				
SPECIAL FIRE FIGHTING PROCEDURES Respiratory protection when fighting fires where exposure to vapors or gases is possible.				
HAZARDOUS FIRE AND EXPLOSION PRODUCTS (chlorides and chlorine) can be evolved in fires of this product.				

FUR 003311

HAZARD IDENTIFICATION	Not available.
EFFECTS OF OVEREXPOSURE	Skin irritation in the form of chloracne, systematic intoxication leads to nausea, vomiting, loss of weight, edema and abdominal pain.
PREVENTION AND FIRST AID PROCEDURES	Remove from exposure. Remove contaminated clothing. Wash contacted area with large amounts of water and soap. Refer to physician.

SECTION VI REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	
ACCUMULABILITY (Materials to avoid)			
HAZARDOUS DECOMPOSITION PRODUCTS CO, CO2, smoke, soot, chlorides and chlorine			
HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	

SECTION VII SPILL OR LEAK PROCEDURES

PREVENTION OF RELEASE IN CASE MATERIAL IS RELEASED OR SPILLED	Absorb on clay, sawdust or other absorbent material. Place in drums. Bury in approved chemical landfill in accordance with local and state regulations.
BEST DISPOSAL METHOD	Burn in approved incinerator in accordance with local and state regulations.

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type)			
Bureau of Mines approved respirator for organic vapors.			
VENTILATION	LOCAL EXHAUST	Yes - for vapors.	SPECIAL
	MECHANICAL (General)		OTHER
PROTECTIVE GLOVES		rubber	EYE PROTECTION
			chemical goggles
OTHER PROTECTIVE EQUIPMENT			

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE	
Avoid skin and eye contact, avoid inhalation of vapors.	
OTHER PRECAUTIONS	FUR 003312

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U.S. DEPARTMENT OF LABOR
WORKPLACE STANDARDS ADMINISTRATION
Bureau of Labor Standards

Form No. OSHA-
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MATERIAL SAFETY DATA SHEET

SECTION I

MANUFACTURER'S NAME
MONSANTO COMPANY

EMERGENCY TELEPHONE NO.
(314) 594-1000

ADDRESS (Number, Street, City, State, and ZIP Code)

800 North Lindbergh Boulevard, St. Louis, Missouri 63166

CHEMICAL NAME AND SYNONYMS

Mixture

TRADE NAME AND SYNONYMS

Pyranol A13B3B-2

CHEMICAL FAMILY

Chlorinated aromatic

FORMULA

Mixture

SECTION II HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					
HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES				%	TLV (Units)

SECTION III PHYSICAL DATA

BOILING POINT (°F.)	760 mm	210 - 400°	SPECIFIC GRAVITY (H ₂ O=1)	25/15 C	1.515-1.525
VAPOR PRESSURE (mm Hg.)		Not Avail	PERCENT VOLATILE BY VOLUME (%)		N.A.
VAPOR DENSITY (AIR=1)		Not Avail	EVAPORATION RATE (=1)		<1
SOLUBILITY IN WATER	20°C negligible				
APPEARANCE AND ODOR	Colorless oil		aromatic odor		

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	Burn	None to Boiling	FLAMMABLE LIMITS	Lel	Uel
				N.A.	N.A.
EXTINGUISHING MEDIA	Self				
SPECIAL FIRE FIGHTING PROCEDURES	Respiratory protection when fighting fires where exposure to vapors or gases is possible.				
UNUSUAL FIRE AND EXPLOSION HAZARDS	Highly toxic gases (hydrogen chloride) can be evolved.				

FUR 003313

SECTION V HEALTH HAZARD DATA	
THRESHOLD LIMIT VALUE	Not available
EFFECTS OF OVEREXPOSURE	Skin irritation in the form of chloracne, systematic intoxication leads to nausea, vomiting, loss of weight, edema and abdominal pain.
EMERGENCY AND FIRST AID PROCEDURES	
Remove from exposure. Remove contaminated clothing. Wash contacted area with large amounts of water and soap.	
Refer to physician.	

SECTION VI REACTIVITY DATA			
STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	
INCOMPATIBILITY (Materials to avoid)			
HAZARDOUS DECOMPOSITION PRODUCTS			
CO, CO ₂ , smoke, soot, hydrogen chloride			
HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	

SECTION VII SPILL OR LEAK PROCEDURES	
STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED	
Absorb on clay, sawdust or other absorbant material. Place in drums. Bury in approved chemical landfill in accordance with local and state regulations.	
WASTE DISPOSAL METHOD	
Burn in approved incinerator in accordance with local and state regulations.	

SECTION VIII SPECIAL PROTECTION INFORMATION			
RESPIRATORY PROTECTION (Specify type)			
Bureau of Mines approved respirator for organic vapors.			
VENTILATION	LOCAL EXHAUST	SPECIAL	
	MECHANICAL (General)	OTHER	
PROTECTIVE GLOVES	rubber	EYE PROTECTION	chemical goggles
OTHER PROTECTIVE EQUIPMENT			

SECTION IX SPECIAL PRECAUTIONS	
PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING	
Avoid skin and eye contact, avoid inhalation of vapors.	
OTHER PRECAUTIONS	

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HAZARDOUS MATERIAL SAFETY DATA SHEET

SECTION I					
MANUFACTURER'S NAME MONSANTO COMPANY			EMERGENCY TELEPHONE NO. (314) 694-1000		
ADDRESS (Number, Street, City, State, and Zip Code) 800 North Lindbergh Boulevard, St. Louis, Missouri 63166					
CHEMICAL NAME AND SYNONYMS Chlorinated aromatic			TRADE NAME AND SYNONYMS Thermalol FR low temp.		
CHEMICAL FAMILY Chlorinated aromatic			FORMULA Mixture		
SECTION II HAZARDOUS INGREDIENTS					
PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					
HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES				%	TLV (Units)
SECTION III PHYSICAL DATA					
BOILING POINT (°F.)	760 mm	210-360°C	SPECIFIC GRAVITY (H ₂ O = 1) (25/15.5°C)	1.440	
VAPOR PRESSURE (mm Hg.)	Not Avail		PERCENT VOLATILE BY VOLUME (%)	N.A.	
VAPOR DENSITY (AIR = 1)	Not Avail		EVAPORATION RATE (BuAc = 1)	<1	
SOLUBILITY IN WATER	20°C negligible	<0.01%			
APPEARANCE AND ODOR	colorless liquid		aromatic odor		
SECTION IV FIRE AND EXPLOSION HAZARD DATA					
FLASH POINT (Method used)	None		FLAMMABLE LIMITS	Lel	Uel
			N.A. N.A.		
EXTINGUISHING MEDIA N.A.					
SPECIAL FIRE FIGHTING PROCEDURES					
Respiratory protection when fighting fires where exposure to vapors or gases is possible.					
UNUSUAL FIRE AND EXPLOSION HAZARDS					
Highly toxic gases (chlorides and chlorine) can be evolved in fires of this product.					

FUR 003315

FR -- LowTemp. SECTION V HEALTH HAZARD DATA

Not Available.

EFFECTS OF OVEREXPOSURE
Skin irritation in the form of chloracne, systematic intoxication leads to nausea, vomiting, loss of weight, edema and abdominal pain.

EMERGENCY AND FIRST AID PROCEDURES
REMOVAL FROM EXPOSURE. Remove contaminated clothing. Wash contacted area with large amounts of water and soap. Refer to physician.

SECTION VI REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	

INCOMPATIBILITY (Materials to avoid)

HAZARDOUS DECOMPOSITION PRODUCTS CO, CO₂, smoke, soot, chlorides and chlorine

HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Absorb on clay, sawdust or other absorbant material. Place in drums. Bury in approved chemical landfill in accordance with local and state regulations.

WASTE DISPOSAL METHOD

Bury in an approved incinerator in accordance with local and state regulations.

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type) Bureau of Mines approved respirator for organic vapors.

VENTILATION	LOCAL EXHAUST	Yes - for vapors	SPECIAL	vapors.
	MECHANICAL (General)		OTHER	

PROTECTIVE GLOVES rubber EYE PROTECTION chemical goggles

OTHER PROTECTIVE EQUIPMENT

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING

Avoid skin and eye contact. Avoid inhalation of vapors.

OTHER PRECAUTIONS

While the information and recommendations set forth herein are believed to be accurate as of the date hereof, MONSANTO COMPANY MAKES NO WARRANTY WITH RESPECT THERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON.

JAG:BOH:JTG:WBP

FUR 003316

1/26/72

MATERIAL SAFETY DATA SHEET

SECTION I					
MANUFACTURER'S NAME MONSANTO COMPANY				EMERGENCY TELEPHONE NO. (314) 694-1000	
ADDRESS (Number, Street, City, State, and ZIP Code) 800 North Lindbergh Boulevard, St. Louis, Missouri 63166					
CHEMICAL NAME AND SYNONYMS Mixture				TRADE NAME AND SYNONYMS Therminol FR-0	
CHEMICAL FAMILY Chlorinated Aromatic				FORMULA Mixture	
SECTION II HAZARDOUS INGREDIENTS					
PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES & OTHERS			OTHERS		
HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES				%	TLV (Units)
SECTION III PHYSICAL DATA					
BOILING POINT (°F.)	760 mm	520-615	SPECIFIC GRAVITY (H ₂ O=1)	(25/15.5°C)	1.170
VAPOR PRESSURE (mm Hg.)	at 200°F	1.35	PERCENT VOLATILE BY VOLUME (%)		N.A.
VAPOR DENSITY (AIR=1)		Not Avail	EVAPORATION RATE (Bulb)		<1
SOLUBILITY IN WATER	at 20°C	negligible			
APPEARANCE AND ODOR	colorless oil		aromatic odor		
SECTION IV FIRE AND EXPLOSION HAZARD DATA					
FLASH POINT (Method used)	None		FLAMMABLE LIMITS	Lo	Hi
EXTINGUISHING MEDIA	N.A.				
SPECIAL FIRE FIGHTING PROCEDURES Respiratory protection when fighting fires where exposure to vapors or gases is possible.					
UNUSUAL FIRE AND EXPLOSION HAZARDS Highly toxic gases (chlorides & chlorine) can be evolved in fires of this product.					

FUR 003317

THRESHOLD LIMIT VALUE	Not available.
EFFECTS OF OVEREXPOSURE Skin irritation in the form of chloracne, systematic intoxication leads to nausea, vomiting, loss of weight, edema and abdominal pain	
EMERGENCY AND FIRST AID PROCEDURES Remove from exposure. Remove contaminated clothing. Wash contacted area with large amounts of water and soap. Refer to physician.	

SECTION VI REACTIVITY DATA

STABILITY	UNSTABLE	X	CONDITIONS TO AVOID
	STABLE		

INCOMPATIBILITY (Materials to avoid)

HAZARDOUS DECOMPOSITION PRODUCTS
CO, CO₂, smoke, soot, chlorides and chlorine.

HAZARDOUS POLYMERIZATION	MAY OCCUR	X	CONDITIONS TO AVOID
	WILL NOT OCCUR		

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Absorb on clay, sawdust or other absorbant material. Place in drums. Bury in approved chemical landfill in accordance with local and state regulations.

WASTE DISPOSAL METHOD
Burn in an approved incinerator in accordance with local and state regulations.

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify)
Bureau of Mines approved respirator for organic vapors.

VENTILATION	LOCAL EXHAUST	Yes - for vapors	SPECIAL
	MECHANICAL (General)		OTHER

PROTECTIVE GLOVES rubber EYE PROTECTION chemical goggles

OTHER PROTECTIVE EQUIPMENT

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING

Avoid skin and eye contact.
Avoid inhalation of vapors

OTHER PRECAUTIONS

While the information and recommendations set forth herein are believed to be accurate as of the date hereof, MONSANTO COMPANY MAKES NO WARRANTY WITH RESPECT THERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON.

JAG:HON:JTG:WBP

FUR 003318

1/24/72

NOTE:

NO REPRESENTATION IS MADE AS TO THE ACCURACY OF THE INFORMATION AND RECOMMENDATIONS HEREIN. SEE PAGE 4 FOR CONDITIONS UNDER WHICH DATA ARE FURNISHED.

MONSANTO PRODUCT NAME

POLYCHLORINATED BIPHENYLS—PCB's*

*See page 4 for definition and notes

MONSANTO COMPANY
800 N. LINDBERGH BLVD.
ST. LOUIS, MO. 63166
EMERGENCY PHONE NO.
(CALL COLLECT)
(314) 694-1000

PRODUCT IDENTIFICATION

Synonyms

PCB's
Chlorodiphenyl (___% Cl)
Chlorinated biphenyl
Polychlorinated biphenyl
Chlorinated biphenyls
(approx. ___% Cl)

Trade Names (Commonly used Monsanto products)

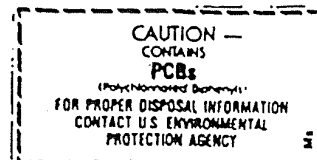
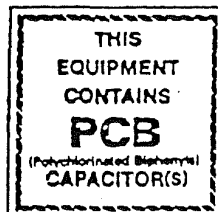
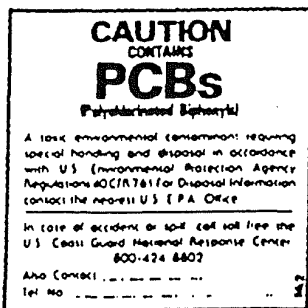
Askarel**
Aroclor®¹ Series 1016, 1221, 1232, 1242, 1248, 1254, 1260
Pyranol®² Series
Inerteen®³ Series
Therminol®¹ FR Series

*See page 4 for notes

CAS No. 001336363, 053469219, 021672296, 01109769, 011096825 and others

WARNING STATEMENTS

Federal regulations under the Toxic Substances Control Act require PCB's and PCB items to be marked. (Check regulations for details.)*



EMERGENCY AND FIRST AID PROCEDURES

Ingestion—Consult a physician. Do not induce vomiting or give any oily laxatives.

NOTE TO PHYSICIAN—If large amounts ingested, gastric lavage is suggested.

Skin—If liquid or solid PCB's are splashed or spilled on skin, contaminated clothing should be removed and the skin washed thoroughly with soap and water.

NOTE TO PHYSICIAN—Hot PCB's may cause thermal burns.

Eyes—Eyes should be irrigated immediately with copious quantities of running water for at least 15 minutes if liquid or solid PCB's get into them. A petrolatum-based ophthalmic ointment may be applied to the eye to relieve the irritating effects of PCB's.

Inhalation—Remove to fresh air. If skin rash or respiratory irritation persists, consult a physician. **NOTE TO PHYSICIAN**—If electrical equipment arcs over, PCB's or other chlorinated hydrocarbon dielectric fluids may decompose to produce HCl, hydrochloric acid, a respiratory irritant.

FUR 003319

G 4048

OCCUPATIONAL CONTROL PROCEDURES

Inhalation—Workplace exposure should be maintained below the OSHA eight-hour, time-weighted average Threshold Limit Value (TLV). At room temperatures, the hazard of inhalation is considered slight or absent. Chemical cartridge respirators or gas masks approved for protection against organic vapors are recommended in the event of spills or leaks of hot fluids. These will provide good protection up to the concentrations shown on the approval labels and the odor will give ample warning if it comes through the device. Self-contained breathing apparatus should be worn when PCB's are encountered in an enclosed space.

Threshold Limit Value (TLV)—Chlorodiphenyl (42% chlorine) 1.0 mg/cu.m.
Chlorodiphenyl (54% chlorine) 0.5 mg/cu.m.

Skin Contact—Avoid prolonged or repeated skin contact. Where employees may come into direct contact with PCB's, protective clothing impervious to PCB's should be worn. Gloves, boots, overshoes and bib-type aprons that cover the boot tops should be used when necessary. This protective equipment should be regularly inspected for defects and to ensure that it is in clean and satisfactory working condition. Contaminated clothing, gloves, etc., should be disposed of as prescribed by regulations.

Eye Contact—Eye protection should be used where there is a possibility of liquid splashes.

Ingestion—Ingestion of these materials is generally not a problem in industry.

PHYSIOLOGICAL EFFECTS SUMMARY:

Skin Contact—Can be absorbed through intact skin. Local action on skin is similar to that of common organic solvents where contact leads to removal of natural fats and oils with subsequent drying and cracking of the skin. A potential exists for the contracting of chloracne.

Eye Contact—The liquid products and their vapors are moderately irritating to eye tissues.

Ingestion—The acute oral toxicities of the undiluted compounds are: LD₅₀ rats—8.65 gm/kg for 42% chlorinated, and 11.9 gm/kg for 54% chlorinated—"slightly toxic."

Inhalation—Animal experiments of varying duration and at different air concentrations show that for similar exposure conditions, the 54% chlorinated material produces more liver injury than the 42% chlorinated material.

Other—There are literature reports that PCB's can impair reproduction function in monkeys. A study reported in the literature with female rats using Aroclor® 1260 stated that Aroclor 1260 caused liver cancers. Monsanto sponsored animal feeding studies of Aroclor 1242, 1254 and 1260. These compounds, fed to both sexes of rats, did not produce cancers. The National Cancer Institute performed a study in 1977 using Aroclor 1254 with both sexes of rats. NCI stated that the PCB, Aroclor 1254 was not carcinogenic under the conditions of their bioassay.

The consistent finding in animal studies with PCB's is that they produce liver injury following prolonged and repeated exposure by any route, if the exposure is of sufficient degree and duration. Liver injury is produced first, and by exposures that are less than that alleged to cause cancer in rodents. Therefore, exposure by all routes should be kept sufficiently low to prevent liver injury.

FIRE PROTECTION INFORMATION

Fire and Explosion—Chlorodiphenyls are essentially non-combustible compounds. They may decompose to form CO, CO₂, HCl, phenolics and aldehydes under severe conditions such as exposure to flame or hot surfaces. No phosgene is formed.

FUR 003320

Standard fire fighting wearing apparel and self-contained breathing apparatus should be worn when fighting fires that involve possible exposure to chlorodiphenyls. Fire fighting equipment must be thoroughly cleaned and decontaminated after use.

PHYSICAL DATA

TABLE I—Properties of Selected Aroclors®

Property	1016	1221	1232	1242	1248	1254	1260
Color (APHA)	—	100	100	100	100	100	150
Physical state	mobile oil	mobile oil	mobile oil	mobile oil	mobile oil	viscous liquid	sticky resin
Stability	inert	inert	inert	inert	inert	inert	inert
Density (lb/gal 25°C)	11.40	9.85	10.55	11.50	12.04	12.82	13.50
Specific gravity x-25°	1.36-1.37	1.18-1.19	1.27-1.28	1.30-1.39	1.40-1.41	1.49-1.50	1.55-1.56
Distillation range (°C)	323-356	275-320	290-325	325-366	340-375	365-390	385-420
Acidity mg KOH/g, maximum	—	.014	.014	.015	.010	.010	.014
Fire point (°C)	none to boiling point	176	238	none to boiling point	none to boiling point	none to boiling point	none to boiling point
Viscosity (100°F)	71-81	38-41	44-51	82-92	185-240	1400-2500	—

REACTIVITY DATA

PCB's are very stable, fire-resistant compounds.

SPILL, LEAK & DISPOSAL INFORMATION

If PCB's leak or are spilled, the following steps should be taken immediately:

All non-essential personnel should leave the leak or spill area.

The area should be adequately ventilated to prevent the accumulation of vapors.

The spill/leak should be contained. Loss to sewer systems, navigable waterways and streams should be prevented. Spills/leaks should be removed promptly by means of absorptive material, such as sawdust, vermiculite, dry sand, clay, dirt or other similar materials, or trapped and removed by pumping or other suitable means (traps, drip-pans, trays, etc.).

Personnel entering the spill or leak area should be furnished with appropriate personal protective equipment and clothing as needed.

Personnel trained in the emergency procedures and protected against the attendant hazards should shut off sources of PCB's, clean up spills, control and repair leaks and fight fires in PCB areas.

All wastes and residues containing PCB's (e.g., wiping cloths, absorbent material, used disposable protective gloves, clothing, etc.) should be collected, placed in proper containers, marked and disposed of in the manner prescribed by EPA regulations (40 CFR 761).

Various federal and state regulations may require reporting of PCB spills. Consult your attorney or appropriate regulatory officials for information relating to spill reporting.

FUR 003321

NOTE:

ALTHOUGH THE INFORMATION AND RECOMMENDATIONS SET FORTH IN THIS SHEET ARE BELIEVED TO BE CORRECT AS OF THE DATE HEREOF, MONSANTO COMPANY MAKES NO REPRESENTATION AS TO THE COMPLETENESS OR ACCURACY OF SUCH INFORMATION AND RECOMMENDATIONS. MONSANTO COMPANY SHALL IN NO EVENT BE RESPONSIBLE FOR ANY DAMAGES OF WHATSOEVER NATURE DIRECTLY OR INDIRECTLY RESULTING FROM THE PUBLICATION OR USE OF OR RELIANCE UPON SUCH INFORMATION AND RECOMMENDATIONS.

NO WARRANTY, EITHER EXPRESS OR IMPLIED, OR MERCHANTABILITY OR FITNESS OR OF ANY OTHER NATURE WITH RESPECT TO THE PRODUCT OR TO THE INFORMATION AND RECOMMENDATIONS HEREIN IS MADE HEREUNDER.

This form has been approved by the Occupational Safety and Health Administration as "equivalent to" OSHA Form 20.

*POLYCHLORINATED BIPHENYLS

For regulatory purposes, under the Toxic Substances Control Act the term "PCB's" refers to a chemical substance limited to the biphenyl molecule that has been chlorinated to varying degrees or any combination of substances which contain 50 ppm (on a dry weight basis) or greater of such substance (40 CFR 761).

Chemically, however, PCB's are defined as a series of technical mixtures, consisting of many isomers and compounds that vary from mobile oily liquids to white crystalline solids and hard non-crystalline resins. Technical products vary in composition, in the degree of chlorination and possibly according to batch.

The mixture generally used contains an average of 3 atoms chlorine per molecule (42% chlorine) to 5 atoms of chlorine per molecule (54% chlorine). They are used as dielectric fluids in transformers and capacitors. Prior to 1972, PCB applications included heat transfer media, hydraulic and other industrial fluids, plasticizers, carbonless paper, paints, inks and adhesives. "Federal regulations now specify that non-totally enclosed PCB activities are permitted only if specifically exempted or authorized." (40 CFR 761 see FEDERAL REGISTER, Vol. 44, P. 31514, May, 31, 1979)

CAS No. 001336363: For general class of compounds

TRADE NAMES

**ASKAREL—Generic name for a broad class of fire-resistant synthetic chlorinated hydrocarbons used as dielectric fluids.

- ¹ Registered trademark of Monsanto Company
- ² Registered trademark of General Electric Company
- ³ Registered trademark of Westinghouse Electric Corporation

This list of trade names is representative of several commonly used Monsanto products (or formulated with Monsanto products). Many other trademarked products were marketed by Monsanto and other chemical manufacturers. PCB's were also manufactured and sold by several European and Japanese producers. Contact the manufacturer of the trademarked product directly, if not in this listing, to determine if the formulation contained PCB's.

DATE September 15, 1980

REVISED

X

SUPERCEDES All prior to 9/15/80

FOR ADDITIONAL NON-EMERGENCY INFORMATION, CONTACT:

John H. Craddock, Manager,
Product & Environmental Safety
Monsanto Industrial Chem. Co.
800 North Lindbergh Boulevard
St. Louis, Missouri 63166
(314) 694-4764

80-010

FUR 003322

MONSANTO'S PCB PROGRAM

W. B. PAPAGEORGE

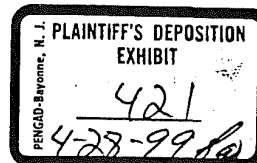
Presented at ANSI Committee C-107
Meeting - September 14, 1971

I appreciate the opportunity to share Monsanto's PCB experience with you and I hope the information I have can help this committee plan and achieve its objectives.

We at Monsanto first heard of PCB's as potential environmental contaminants in early 1967 when we received copies of a talk given in Sweden by Professors Widmark and Jensen of the University of Stockholm. In their paper they described how they were able to identify a material which had been interfering with pesticide analyses as being polychlorinated biphenyls.

Our laboratories began work on the development of analytical methodology to confirm that PCB's indeed were being found in the environment. During 1968 and 1969 as methodology improved the evidence continued to indicate that the higher chlorinated biphenyls were being identified in the tissues of fish and birds.

During this period Monsanto mounted an extensive program aimed at acquiring more knowledge about PCB's and their effect on the environment. We perfected our analytical methods, we started animal toxicity studies, began biodegradation work and evaluated alternative materials for those applications we felt were contributing substantially to contamination.



FUR 004045

Our animal toxicity work was similar to the type we would have undertaken if we had wished to have FDA approval for food use. Chronic toxicity and reproduction studies were made on leghorn chickens. Two year chronic feeding studies were started on rats and dogs. Three generation reproduction studies were made on rats.

The PCB's used in the tests were Monsanto's Aroclor 1242, Aroclor 1254 and Aroclor 1260. These were selected since they represented the more commonly used PCB mixtures. The animals were fed concentrations of 1 ppm, 10 ppm and 100 ppm in their normal diets. The results to date indicate that at the levels used the rats and dogs showed no effects with Aroclor 1242. At 100 ppm both the rats and dogs exhibited decreased weight gains and enlarged livers. The chickens were affected by Aroclor 1242 at the 10 ppm level. The hatchability of the eggs was significantly reduced.

To summarize what I've said about Monsanto's sponsored animal toxicity work the highly chlorinated polychlorinated biphenyls at 100 ppm in the animal diet does have some effect on mammals.

The lower chlorinated polychlorinated biphenyls at 10 ppm in the diet has some effect on leghorn chickens, and I say specifically leghorn chickens because there is mounting evidence that there are definite species variations as determined by the Pautuxet Laboratories here in Maryland with four types of wild birds.

There is a species variation noted which frustrates many scientists

FUR 004046

I was asked what we know about the effect on marine life. Monsanto did sponsor static fish toxicity work and we were completely frustrated because these PCB's have the tendency to plate out on surfaces. Our information was garbled because in the static testing we were really exposing the fish to PCB environments a lot less than we thought we were. The data was so distorted it was meaningless. In the meantime, we found that there are many competent laboratories looking at fish and the effects on fish that we decided that maybe this is an area that is best left to the experts.

We have been in touch with laboratories such as the Water Quality Laboratory of Duluth, Minnesota. They have conducted studies which indicate there is some effect on some species. There has been some work done in the Columbia, Missouri Bureau of Interior Fish-Pesticide Laboratory which indicates, for example, magnification about 50,000 times. By that I mean that the amount of PCB detected in the fish tissues was 50,000 times that present in the water environment in which this fish was exposed.

There have been reports of fish kills and some very drastic effects attributed to PCB's. I've tried to get evidence that these things have occurred. I have not been able to confirm any reported incident.

We have talked with scientists at the Gulf-Breeze, Florida Commercial Fisheries Laboratory. They have conducted studies

FUR 004047

with crab and shrimp. This is the laboratory that did detect a build-up in crab and also the lethal effect on juvenile shrimp. Very, very low concentrations - 5 ppb in the water - do destroy juvenile shrimp.

There is a growing thought among many of the responsible scientists that this environmental problem is most complex and it is not really any one insult that is the demise of any particular species, but it could be the cumulative effect of all insults a creature is exposed to and usually the last insult is the one that gets blamed. Dr. Tom Duke of Gulf-Breeze is a proponent of this theory and he is conducting studies to substantiate this. It could be the lack or presence of oxygen, the lack or presence of proper nutrients in the environment, the lack or presence of the proper temperature conditions, the exposure to a DDT or a cadmium or a mercury or an arsenic, and along comes a PCB and the fish dies. PCB might get blamed. This is the kind of thing that does happen in the environment.

There is a growing concern that we should be considering to a greater degree chronic effects of all these materials rather than relying on the old acute studies that used to serve as a screening for many, many chemicals. I have sketchy data on marine life. We know that it does build up in the marine environment and there is, of course, the published evidence that it does affect the fish eating birds.

FUR 004048

There is some indication in the Duluth studies that reproduction and survival of the frye is affected. There seems to be minimal affect on adult fish.

It was suggested earlier that I might want to review the manufacture of PCB's, the many applications in which it was used and what our present program is. To the best of my information, it was 1929 that these materials were introduced as very attractive fluids for use in transformers, and there are many in this audience that are more familiar with this development than I am. PCB's were used in transformers as an insulating cooling fluid because they are more resistant to breakdown, less apt to explode and burst into flames and cause property damage and human injury.

Through the years, additional uses were found for these materials because of these properties that I mentioned earlier. They gradually at first, and of course with increasing amounts, ended up in applications that Monsanto through its in-house usage referred to as plasticizer usages. That is not a very good description, but it fit our needs for many years, and you'll find us using that expression. These are uses such as in paint formulations, the specialty ink uses, the plasticizer in sealants, adhesives, and paper coatings of all sorts.

There was a use that was a real thorn in our side and you'll see at least some of the earlier articles on PCB's referring to pesticide use. There were some studies conducted by the Department of Agriculture in which PCB's were used to extend the effect of

FUR 004049

life of pesticides such as lindane. It was never intended for broadcasting as we visualize DDT was on food crops, cotton crops, or orchards. The only widespread use that I could find was a limited trial to help prevent or curtail the dutch elm disease, and that proved to be a failure. The other uses were extremely small in private formulations that were used to spray or coat hard surfaces - shelving, corners of floors and all for the typical crawling type insects such as the roach and silverfish. In fact it was so small that Monsanto did not market directly to pesticide formulators; we gave this business to our distributors. On the other hand, this use did cause considerable emotion and was used by some to explain the presence of PCB's in remote areas. We wrote to the Department of Agriculture suggesting that during 1970 when pesticides were being re-registered that PCB's not be approved. Finally in October they did put out a notice to that effect.

We have had questions raised, "Is it in my shower curtains at home? Is it in the draperies? In the Carpeting?" The answers to those is "not very likely". And I use those words because we really don't know. If it was put into these applications, it was so small we, Monsanto, were not aware of it. It was not used in automobile tires; it was not used in brake linings.

Other major uses include the use in hydraulic fluids which are fire resistant. Monsanto marketed these fluids under its trademark Pydraul. I am sure some of you remember the Livonia,

FUR 004050

Michigan fire? This was a disastrous fire in terms of property damage and was really a high mark in terms of convincing industry that there was a need for fire resistant hydraulic fluids. But the application is not the type that is maintained to a degree where everything is leakproof. Many of these connections leak, hoses burst, and the tendency is to keep producing by adding more fluid. So it is conceivable that many of these hydraulic fluids ended up in the sewer. I do not intend to criticize the customers of our products. From the knowledge that we had at that time of the material the practice was considered acceptable.

Another fairly widespread application of PCB's is the use of these fluids as a heat transfer media to achieve high temperatures, have a fire resistant transfer fluid, and avoid the installation of high pressure equipment. These materials were ideally suited for this application. We thought at one time that these were adaptable to close control and proper maintenance where we could logically call them closed systems. Some recent evidence indicated that we were wrong and I'll get into that when I discuss our present applications.

One application that was a fairly significant one and one that in our thinking is associated with coatings is the use in carbonless reproduction paper. With the emphasis on recycling paper, wastes and with the persistence of PCB's there is a problem developing in that PCB's are being found in many paper products and many of these paper products end up in food packaging.

FUR 004051

Initially the evidence we were getting seemed to point to the higher chlorinated materials as environmental pollutants. As soon as we were aware of this, we sent a letter to all of our customers telling them that what little we knew indicated that these materials could be an environmental problem, and care should be exercised in handling. When the results came in on our chicken toxicity studies they indicated that the lower chlorinated materials might be a problem regarding birds. We decided, as a company, that we better place some restrictions on these materials because there were to us some uses that deserved to be kept in spite of the problems that we saw facing us.

We decided that we've got to get out of those applications where we felt there was no earthly chance or it was beyond our ability to control the introduction into the environment, so we got out of all the so-called plasticizer applications. August 30, 1970 was the targeted effective date.

We then went into a very active program of reformulating the hydraulic fluids. There again, it required a lot of testing.

We had to run these new materials through the Underwriters Laboratories for approval on fire resistance. They had to be compatible with the machinery then in use. This is not easily done, but it was done.

We decided that we could and must continue to supply the transformer manufacturer, the capacitor manufacturer, and at that

FUR 004052

time closed heat transfer systems based primarily on our concept that fire resistance was important in heat transfer.

To pick up the point that was raised earlier about foreign imports, we are to the best of our ability trying to monitor imports. To this day, we have no information that any have arrived in this country. On the other hand, we are getting some reports that some of our former customers have made inquiries of the foreign producers. I am also told by some Canadian provincial agency people that they had heard and were going to further investigate that PCB's were entering Canada and from there moved into the United States. I have talked to representatives of the Japanese producer, the Kanegafuchi Company, and I am led to believe that they are most reluctant to enter this business. On the other hand, the Japanese producers are the producers that are being accused of entering the U.S. market. I have talked to representatives of the French companies. They assure me that they don't want any part of this business.

In May, 1970 Congressman William Fitz Ryan introduced a proposed bill which would in essence place into law the very things that Monsanto had proposed doing on a voluntary basis. The bill provided that PCB's be banned except for those situations where the Secretary of HEW would give special permission or license.

We went through the latter part of '70 and early part of this year feeling, however, that we were still walking on thin ice.

FUR 004053

But we thought that we had made some tremendous strides in the right direction to preserve those uses which we thought were essential while eliminating those uses which were grossly contaminating the environment. This summer our hopes of control in the heat transfer business vanished when we found that a user of PCB did not appreciate the problem, did not maintain his equipment and created the recent chicken, egg, fishmeal problem.

Because of this incident, Congressman Ryan withdrew the first bill that was submitted and has now placed before the same committee a bill which totally bans PCB and does not provide for any use whatever. And there are, of course, penalties for the marketing, manufacture, or use of PCB in this country. A very drastic measure which does cause or can cause a lot of concern among those of us who feel that PCB has a place in our society under proper conditions.

As a result of this incident, we were forced to re-evaluate our position. We decided that, although heat transfer systems could be closed units, we are still at the mercy of the attitude of the operator of the equipment and we continuously faced the situation where even a pinhole leak can create tremendous problems before it can be discovered. So we have taken, again, an arbitrary position and informed all of our customers in the food (whether it's animal or human food), packaging business, and the pharmaceutical business, that we will no longer supply them heat transfer fluids which contain PCB's.

FUR 004054

In addition, we will no longer market to any new heat transfer applications. Our efforts will be concentrated on reducing those that we market today. This business should decrease as time goes on.

To get back to legislation ... as many of you probably know, there is before Senator Phillip Hart's committee a bill referred to as the Toxic Substances Act of 1971. The purpose of this bill is to prevent the introduction into our society of hazardous materials. It also provides for the review of materials now in our society and the curtailment of the use of the more hazardous ones. Initial hearings were held in August, to which a select few individuals were invited to testify. PCB was brought out as an example of a material introduced into society and thought at one time to be most valuable, but is now considered a serious threat to all of us.

The meetings will be resumed in October; I do not know the exact date as yet, and I'm led to believe that this would be the opportunity for industry to speak up in its behalf. I am assuming that since PCB's were brought up as an example of the type of substance this bill is supposed to prevent that Monsanto as sole producer in this country will be either invited or we may choose to ask to be invited (we don't know at this point just what is the proper approach here) to speak on the merits of retaining PCB's in transformers, capacitors and fire resistant heat transfer systems, non-food applications.

FUR 004055

I mention this bill because it is our opinion, and we could be wrong, that rather than act on Congressman Ryan's bill, which is specific toward PCB's, we suspect that the Toxic Substances Act will have in it provisions which will refer to such materials as PCB's.

We feel we have good technical data to justify our staying in the business for limited applications. But we cannot overlook the emotions that have set in. And believe me there are many and they are deep. It is difficult to combat emotions, as you know, and the references in the popular press to hazardous poisons and birth defects, which have not been substantiated, are most difficult to overcome. Although we talk about persistent versions of PCB and degradable versions of PCB I suspect, and this is a personal opinion, that there would be many who just discount this kind of information. This is a very real problem; in my opinion it is a difficult problem.

As a little more background let me describe what I understood from a meeting we held last week with representatives of the Food and Drug Administration. It is my personal opinion that the Food and Drug people are as conscientious as can be in trying to cope with the PCB problem. They are objective people trying to work with a minimum of data. I suspect they are as frustrated as any group of people can be as to what is the right way to go. There are tremendous pressures on the Food and Drug people today as well as the Department of Agriculture brought about by critics.

FUR 004056

These agencies are trying to objectively cope with the problem and at the same time trying to somehow live with these pressures that are being applied.

The FDA people really don't at this point in time have much information that will lead them to a regulation as to how much PCB should be tolerated in food. They have established some guidelines based on what little information they have from their own laboratories and the information that Monsanto has shared with them. The FDA will permit fish at 5 ppm on the marketplace; milk at .2 ppm or less; eggs .5 ppm; poultry (they have a double standard) 5 ppm in the fatty tissue and 5 ppm in the muscle tissue.

Another problem that is disturbing to the FDA, is the recycle paper problem. The cereal boxes, the cracker boxes, all of these boxes that are made from what is known as chipboard, are made from recycle paper. Fairly high levels of PCB's are being found in this recycle board. It probably comes from about three or four different sources. It may come from some ink application in the past, some adhesive application, some coating application, as well as the carbonless reproduction paper application. There have been some pilot studies made by the American Paper Institute to isolate the carbonless reproduction paper from the recycle batch. They still found PCB's in that batch. They are probably looking at maybe the second or third generation of recycle. And with the emphasis on recycle, I cannot see any way out of this dilemma except that there will be more and more PCB's in these cartons.

FUR 004057

A thought we must all keep in mind, too, is that we've got to live with the PCB's we introduced into the environment for the past 40 years. They have not disappeared overnight; they will not disappear overnight. We do not have any tests that tell us how long it will take. We can only make an educated guess and we might say they will be out there for another generation, 25 to 30 years yet. Hopefully, it will be a decreasing amount as time goes on.

Monsanto has conducted biodegradation tests on its products.

We have three programs that are now active. One program we are conducting in our laboratories in Ruabon, Wales in which we are making what I would refer to as scientifically basic studies in terms of which isomers are most degradable and with what type of microbe. This is a little bit on the impractical side at this point in time. We have as a consultant, Professor Charles Evans of Bangor University in South Wales, who is a noted authority worldwide in this kind of activity. He has isolated at least three microbes that seem to thrive on polychlorinated biphenyls. These microbes he developed from soil that he obtained from his garden. What this tells us is that there are microbes out there in the environment that will eventually destroy these materials.

In the St. Louis area, we have two types of tests going. One is the use of river water with its normal biota in it, in which we introduced these polychlorinated biphenyls and look for the disappearance rate. It is a very quick and rather unsophisticated type of study. The other type of test is the one that simulates

FUR 004058

those conditions which are apt to be found in a normal municipal sewage treatment plant. It's an aerobic test using an activated sludge from a St. Louis waste treatment plant. As a standard, we use a soft detergent because it is well known to other laboratories. What we are doing, really is using our expertise that we established back in the days when the hard versus soft detergent controversy was quite common. And we are using these soft detergents that do degrade as our controls and comparing the PCB's to these controls. The studies so far show that there are isomers within each of these mixtures that do degrade. The lower the chlorine level, the faster they disappear, the higher the chlorine level the more resistant they are. Which only confirms what many of us had suspected. We were not too surprised by this data.

I will attempt to summarize ... I think we can conclude that PCB's are in the environment. There is no question about it.

Many of these PCB's are manmade and were introduced to the environment because of our lack of understanding of what these materials can do to the environment. In this country Monsanto, as sole producer, has attempted to improve the situation by limiting the applications to which these materials are used. Studies today would indicate that these PCB's are not and cannot be classified as highly toxic. There is still a lot of information that is needed to help us determine the long term effect on human beings. We feel that the properties of these materials make them, at least as of today, the most suitable material for use in transformers, capacitors and heat transfer systems. We also believe that under proper conditions we can control the amount of these

FUR 004059

that do enter the environment to the point where the adverse effects are not great and that the benefits we derive far outweigh the minor adverse effects that we might notice. Now there are many of us in the transformer and capacitor application that have made tremendous strides in controlling these materials. I suspect our objective is to further improve our ability to control this material. In my personal opinion the emotion that is now prevailing regarding PCB's is something that we must contend with. Whether we believe in it or not, there are many people that sincerely believe PCB's should be totally banned.

FUR 004060

STATUS REPORT

PCB/PCT IMPLEMENTATION PROGRAM

U.S. DOMESTIC PROGRAM

I. Discontinue sales of PCBs for heat transfer applications

The sales of PCB heat transfer fluids in the U.S. were terminated on December 15, 1971 with two exceptions, both covered with hold harmless agreements. We continue to supply Goodyear Tire and Rubber Company under an agreement until August 7, 1972. We supplied fluid to Bendix Corporation under an agreement but sales were terminated prior to June 1972.

Certified by T. L. Gossage

II. Further sale and delivery of PCBs as dielectric fluids for transformers and capacitors will be made in conformance with certain restrictive policies adopted by Monsanto management.

Sales of PCB dielectric fluids in the U.S. were terminated on January 15, 1972 except to approved customers who satisfy Monsanto's special requirements.

Certified by T. L. Gossage

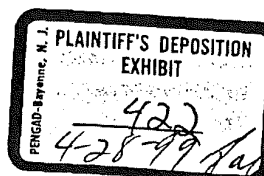
III. Discontinue all sales of PCTs (polychlorinated terphenyls) no later than June 30, 1972. The program calls for 75% of such sales to be terminated by March 31, 1972, with the remainder to be terminated during the second quarter of 1972.

With two exceptions, sales of plasticizers containing PCTs were terminated on March 31, 1972, exclusive of a few customers who had signed hold harmless agreements. The two exceptions occurred in early April. Sales to customers who had signed hold harmless agreements were terminated prior to June 30, 1972.

Certified by W. S. Clark

Sales of PCT industrial fluids were terminated on June 30, 1972.

Certified by T. L. Gossage



FUR 004147

U.S. EXPORT PROGRAM

- I. Discontinue all sales of PCBs for all uses other than as dielectric fluids in transformers and capacitors no later than January 31, 1972. Effective date of discontinuance shall be date of letter giving formal notification.

Sales of PCBs for all uses other than dielectric fluids in transformers and capacitors were terminated by January 31, 1972.

Certified by E. Greene
D. Goodwillie
W. S. Clark

- II. Further sale and delivery of PCBs as dielectric fluids for transformers and capacitors will be made in conformance with the restrictive policies adopted by Monsanto management.

In Canada sales of PCBs to dielectric applications were terminated on January 31, 1972 except to approved customers who satisfy Monsanto's special requirements.

Certified by D. Goodwillie

Remaining export sales of PCB dielectric fluids were terminated on March 31, 1972 except to approved customers who satisfy Monsanto's special requirements.

Certified by E. Greene

- III. Discontinue all sales of PCTs no later than June 30, 1972. The program calls for 75% of such sales to be terminated by March 31, 1972 with the remainder to be terminated during the second quarter of 1972.

All sales of plasticizers containing PCTs were terminated on March 31, 1972 except for those customers who signed special agreements. These were terminated by June 30, 1972.

Certified by W. S. Clark
P. J. Marsh
D. Goodwillie
E. Greene

Sales of industrial fluids containing PCTs were terminated on June 30, 1972.

Certified by D. Goodwillie
P. J. Marsh
E. Greene

FUR 004148

MONSANTO EUROPE PROGRAM

- I. Discontinue all sales of PCBs for other than dielectric uses by January 31, 1972.

Sales of all PCB products other than hydraulic fluids for the German mining industry and dielectric fluids were terminated on January 31, 1972. Program calls for termination of sales to the German mines by November 30, 1972.

Certified by P. J. Marsh

- II. Further sales and delivery of PCBs for dielectric uses for transformers and capacitors will be subject to the same restrictive policies adopted for U.S. domestic and U.S. export sales and the effective date of implementation will be March 31, 1972.

Sales of PCB dielectric fluids were terminated on March 31, 1972 except to approved customers who satisfy Monsanto's special requirements and to Eastern European customers to whom we continue to sell without restrictions.

Certified by P. J. Marsh

MMK PROGRAM

Mitsubishi Monsanto discontinued the exporting of PCBs except for dielectric purposes on January 31, 1972. Manufacture of PCBs was discontinued entirely on March 17, 1972 and all sales were discontinued shortly thereafter.

Certified by E. Greene

FUR 004149

Monsanto

MONSANTO INDUSTRIAL CHEMICALS CO.
800 N. Lindbergh Boulevard
St. Louis, Missouri 63166
Phone: (314) 894-1000

Dear Sir:

We are writing to advise you that Monsanto has adopted certain restrictive policies with respect to its further sale and delivery of all polychlorinated biphenyl (PCB's) products used as dielectric fluids in transformers and capacitors including but not limited to those sold under tradenames such as Aroclor® , Inerteen® , and Pyranol® , and under the generic term askarel.

Effective 15 January 1972 Monsanto will sell and deliver these products only to manufacturers of transformers or capacitors who have entered into agreement to indemnify and hold harmless Monsanto in the use of these products. The two copies of such an agreement are attached. The acceptance by Monsanto of such an agreement is subject to receipt of financial and other information from you (such as evidence of adequate insurance protection) which, in Monsanto's opinion, makes the agreement meaningful.

As we have previously advised you, studies indicate PCB's may be accumulating in the environment. In some instances, PCB's have been found in food or in the food chain. For your information, attached is an article by Carl G. Gustafson of the Federal Water Quality Administration appearing in "Environmental Science & Technology" which deals with this subject. Because of Monsanto's concern over this problem, we are discontinuing sales of PCB's in any applications except as dielectric fluids for use in transformers and capacitors.

FUR 004150

a unit of Monsanto Company

WATER_PCB-SD0000071484

Monsanto

MONSANTO INDUSTRIAL CHEMICALS CO.
800 N. Lindbergh Boulevard
St. Louis, Missouri 63186
Phone: (314) 694-1000

SPECIAL UNDERTAKING BY PURCHASERS OF POLYCHLORINATED BIPHENYLS

Monsanto Company ("Monsanto") manufactures certain polychlorinated biphenyl products ("PCB's") which _____ ("Buyer") desires to purchase. While Buyer desires to purchase PCB's because of certain desirable flame resistant and insulator properties, Buyer acknowledges that it is aware and has been advised by Monsanto that PCB's tend to persist in the environment; that care is required in their handling, possession, use and disposition; that tolerance limits have been or are being established for PCB's in various food products.

Monsanto has therefore adopted certain restrictive policies with respect to its further production, sale and delivery of PCB's, including the receipt of undertakings from its customers as set forth below, and Buyer is willing to agree to such undertakings with respect to sales and/or deliveries of PCB's by Monsanto to Buyer.

Accordingly, Buyer hereby covenants and agrees that, with respect to any and all PCB's sold or delivered by or on behalf of Monsanto to Buyer on or after the date hereof and in consideration of any such sale or delivery, Buyer shall defend, indemnify and hold harmless Monsanto, its present, past and future directors, officers, employees and agents, from and against any and all liabilities, claims, damages, penalties, actions, suits, losses, costs and expenses arising out of or in connection with the receipt, purchase, possession, handling, use, sale or disposition of such PCB's by, through or under Buyer, whether alone or in combination with other substances, including, without implied limitation, any contamination of or adverse effect on humans, marine and wildlife, food, animal feed or the environment by reason of such PCB's.

FUR 004151

a unit of Monsanto Company

All existing contracts for the sale of PCB's by Monsanto to Buyer are hereby amended to contain the provisions set forth above.

Nothing herein shall create or imply any duty or obligation of Monsanto to sell or deliver any PCB's to Buyer. No conditions, understandings or agreements purporting to modify or vary the terms hereof shall be binding unless hereafter made in writing specifically referring to this agreement and signed by the party to be bound and no modification or variance of the above undertaking shall be effected by the acknowledgment or acceptance of any sale document, purchase order, shipping instruction or other forms containing terms or conditions at variance herewith.

_____	_____
(Buyer)	MONSANTO COMPANY
BY: _____	BY: _____
TITLE: _____	
DATE: _____	

FUR 004152

feature

PCB's—prevalent and persistent

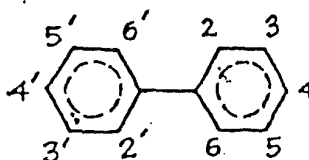
Intensified research is needed to minimize their dangers

Carl G. Gustafson, Federal Water Quality Administration, Athens, Ga.

During the past three years, a special class of compounds, called polychlorinated biphenyls (pcb's), has claimed the attention of ecologists and pesticide analysts in this country. These compounds were not discovered in the environment until 1966 in Sweden and 1967 in the U.S., despite the fact that they have been available commercially for 40 years. Interest in pcb's has arisen because they are frequently found in fish, bird, water, sediment, and other environmental samples when such samples are examined for chlorinated pesticide residues. That a wide variety of samples containing pcb's has been collected from England, Scandinavia, The Netherlands, Antarctica, Central America, and many different parts of the U.S. makes them truly ubiquitous pollutants.

Polychlorobiphenyls are made by substituting chlorine atoms for one or more of the hydrogen atoms at the

numbered positions of the biphenyl structure.



In the process of replacing hydrogen atoms with chlorine atoms, a large number of substitution combinations arise. For example, three monochlorobiphenyl isomers are possible, 12 dichlorobiphenyl isomers, 21 trichlorobiphenyl isomers, and so on. Theoretically, 210 compounds can be prepared by this substitution process; a typical example would be 2,4,6,2',4'-pentachlorobiphenyl.

Whenever aromatic hydrocarbons such as biphenyls are chlorinated, the product is a mixture of compounds, including isomers. It is quite difficult to synthesize single, specific chlorobiphenyl compounds in the laboratory unless involved procedures are employed. Consequently few of the individual compounds have been prepared in the pure form for study.

In the commercial process for pcb manufacture, biphenyl is chlorinated with anhydrous chlorine in tall cylindrical towers with either iron filings or ferric chloride as the catalyst. The by-product is hydrogen chloride; the product is a mixture of several pcb's. The degree of chlorination is determined by measuring the specific gravity of the mixture or, when the product is more viscous, the ball-and-ring softening-point test is used. The whole process takes from 12 to 36 hours.

In the U.S., the sole manufacturer of pcb's is the Monsanto Co., which markets them under the trade name

Aroclor. pcb's are also manufactured in Europe and Japan, under trade names such as Phenochlor and Clophen. The various Aroclors are differentiated by a four-digit number, with the last two digits indicating the percentage of chlorine in the mixture.

Properties

The three most important physical properties of the pcb's are low vapor pressures (they have high boiling points), low water solubility, and high dielectric constants. They are miscible with most organic solvents and compatible with many types of polymers. Although some individual polychlorobiphenyl compounds are crystalline, the Aroclor mixtures are either liquids or resins.

The chemical properties that make pcb's desirable industrial materials are their excellent thermal stability, their strong resistance to both acidic and basic hydrolysis, and their general inertness. They are quite resistant to oxidation. Monsanto reports, in a technical bulletin on pcb's, that they can be heated to 140° C. under 260 p.s.i. of oxygen pressure "without showing any evidence of oxidation as judged by development of acidity or formation of sludge."

The physiological properties of the pcb's make them potentially significant contaminants of the environment. For any pollutant, two factors are involved: acute toxicity, which is immediately evident because of a high death rate or other maiming effect; and chronic toxicity, which is the result of a slow accumulation of the poison in the body and is a sublethal effect. Whenever acute toxicity is high, a pollutant will be readily recognized and appropriate remedial actions will be introduced. If, on the other hand, acute toxicity is low,

The Monsanto Co. stated recently in a letter to Congressman William F. Ryan of New York that as of August 30, it would no longer sell pcb's to customers for use in general plasticizer operations where disposal of the end-products cannot be controlled. After some lag period—the time it takes to eventually dispose of the products made from pcb's and currently in processor's inventories—the quantity of pcb's getting into the environment may be substantially reduced. If Monsanto's former customers look for pcb substitutes, rather than purchasing pcb's from manufacturers in Japan and Europe, the projected decrease could become a reality.

Carl G. Gustafson

the physiological effects will go unnoticed until the chronic effects make themselves evident. When this happens, the problem may have advanced beyond immediate or easy correction.

Acute toxicity

All studies of PCB's in animals indicate that acute toxicity is not a significant factor. Their acute toxicities are on the order of those of other chlorinated aromatic compounds. Monsanto has sponsored two investigations of the acute toxicities of Aroclor mixtures. In the first, at the Kettering Laboratory at the University of Cincinnati, Dr. J. F. Treon and his co-workers investigated the toxicity of Aroclor vapors for guinea pigs, mice, rabbits, and rats. All animals survived a 24-day exposure to 0.83 p.p.m. of Aroclor 1242 for 7 hours per day on 17 of those days. Even after more prolonged tests, there were no severe effects from Aroclor 1242. In the second investigation, still in process, three groups of beagles are fed Aroclor 1242, 1254, and 1260, respectively, at a rate of 100 p.p.m. in their diets. After three months no significant abnormalities have been noted.

Similar studies on fish have been performed in several laboratories. Dr. Richard Schoettger of the Sport Fisheries and Wildlife Fish-Pesticide Research Laboratory in Columbia, Mo., reports that 96 hour- TL_{50} toxicities of the Aroclors to trout range from 1.17 to 60 p.p.m. Compared to DDT, whose 96 hour- TL_{50} toxicity is 0.002 to 0.009 p.p.m. for trout, the PCB's have a relatively low acute toxicity. With the more sensitive bluegill, the 96 hour- TL_{50} for Aroclor 1248 is 0.278 p.p.m., while that of DDT is 0.008 p.p.m. Aroclor toxicities appear to be inversely proportional to the chlorine content of the mixture.

Shellfish, oysters, and shrimp are more sensitive to PCB's. Dr. Tom Duke, at the Bureau of Commercial Fisheries Pesticide Field Station, reports 100% mortality of juvenile pink shrimp exposed to 0.10 p.p.m. of Aroclor 1254 in water for 48 hours. This concentration of Aroclor 1254 will cause a 100% decrease in shell growth of oysters after 96 hours. To achieve the same effects with DDT in these experiments, only 0.0006 p.p.m. and 0.01 p.p.m., respectively, were required.

There is very little evidence that PCB's are toxic to insects. Studies to date show that they are less toxic than

dieldrin or DDT. As with fish, their toxicity appears to be inversely proportional to the chlorine content of the mixture.

Based on the above data, it is understandable why the polychlorobiphenyls, commercially available for 40 years, have only recently attracted attention as toxic environmental contaminants.

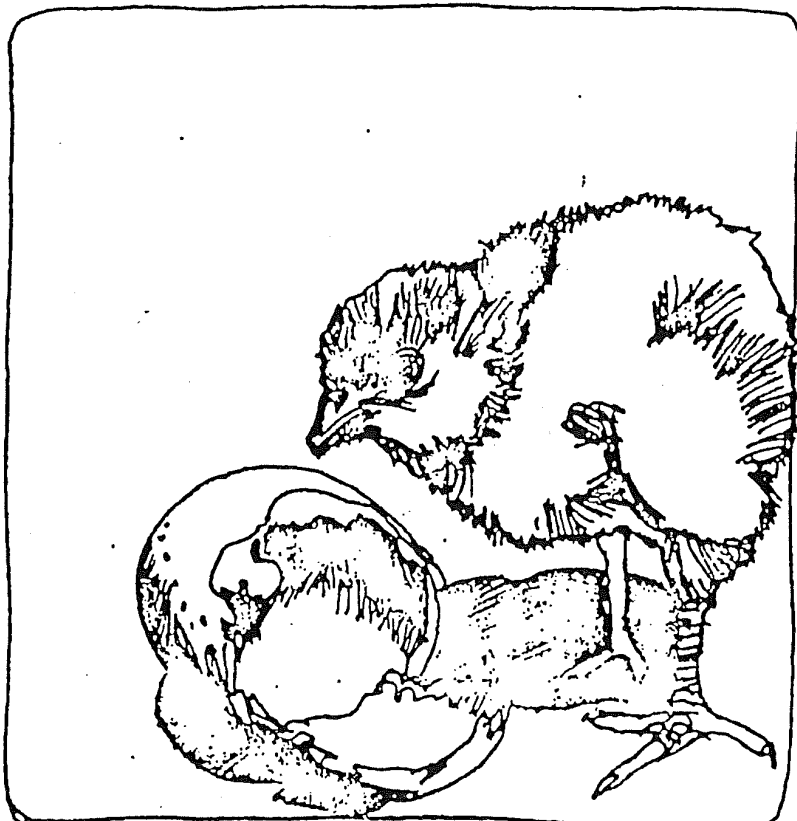
Chronic toxicity

The chronic toxicities of PCB's present a more disturbing situation; several chronic effects have been observed. It was discovered, quite by accident, that PCB's have a toxic effect on chickens. Professor E. L. McCune and his co-workers at the University of Missouri found their chickens dying after they were placed in a feeding house, parts of which had been freshly painted with an epoxy paint. Careful investigation revealed that the toxic factor was Aroclor 1242, a binder in the paint. When Aroclor 1242 was fed to the chicks it produced the same characteristic effects as chick edema factor. McCune reported: "Gross pathology included hydropericardium, hydroperitonium, enlarged heart, liver, and kidneys, and hemorrhage of internal organs. Mi-

croscopically the kidneys showed marked tubular dilation and numerous casts."

Another chronic effect of PCB's is related in wildfowl. The accumulation of high concentrations of chlorinated hydrocarbons in birds resulted in disruption of normal breeding behavior and in the formation of thin-shelled eggs. A dramatic example of this effect has been observed in the case of the brown pelican. On the Anacapa Islands off the California coast, no young were hatched last year from 300 pairs of nesting birds. The shells of most eggs laid were so thin that a dent occurred when the egg was picked up.

There are two possible causes for the laying of thin-shelled eggs by wildfowl. One is a low calcium reserve in the bird; the other is the inability of the bird to deliver the needed calcium to its oviduct, where the eggshell is forming. The calcium level in the avian biosystem and the calcium reserve in the secondary bone structure or medullary bone, found only in female birds when they are breeding, are controlled by the hormone estrogen. A high estrogen level is associated with the formation of this calcium reserve. Chlorinated hydrocarbons, such as DDT,



chlordane, dieldrin, and PCB's, activate enzymes in the liver which transform estrogen into a more water-soluble compound that is readily eliminated from the bird's body. This means that when estrogen levels are low, calcium reserves will also be low, and therefore very little calcium will be available for strong eggshell production. Dieldrin and PCB's are more effective than DDT in this type of enzyme-induction activity. Aroclor 1262 has an estradiol degrading potential four to five times that of *p,p'*-DDE or technical grade DDT.

The ability of the female bird to deliver calcium to her oviduct during the last 20 hours, when the eggshell is being formed, is related to the functioning of the enzyme carbonic anhydrase. When birds that have exhibited the ability to lay normal eggs are injected with a metabolite of DDT (DDE) just prior to the formation of the eggshell, they will lay thin-shelled eggs. This indicates that DDT also inhibits the activity of carbonic anhydrase, the enzyme that controls the flow of calcium from the blood stream of the bird into its oviduct.

Since dieldrin seems to have no effect on carbonic anhydrase, we may assume that neither do the PCB's. However, these compounds delay breeding time significantly. Many ornithologists feel that late breeding has a stronger influence on the reduction of bird populations than does the laying of thin-shelled eggs. If this is true, PCB's are a more potent threat than DDT to our declining bird populations, especially for predatory birds that accumulate fairly high levels of PCB's because they eat smaller animals that already have concentrated PCB's in their own tissues.

Other investigators have produced evidence to show that PCB's are similar to DDT in their activity. Dr. Joseph Street at Utah State University has shown that when PCB's accumulate in the liver, they induce microsomal enzyme activity by bringing about more rapid metabolism of drugs, insecticides, and other foreign compounds. He fed rats a diet containing 50 p.p.m. of Aroclor 1254 or Aroclor 1260. After 10 days on this diet, the test animals were administered hexobarbital at a dose of 100 p.p.m. to induce sleep. In comparison with a control group, the sleeping time for these rats was reduced by 65 to 80%. Street also found that Aroclor, when fed at the



same level, will reduce dieldrin storage in adipose tissue by 90 to 95%; increase aniline oxidation by 200 to 300%; and increase EPN detoxication by 430 to 470%. In addition, the PCB's cause activation of organothiophosphate compounds, which adversely affect the system. This latter effect counterbalances the detoxification of dieldrin.

Normally, when a substrate activates an enzyme, it is converted to a water-soluble form that will be eliminated from the system; however, this is not the case with PCB's. Because they remain in the system for prolonged periods of time, their enzyme induction activity is always present. In this way the normal concentration of important body chemicals may be lowered to the

point of bringing about malfunctions in the system. For example, Street believes that the PCB's bring about steroid degradation, which can lead to altered endocrine relationships.

The chronic toxicity to man is as follows:

Like the chlorinated naphthalenes, the chlorinated diphenyls have two distinct actions on the body, namely, a skin effect and a toxic action on the liver. The lesion produced in the liver is an acute yellow atrophy. This hepato-toxic action of the chlorinated diphenyls appears to be increased if there is exposure to carbon tetrachloride at the same time. The higher the chlorine content of the diphenyl compound, the more toxic it is liable to be. Oxides of chlorinated diphenyls are more

toxic than the unoxidized materials.

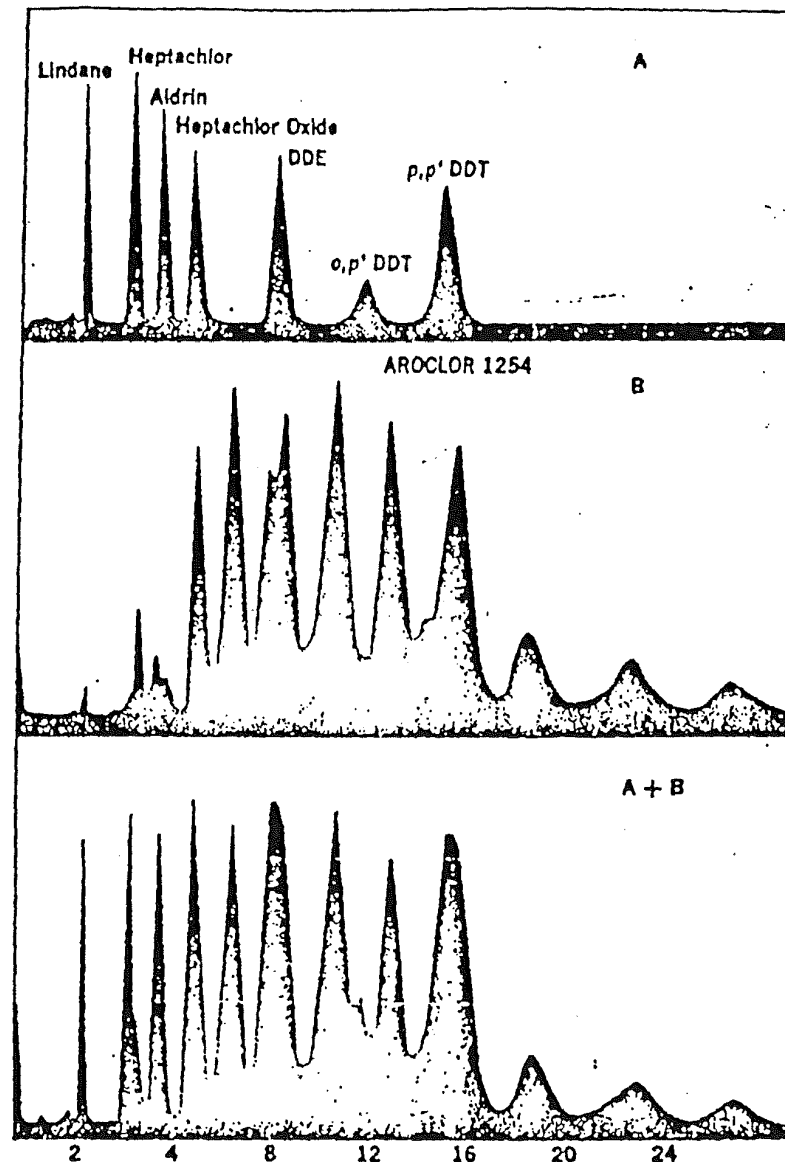
The skin lesion is known as chloracne, and consists of small pimples and dark pigmentation of the exposed areas, initially. Later, comedones and pustules develop. In persons who have suffered systemic intoxication, the usual signs and symptoms are nausea, vomiting, loss of weight, jaundice, edema, and abdominal pain. Where the liver damage has been severe, the patient may pass into coma and die.

Sax, N. Irving, "Dangerous Properties of Industrial Materials," 3rd ed., Van Nostrand-Reinhold, New York, 1968.

The ubiquity of PCB's is related to the wide spectrum of applications that have been found for them. The largest single use of PCB's is related to their electrical properties—as coolant-insulation fluids in transformers. For this purpose the Aroclors are also sold under such trade names as Chlorextol (Allis-Chalmers Mfg. Co.), Dykanol (Federal Pacific Electric Co.), Inerteen (Westinghouse Electric Co.), Nomamol (Wagner Electric Co.), Pyranol (General Electric Co.), and Therminol (Monsanto Co.).

Other uses of PCB's include formulation into ballasts for fluorescent fixtures; impregnation of cotton and asbestos for braided insulation of electrical wiring; a plasticizer in wire and cable coatings; capacitors and askarel-type transformers; and plasticizers of vinyl chloride polymer films. Because of their thermal stability and fire resistance, the PCB's also find application in high-pressure hydraulic fluids, specialized lubricants and gasket sealers, heat transfer agents, and machine tool cutting oils. Miscellaneous uses include: formulation into some epoxy paints; protective coatings for wood, metal, and concrete; adhesives; and in carbonless reproducing paper. One of the primary manufacturers of carbonless reproducing paper also sells Aroclors in an encapsulated form.

Generally the kinds of applications described above mean that the PCB's will be in many types of products that eventually find their way to the domestic market. When used in manufacture of ballasts for fluorescent fixtures they will be found in kitchens, bathrooms, stores, and offices throughout the country. Wherever office forms are used that do not use carbon paper, one may find PCB's formulated into the microcapsules of dye that comprise the re-



Gas chromatogram A is of a standard pesticide mixture, B is typical of Aroclor 1254, and A + B is the chromatogram of a 50 : 50 mixture of both. The concentration of Aroclor 1254 is approximately 10 times those of the pesticides in A, hence it is understandable why PCB's were not readily recognized in pesticide chromatograms. Gas chromatograph (Packard 7620) conditions: gas flow 80 ml./min. nitrogen; temperatures—oven, 210° C., inlet, 230° C., detector, 218° C.; Ni^{63} electron capture detector; $5' \times \frac{1}{8}"$ glass column packed with 8% SE-30 on Chromosorb Q 80-90 mesh.

producing layer of the business form. PCB's have also been found on the transparent receipts used in credit card charge forms. As plasticizers they can be expected to appear in many consumer plastics.

Since the chronic toxicities are so significant, it becomes important to know just how extensively the PCB's are distributed in the ecosystem, and just how they find their way into

the environment. Rainwater in England, brown seals off the coast of Scotland, white-tailed eagles in Sweden, cod in the Baltic Sea, mussels in The Netherlands, adelic penguin eggs in the Antarctica, brown pelican eggs in Panama, Arctic terns, shrimp in Florida, river water in Japan, waters in the Great Lakes, human hair, and human adipose tissue—samples of all these have been found to contain PCB's.

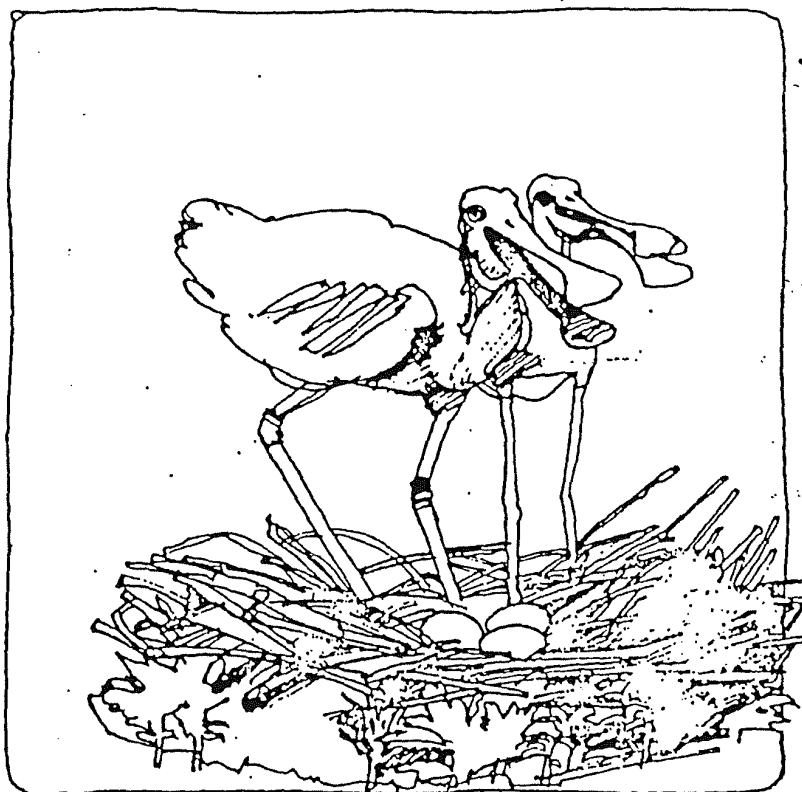
thus making them a class of widely dispersed pollutants.

Readily absorbed

The properties of PCB's that make them industrially useful are the same properties that cause them to persist in the environment. These include thermal stability, resistance to oxidation and hydrolysis, solubility in a wide range of organic solvents, water insolubility, high dielectric constant, and compatibility with many types of macromolecules. Their resistance to oxidation and hydrolysis also makes PCB's more stable and persistent than DDT. Consequently, they could eventually accumulate to a higher concentration than DDT, especially if the use of DDT is sharply curtailed in the U.S.

The solubility of PCB's in nonpolar solvents explains why they are readily absorbed into fatty tissue and into the liver. Their resistance to oxidation or other types of chemical degradation explains their persistence in the environment and accumulation in animal tissue. The latter effect is enhanced both by their insolubility in water and solubility in organic solvents. Their chemical inertness and resistance to metabolism account for their low acute toxicity. But as they slowly build up in a living system their concentration approaches toxicity levels, at which point chronic effects make themselves evident.

It has been established that fish-eating birds will accumulate large concentrations of PCB's, as in the case of the white-tailed eagle, which has been found to have as much as 14,000 p.p.m. of PCB's. Peregrine falcons, taken off the coast of California, were found to have as much as 2000 p.p.m. in their lipid tissue. When shrimp were exposed to 10 p.p.b. of Aroclor 1254 for 48 hours, they accumulated 1300 p.p.b. of PCB's, which represents a 130-fold concentration in a very short time. Oysters, exposed to an identical concentration of Aroclor 1254 for 96 hours and then placed in PCB-free water for four days, still had a concentration of 33,000 p.p.b. of PCB's, which constitutes a 3300-fold concentration. This means that even though the concentrations of PCB's are in the parts-per-billion range in the environment, their high lipid solubility causes them to collect in fatty tissues of lower animals and marine life. Therefore, species at the top of a food chain will also accumulate PCB's in their bodies, particularly in their lipid tissue and liver, in much the same



way as they accumulate DDT and other chlorinated pesticides.

Because of the low solubility of PCB's in water, when a solution or dispersion of them is discharged into a river or lake, they will accumulate on the sediment in relatively high concentrations. Subsequently, they will redissolve very slowly in the water as conditions change. Therefore, it will usually take a long time to flush out a contaminated area.

Accidental occurrence

The reason that PCB's have not been found in the ecosystem as extensively as DDT, and are not present in environmental samples at as high a concentration as DDT, is that PCB's find their way into the environment accidentally. DDT is deliberately spread because this is the only way its insecticidal properties can be utilized. PCB's are not intended to get into the environment, but they do because their unique chemical properties prevent them from being destroyed by our usual waste disposal methods. Thus, they inadvertently escape and become widely dispersed.

In Sweden, where the use of DDT has been banned, and where the main power source is hydroelectric, investi-

gators find that the concentration of PCB's in the environment is as high as that of DDT.

There are several ways by which PCB's get into the ecosystem. One of these is by incineration. Products containing PCB's, such as carbonless reproducing paper in business forms, plastics (especially polymer film and sheeting that contain PCB's as plasticizers), spent ballasts from fluorescent light fixtures, and objects coated with PCB-formulated coatings, all find their way to the city dump or incinerator for burning. The PCB's do not burn but are vaporized. They are then carried into the atmosphere, where they collect on particulate matter and are subsequently returned to the surface of the earth, into the rivers, lakes, and oceans. In this way they become widely distributed throughout the global environment. Another source is probably land run-off from industrial wastes and dumps. A third source is the point of manufacture and the plants where PCB's are processed into other products. They can escape through the plant ventilation and exhaust systems into the atmosphere and through its waste treatment system into sewers or directly into waterways.

It is interesting to note that the incidence of PCB's in environmental samples is highest in industrialized and urbanized areas. Birds whose primary habitat is the San Francisco Bay area have a larger concentration of PCB's per unit of body weight than those located in Baja, Calif., which is completely rural. Aquatic life in the Archipelago of Stockholm, the most industrialized area of Sweden, were found to have a higher concentration of PCB's than fish samples taken from the western coast of Sweden, a less developed area. Sediment samples taken from southern portions of Lake Michigan have a higher concentration of PCB's than those from other parts of the lake.

Monsanto states that until a recent change in marketing policy (see inset, page 814), sales of Aroclors were increasing at the rate of 8% per year. While this increase does not seem significant, it may be important if the increased consumption was in consumer products and thus would find their way into our normal solid waste disposal systems. Such an occurrence would mean a definite increase of PCB residues in the environment, and therefore a marked increase in their chronic toxicity effects.

Detection

PCB's were not discovered in environmental samples until very recently for several reasons. First, as indicated above, they have not been deliberately distributed about the ecosystem. Secondly, because of their relatively low acute toxicities, their presence was not immediately evident. Finally, they are difficult to detect analytically.

The PCB's were first detected as interfering peaks in the gas chromatographic analysis (GC) of environmental samples being analyzed for chlorinated pesticide residues. When PCB's are present in a sample they give a pattern of several GC peaks, whose retention times are similar to those of dieldrin, DDT, DDE, aldrin, and heptachlor oxide. Because the peaks were not large or sharp, investigators tended to ignore them until S. Jensen, in Sweden, and R. Risebrough, at the University of California at Berkeley, identified them as corresponding to common constituents of environmental samples being analyzed for persistent pesticides.

The problem of the interferences of PCB's with the analysis of other chlorinated pesticides has been largely overcome by prior treatment of the sample. Several investigators have used

column chromatography to separate PCB's from chlorinated pesticides. At a recent meeting, sponsored by the FWQA's National Water Quality Laboratory, Duluth, Minn., a general procedure was recommended for separation of PCB's from pesticides. In this procedure for biosamples, the sample is extracted with hexane as in regular pesticide analysis. It is then partitioned with acetonitrile to remove fats, the cleaned-up extract is passed through a Fluoril column and then through a silicic acid column. Finally, the sample is analyzed by gas chromatography, with a chloride-specific detector. In this way the pesticides are retained on the silicic acid column for later elution and identification.

Research needs

To assess fully the significance of PCB's as environmental pollutants, additional research is needed. No one really knows the extent of the chronic effects of these chlorinated hydrocarbons. Some problems that need to be considered are:

- Although PCB's are known to accumulate in human organs we do not know at what concentration they will begin to exhibit toxic effects. Will these chronic effects be similar to those shown in animals—microsomal enzyme activity, calcium metabolism inhibition, and so on? What are other possible chronic effects?

- Which of the many PCB compounds in the commercially available mixtures are responsible for their toxicity? Can commercial PCB mixtures be modified to eliminate the toxic components? Pure samples are required to answer these questions. At the present time work is continuing at the FWQA's Southeast Water Laboratory to separate each of the Aroclor mixtures into its many components, and to identify each component.

- We need to know all the uses for the PCB's. What is the annual production of PCB's? Our knowledge of these facts is limited and needs to be expanded. These facts should be known if we are to accurately determine how they get into the environment, and take steps to prevent further environmental contamination by them.

- In view of the complexity of the isolation and accurate quantitative analysis of PCB's in chlorinated residues, a straightforward, unambiguous measurement of them needs to be developed.

- What is the fate of PCB's in natural waters? More needs to be known of their partition coefficients between bottom sediments and water. This is vital if we are to estimate how long it will take for a river bed to clean itself of contamination. It will also be useful when assessing the effects of PCB's on marine life that feed on the bottoms of lakes, rivers, and estuaries. We should also learn more about PCB solubility in water of various ionic strengths.

- Are present waste treatment systems adequate to handle PCB's? Do special measures need to be taken when PCB's are part of the waste effluent being treated?

By trying to get some of these answers now, we may find that we are in a position to control the escape of PCB's into the environment before additional damage is done. So frequently, action is taken only after it is evident that massive damage has resulted from a particular pollutant. In the case of the PCB's we may have an opportunity to resolve the situation before that happens.

Additional Reading

Hubbard, H. L., "Chlorinated Biphenyl and Related Compounds," *Encyclopedia of Chemical Technology*, 2nd ed., 5, Interscience Publ., New York, N.Y., 1964, pp. 289-298.

Reynolds, L. M., *Bull. Environ. Contam. Toxicol.* 4, 128 (1969).

Risebrough, R. N., et. al., *Nature* 220 (1968).



Carl G. Gustafson, chairman of the Department of Chemistry of King's College, Briarcliff Manor, N.Y., received a Ph.D. in organic chemistry from the University of Delaware in 1957. During the 1969-70 academic year, he was on leave at the FWQA Southeast Water Laboratory in Athens, Ga., where he studied trace organic analysis in waste effluents. As a member of the National Water Contaminants Characterization Research Program, he worked with PCB's and pulp and paper mill effluents.

FUR 004158

Monsanto

MONSANTO INDUSTRIAL CHEMICALS CO.
800 N. Lindbergh Boulevard
St. Louis, Missouri 63166
Phone: (314) 884-1000

February 4, 1972

Dear Sir:

We are writing to advise you that Monsanto has adopted certain policies with respect to its further sale and delivery of all polychlorinated biphenyl (PCB) products used as dielectric fluids including but not limited to those sold under tradenames such as Aroclor [®], Inerteen [®], and Pyranol [®], and under the generic term askarel.

Effective immediately Monsanto will sell and deliver these products only to manufacturers of electrical equipment or components who utilize the products as dielectric fluids and who have entered into agreement to indemnify and hold harmless Monsanto in the use of these products. The two copies of such an agreement are attached. The acceptance by Monsanto of such an agreement is subject to receipt of financial and other information from you (such as evidence of adequate insurance protection) which, in Monsanto's opinion, makes the agreement meaningful.

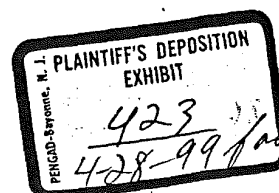
As you are undoubtedly aware, studies indicate PCBs may be accumulating in the environment. In some instances, PCBs have been found in food or in the food chain. For your information, attached is an article by Carl G. Gustafson of the Federal Water Quality Administration appearing in "Environmental Science & Technology" which deals with this subject. Because of Monsanto's concern over this problem, we have discontinued sales of PCBs except for use as dielectric fluids in electrical equipment and components.

If you desire to continue purchase of these products from Monsanto, please have the attached copies of agreement signed by an authorized officer on behalf of your company and forward a fully signed copy, together with your most recent audited financial statement and any other information which you feel will assist Monsanto in its evaluation.

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Page 2

If you have any questions please telephone (314) 694-2455 or write directly to Mr. H.S. Bergen, Monsanto Company, P.O. Box 14617, St. Louis, Missouri 63178.

We sincerely regret any hardships that this decision may cause you but it is taken in an effort to continue to make available these products for these important electrical applications.

Very truly yours,

Howard Bergen

Howard Bergen, Director
Specialty Products Group
Monsanto Industrial Chemicals Co.

/b1

Enclosures

FUR 004160

Monsanto

MONSANTO INDUSTRIAL CHEMICALS CO.
800 N. Lindbergh Boulevard
St. Louis, Missouri 63168
Phone: (314) 694-1000

SPECIAL UNDERTAKING BY PURCHASERS OF POLYCHLORINATED BIPHENYLS

Monsanto Company ("Monsanto") manufactures certain polychlorinated biphenyl products ("PCB's") which _____ ("Buyer") desires to purchase. While Buyer desires to purchase PCB's because of certain desirable flame resistant and insulator properties, Buyer acknowledges that it is aware and has been advised by Monsanto that PCB's tend to persist in the environment; that care is required in their handling, possession, use and disposition; that tolerance limits have been or are being established for PCB's in various food products.

Monsanto has therefore adopted certain restrictive policies with respect to its further production, sale and delivery of PCB's, including the receipt of undertakings from its customers as set forth below, and Buyer is willing to agree to such undertakings with respect to sales and/or deliveries of PCB's by Monsanto to Buyer.

Accordingly, Buyer hereby covenants and agrees that, with respect to any and all PCB's sold or delivered by or on behalf of Monsanto to Buyer on or after the date hereof and in consideration of any such sale or delivery, Buyer shall defend, indemnify and hold harmless Monsanto, its present, past and future directors, officers, employees and agents, from and against any and all liabilities, claims, damages, penalties, actions, suits, losses, costs and expenses arising out of or in connection with the receipt, purchase, possession, handling, use, sale or disposition of such PCB's by, through or under Buyer, whether alone or in combination with other substances, including, without implied limitation, any contamination of or adverse effect on humans, marine and wildlife, food, animal feed or the environment by reason of such PCB's.

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All existing contracts for the sale of PCB's by Monsanto to Buyer are hereby amended to contain the provisions set forth above.

Nothing herein shall create or imply any duty or obligation of Monsanto to sell or deliver any PCB's to Buyer. No conditions, understandings or agreements purporting to modify or vary the terms hereof shall be binding unless hereafter made in writing specifically referring to this agreement and signed by the party to be bound and no modification or variance of the above undertaking shall be effected by the acknowledgment or acceptance of any sale document, purchase order, shipping instruction or other forms containing terms or conditions at variance herewith.

_____	MONSANTO COMPANY
(Buyer)	
BY: _____	BY: _____
TITLE: _____	
DATE: _____	

FUR 004162

PCB's—prevalent and persistent

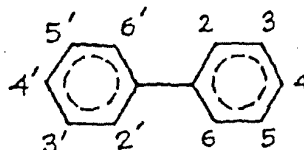
Intensified research is needed to minimize their dangers

Carl G. Gustafson, Federal Water Quality Administration, Athens, Ga.

During the past three years, a special class of compounds, called polychlorinated biphenyls (PCB's), has claimed the attention of ecologists and pesticide analysts in this country. These compounds were not discovered in the environment until 1966 in Sweden and 1967 in the U.S., despite the fact that they have been available commercially for 40 years. Interest in PCB's has arisen because they are frequently found in fish, bird, water, sediment, and other environmental samples when such samples are examined for chlorinated pesticide residues. That a wide variety of samples containing PCB's has been collected from England, Scandinavia, The Netherlands, Antarctica, Central America, and many different parts of the U.S. makes them truly ubiquitous pollutants.

Polychlorobiphenyls are made by substituting chlorine atoms for one or more of the hydrogen atoms at the

numbered positions of the biphenyl structure.



In the process of replacing hydrogen atoms with chlorine atoms, a large number of substitution combinations arise. For example, three monochlorobiphenyl isomers are possible, 12 dichlorobiphenyl isomers, 21 trichlorobiphenyl isomers, and so on. Theoretically, 210 compounds can be prepared by this substitution process; a typical example would be 2,4,6,2',4'-pentachlorobiphenyl.

Whenever aromatic hydrocarbons such as biphenyls are chlorinated, the product is a mixture of compounds, including isomers. It is quite difficult to synthesize single, specific chlorobiphenyl compounds in the laboratory unless involved procedures are employed. Consequently few of the individual compounds have been prepared in the pure form for study.

In the commercial process for PCB manufacture, biphenyl is chlorinated with anhydrous chlorine in tall cylindrical towers with either iron filings or ferric chloride as the catalyst. The by-product is hydrogen chloride; the product is a mixture of several PCB's. The degree of chlorination is determined by measuring the specific gravity of the mixture or, when the product is more viscous, the ball-and-ring softening-point test is used. The whole process takes from 12 to 36 hours.

In the U.S., the sole manufacturer of PCB's is the Monsanto Co., which markets them under the trade name

Aroclor. PCB's are also manufactured in Europe and Japan, under trade names such as Pbenochlor and Clophen. The various Aroclors are differentiated by a four-digit number, with the last two digits indicating the percentage of chlorine in the mixture.

Properties

The three most important physical properties of the PCB's are low vapor pressures (they have high boiling points), low water solubility, and high dielectric constants. They are miscible with most organic solvents and compatible with many types of polymers. Although some individual polychlorobiphenyl compounds are crystalline, the Aroclor mixtures are either liquids or resins.

The chemical properties that make PCB's desirable industrial materials are their excellent thermal stability, their strong resistance to both acidic and basic hydrolysis, and their general inertness. They are quite resistant to oxidation. Monsanto reports, in a technical bulletin on PCB's, that they can be heated to 140° C. under 260 p.s.i. of oxygen pressure "without showing any evidence of oxidation as judged by development of acidity or formation of sludge."

The physiological properties of the PCB's make them potentially significant contaminants of the environment. For any pollutant, two factors are involved: acute toxicity, which is immediately evident because of a high death rate or other maiming effect; and chronic toxicity, which is the result of a slow accumulation of the poison in the body and is a sublethal effect. Whenever acute toxicity is high, a pollutant will be readily recognized and appropriate remedial actions will be introduced. If, on the other hand, acute toxicity is low,

The Monsanto Co. stated recently in a letter to Congressman William F. Ryan of New York that as of August 30, it would no longer sell PCB's to customers for use in general plasticizer operations where disposal of the end-products cannot be controlled. After some lag period—the time it takes to eventually dispose of the products made from PCB's and currently in processor's inventories—the quantity of PCB's getting into the environment may be substantially reduced. If Monsanto's former customers look for PCB substitutes, rather than purchasing PCB's from manufacturers in Japan and Europe, the projected decrease could become a reality.

Carl G. Gustafson

the physiological effects will go unnoticed until the chronic effects make themselves evident. When this happens, the problem may have advanced beyond immediate or easy correction.

Acute toxicity

All studies of PCB's in animals indicate that acute toxicity is not a significant factor. Their acute toxicities are on the order of those of other chlorinated aromatic compounds. Monsanto has sponsored two investigations of the acute toxicities of Aroclor mixtures. In the first, at the Kettering Laboratory at the University of Cincinnati, Dr. J. F. Treon and his co-workers investigated the toxicity of Aroclor vapors for guinea pigs, mice, rabbits, and rats. All animals survived a 24-day exposure to 0.83 p.p.m. of Aroclor 1242 for 7 hours per day on 17 of those days. Even after more prolonged tests, there were no severe effects from Aroclor 1242. In the second investigation, still in process, three groups of beagles are fed Aroclor 1242, 1254, and 1260, respectively, at a rate of 100 p.p.m. in their diets. After three months no significant abnormalities have been noted.

Similar studies on fish have been performed in several laboratories. Dr. Richard Schoettger of the Sport Fisheries and Wildlife Fish-Pesticide Research Laboratory in Columbia, Mo., reports that 96 hour- TL_{50} toxicities of the Aroclors to trout range from 1.17 to 60 p.p.m. Compared to DDT, whose 96 hour- TL_{50} toxicity is 0.002 to 0.009 p.p.m. for trout, the PCB's have a relatively low acute toxicity. With the more sensitive bluegill, the 96 hour- TL_{50} for Aroclor 1248 is 0.278 p.p.m., while that of DDT is 0.008 p.p.m. Aroclor toxicities appear to be inversely proportional to the chlorine content of the mixture.

Shellfish, oysters, and shrimp are more sensitive to PCB's. Dr. Tom Duke, at the Bureau of Commercial Fisheries Pesticide Field Station, reports 100% mortality of juvenile pink shrimp exposed to 0.10 p.p.m. of Aroclor 1254 in water for 48 hours. This concentration of Aroclor 1254 will cause a 100% decrease in shell growth of oysters after 96 hours. To achieve the same effects with DDT in these experiments, only 0.0006 p.p.m. and 0.01 p.p.m., respectively, were required.

There is very little evidence that PCB's are toxic to insects. Studies to date show that they are less toxic than

dieldrin or DDT. As with fish, their toxicity appears to be inversely proportional to the chlorine content of the mixture.

Based on the above data, it is understandable why the polychlorobiphenyls, commercially available for 40 years, have only recently attracted attention as toxic environmental contaminants.

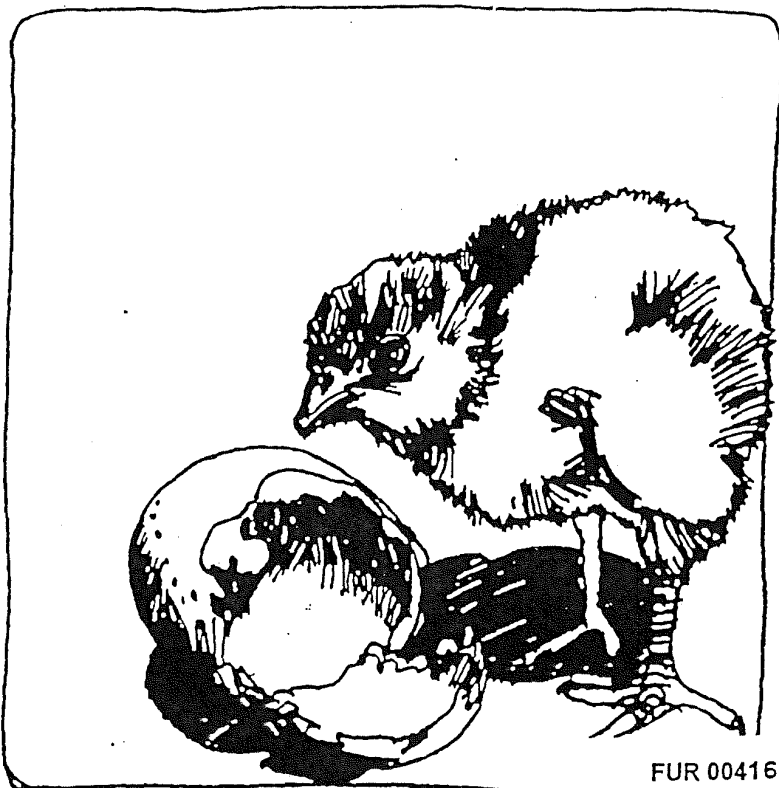
Chronic toxicity

The chronic toxicities of PCB's present a more disturbing situation; several chronic effects have been observed. It was discovered, quite by accident, that PCB's have a toxic effect on chickens. Professor E. L. McCune and his co-workers at the University of Missouri found their chickens dying after they were placed in a feeding house, parts of which had been freshly painted with an epoxy paint. Careful investigation revealed that the toxic factor was Aroclor 1242, a binder in the paint. When Aroclor 1242 was fed to the chicks it produced the same characteristic effects as chick edema factor. McCune reported: "Gross pathology included hydropericardium, hydroperitonium, enlarged heart, liver, and kidneys, and hemorrhage of internal organs. Mi-

croscopically the kidneys showed marked tubular dilation and numerous casts."

Another chronic effect of PCB's is related in wildfowl. The accumulation of high concentrations of chlorinated hydrocarbons in birds resulted in disruption of normal breeding behavior and in the formation of thin-shelled eggs. A dramatic example of this effect has been observed in the case of the brown pelican. On the Anacapa Islands off the California coast, no young were hatched last year from 300 pairs of nesting birds. The shells of most eggs laid were so thin that a dent occurred when the egg was picked up.

There are two possible causes for the laying of thin-shelled eggs by wildfowl. One is a low calcium reserve in the bird; the other is the inability of the bird to deliver the needed calcium to its oviduct, where the eggshell is forming. The calcium level in the avian biosystem and the calcium reserve in the secondary bone structure or medullary bone, found only in female birds when they are breeding, are controlled by the hormone estrogen. A high estrogen level is associated with the formation of this calcium reserve. Chlorinated hydrocarbons, such as DDT,



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chlordane, dieldrin, and PCB's, activate enzymes in the liver which transform estrogen into a more water-soluble compound that is readily eliminated from the bird's body. This means that when estrogen levels are low, calcium reserves will also be low, and therefore very little calcium will be available for strong eggshell production. Dieldrin and PCB's are more effective than DDT in this type of enzyme-induction activity. Aroclor 1262 has an estradiol degrading potential four to five times that of *p,p'*-DDE or technical grade DDT.

The ability of the female bird to deliver calcium to her oviduct during the last 20 hours, when the eggshell is being formed, is related to the functioning of the enzyme carbonic anhydrase. When birds that have exhibited the ability to lay normal eggs are injected with a metabolite of DDT (DDE) just prior to the formation of the eggshell, they will lay thin-shelled eggs. This indicates that DDT also inhibits the activity of carbonic anhydrase, the enzyme that controls the flow of calcium from the blood stream of the bird into its oviduct.

Since dieldrin seems to have no effect on carbonic anhydrase, we may assume that neither do the PCB's. However, these compounds delay breeding time significantly. Many ornithologists feel that late breeding has a stronger influence on the reduction of bird populations than does the laying of thin-shelled eggs. If this is true, PCB's are a more potent threat than DDT to our declining bird populations, especially for predatory birds that accumulate fairly high levels of PCB's because they eat smaller animals that already have concentrated PCB's in their own tissues.

Other investigators have produced evidence to show that PCB's are similar to DDT in their activity. Dr. Joseph Street at Utah State University has shown that when PCB's accumulate in the liver, they induce microsomal enzyme activity by bringing about more rapid metabolism of drugs, insecticides, and other foreign compounds. He fed rats a diet containing 50 p.p.m. of Aroclor 1254 or Aroclor 1260. After 10 days on this diet, the test animals were administered hexobarbital at a dose of 100 p.p.m. to induce sleep. In comparison with a control group, the sleeping time for these rats was reduced by 65 to 80%. Street also found that Aroclor, when fed at the



same level, will reduce dieldrin storage in adipose tissue by 90 to 95%; increase aniline oxidation by 200 to 300%; and increase EPN detoxication by 430 to 470%. In addition, the PCB's cause activation of organothiophosphate compounds, which adversely affect the system. This latter effect counterbalances the detoxification of dieldrin.

Normally, when a substrate activates an enzyme, it is converted to a water-soluble form that will be eliminated from the system; however, this is not the case with PCB's. Because they remain in the system for prolonged periods of time, their enzyme induction activity is always present. In this way the normal concentration of important body chemicals may be lowered to the

point of bringing about malfunctions in the system. For example, Street believes that the PCB's bring about steroid degradation, which can lead to altered endocrine relationships.

The chronic toxicity to man is as follows:

Like the chlorinated naphthalenes, the chlorinated diphenyls have two distinct actions on the body, namely, a skin effect and a toxic action on the liver. The lesion produced in the liver is an acute yellow atrophy. This hepato-toxic action of the chlorinated diphenyls appears to be increased if there is exposure to carbon tetrachloride at the same time. The higher the chlorine content of the diphenyl compound, the more toxic it is liable to be. Oxides of chlorinated diphenyls are more

toxic than the unoxidized materials.

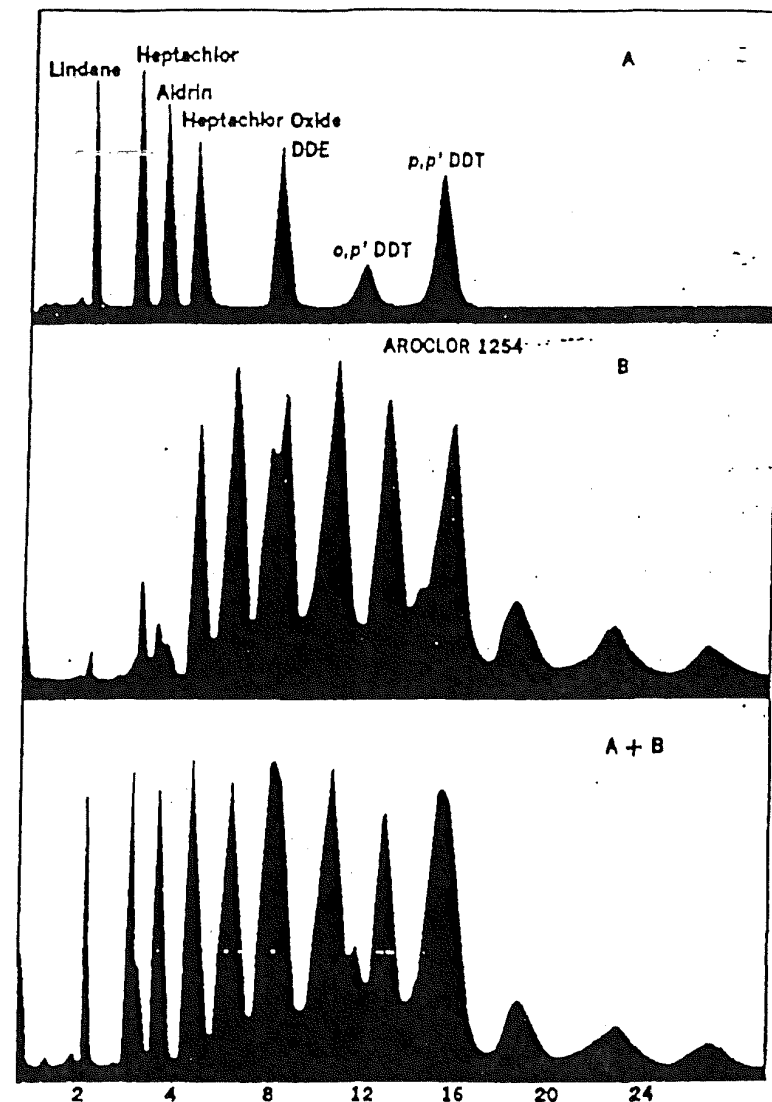
The skin lesion is known as chloracne, and consists of small pimples and dark pigmentation of the exposed areas, initially. Later, comedones and pustules develop. In persons who have suffered systemic intoxication, the usual signs and symptoms are nausea, vomiting, loss of weight, jaundice, edema, and abdominal pain. Where the liver damage has been severe, the patient may pass into coma and die.

Sav. N. Irving, "Dangerous Properties of Industrial Materials," 3rd ed., Van Nostrand-Reinhold, New York, 1968.

The ubiquity of PCB's is related to the wide spectrum of applications that have been found for them. The largest single use of PCB's is related to their electrical properties—as coolant-insulation fluids in transformers. For this purpose the Aroclors are also sold under such trade names as Chlorextol (Allis-Chalmers Mfg. Co.), Dykanol (Federal Pacific Electric Co.), Iner-teen (Westinghouse Electric Co.), No-flamol (Wagner Electric Co.), Pyranol (General Electric Co.), and Thermi-nol (Monsanto Co.).

Other uses of PCB's include formulation into ballasts for fluorescent fixtures; impregnation of cotton and asbestos for braided insulation of electrical wiring; a plasticizer in wire and cable coatings; capacitors and askarel-type transformers; and plasticizers of vinyl chloride polymer films. Because of their thermal stability and fire resistance, the PCB's also find application in high-pressure hydraulic fluids, specialized lubricants and gasket sealers, heat transfer agents, and machine tool cutting oils. Miscellaneous uses include: formulation into some epoxy paints; protective coatings for wood, metal, and concrete; adhesives; and in carbonless reproducing paper. One of the primary manufacturers of carbonless reproducing paper also sells Aroclors in an encapsulated form.

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the environment. Rainwater in England, brown seals off the coast of Scotland, white-tailed eagles in Sweden, cod in the Baltic Sea, mussels in The Netherlands, adie penguin eggs in the Antarctica, brown pelican eggs in Panama, Arctic terns, shrimp in Florida, river water in Japan, waters in the Great Lakes, human hair, and human adipose tissue—samples of all these have been found to contain PCB's.

thus making them a class of widely dispersed pollutants.

Readily absorbed

The properties of PCB's that make them industrially useful are the same properties that cause them to persist in the environment. These include thermal stability, resistance to oxidation and hydrolysis, solubility in a wide range of organic solvents, water insolubility, high dielectric constant, and compatibility with many types of macromolecules. Their resistance to oxidation and hydrolysis also makes PCB's more stable and persistent than DDT. Consequently, they could eventually accumulate to a higher concentration than DDT, especially if the use of DDT is sharply curtailed in the U.S.

The solubility of PCB's in nonpolar solvents explains why they are readily absorbed into fatty tissue and into the liver. Their resistance to oxidation or other types of chemical degradation explains their persistence in the environment and accumulation in animal tissue. The latter effect is enhanced both by their insolubility in water and solubility in organic solvents. Their chemical inertness and resistance to metabolism account for their low acute toxicity. But as they slowly build up in a living system their concentration approaches toxicity levels, at which point chronic effects make themselves evident.

It has been established that fish-eating birds will accumulate large concentrations of PCB's, as in the case of the white-tailed eagle, which has been found to have as much as 14,000 p.p.m. of PCB's. Peregrine falcons, taken off the coast of California, were found to have as much as 2000 p.p.m. in their lipid tissue. When shrimps were exposed to 10 p.p.b. of Aroclor 1254 for 48 hours, they accumulated 1300 p.p.b. of PCB's, which represents a 130-fold concentration in a very short time. Oysters, exposed to an identical concentration of Aroclor 1254 for 96 hours and then placed in PCB-free water for four days, still had a concentration of 33,000 p.p.b. of PCB's, which constitutes a 3300-fold concentration. This means that even though the concentrations of PCB's are in the parts-per-billion range in the environment, their high lipid solubility causes them to collect in fatty tissues of lower animals and marine life. Therefore, species at the top of a food chain will also accumulate PCB's in their bodies, particularly in their lipid tissue and liver, in much the same



way as they accumulate DDT and other chlorinated pesticides.

Because of the low solubility of PCB's in water, when a solution or dispersion of them is discharged into a river or lake, they will accumulate on the sediment in relatively high concentrations. Subsequently, they will redissolve very slowly in the water as conditions change. Therefore, it will usually take a long time to flush out a contaminated area.

Accidental occurrence

The reason that PCB's have not been found in the ecosystem as extensively as DDT, and are not present in environmental samples at as high a concentration as DDT, is that PCB's find their way into the environment accidentally. DDT is deliberately spread because this is the only way its insecticidal properties can be utilized. PCB's are not intended to get into the environment, but they do because their unique chemical properties prevent them from being destroyed by our usual waste disposal methods. Thus, they inadvertently escape and become widely dispersed.

In Sweden, where the use of DDT has been banned, and where the main power source is hydroelectric, investi-

gators find that the concentration of PCB's in the environment is as high as that of DDT.

There are several ways by which PCB's get into the ecosystem. One of these is by incineration. Products containing PCB's, such as carbonless reproducing paper in business forms, plastics (especially polymer film and sheeting that contain PCB's as plasticizers), spent ballasts from fluorescent light fixtures, and objects coated with PCB-formulated coatings, all find their way to the city dump or incinerator for burning. The PCB's do not burn but are vaporized. They are then carried into the atmosphere, where they collect on particulate matter and are subsequently returned to the surface of the earth, into the rivers, lakes, and oceans. In this way they become widely distributed throughout the global environment. Another source is probably land run-off from industrial wastes and dumps. A third source is the point of manufacture and the plants where PCB's are processed into other products. They can escape through the plant ventilation and exhaust systems into the atmosphere and through its waste treatment system into sewers or directly into waterways.

It is interesting to note that the incidence of PCB's in environmental samples is highest in industrialized and urbanized areas. Birds whose primary habitat is the San Francisco Bay area have a larger concentration of PCB's per unit of body weight than those located in Baja, Calif., which is completely rural. Aquatic life in the Archipelago of Stockholm, the most industrialized area of Sweden, were found to have a higher concentration of PCB's than fish samples taken from the western coast of Sweden, a less developed area. Sediment samples taken from southern portions of Lake Michigan have a higher concentration of PCB's than those from other parts of the lake.

Monsanto states that until a recent change in marketing policy (see inset, page 814), sales of Aroclors were increasing at the rate of 8% per year. While this increase does not seem significant, it may be important if the increased consumption was in consumer products and thus would find their way into our normal solid waste disposal systems. Such an occurrence would mean a definite increase of PCB residues in the environment, and therefore a marked increase in their chronic toxicity effects.

Detection

PCB's were not discovered in environmental samples until very recently for several reasons. First, as indicated above, they have not been deliberately distributed about the ecosystem. Secondly, because of their relatively low acute toxicities, their presence was not immediately evident. Finally, they are difficult to detect analytically.

The PCB's were first detected as interfering peaks in the gas chromatographic analysis (GC) of environmental samples being analyzed for chlorinated pesticide residues. When PCB's are present in a sample they give a pattern of several GC peaks, whose retention times are similar to those of dieldrin, DDT, DDE, aldrin, and heptachlor oxide. Because the peaks were not large or sharp, investigators tended to ignore them until S. Jensen, in Sweden, and R. Risebrough, at the University of California at Berkeley, identified them as corresponding to common constituents of environmental samples being analyzed for persistent pesticides.

The problem of the interferences of PCB's with the analysis of other chlorinated pesticides has been largely overcome by prior treatment of the sample. Several investigators have used

column chromatography to separate PCB's from chlorinated pesticides. At a recent meeting, sponsored by the FWQA's National Water Quality Laboratory, Duluth, Minn., a general procedure was recommended for separation of PCB's from pesticides. In this procedure for biosamples, the sample is extracted with hexane as in regular pesticide analysis. It is then partitioned with acetonitrile to remove fats, the cleaned-up extract is passed through a Fluorisil column and then through a silicic acid column. Finally, the sample is analyzed by gas chromatography, with a chloride-specific detector. In this way the pesticides are retained on the silicic acid column for later elution and identification.

Research needs

To assess fully the significance of PCB's as environmental pollutants, additional research is needed. No one really knows the extent of the chronic effects of these chlorinated hydrocarbons. Some problems that need to be considered are:

- Although PCB's are known to accumulate in human organs we do not know at what concentration they will begin to exhibit toxic effects. Will these chronic effects be similar to those shown in animals—microsomal enzyme activity, calcium metabolism inhibition, and so on? What are other possible chronic effects?

- Which of the many PCB compounds in the commercially available mixtures are responsible for their toxicity? Can commercial PCB mixtures be modified to eliminate the toxic components? Pure samples are required to answer these questions. At the present time work is continuing at the FWQA's Southeast Water Laboratory to separate each of the Aroclor mixtures into its many components, and to identify each component.

- We need to know all the uses for the PCB's. What is the annual production of PCB's? Our knowledge of these facts is limited and needs to be expanded. These facts should be known if we are to accurately determine how they get into the environment, and take steps to prevent further environmental contamination by them.

- In view of the complexity of the isolation and accurate quantitative analysis of PCB's in chlorinated residues, a straightforward, unambiguous measurement of them needs to be developed.

- What is the fate of PCB's in natural waters? More needs to be known of their partition coefficients between bottom sediments and water. This is vital if we are to estimate how long will take for a river bed to clean it of contamination. It will also be useful when assessing the effects of PCB's on marine life that feed on the bottom of lakes, rivers, and estuaries. We should also learn more about PCB solubility in water of various ionic strengths.

- Are present waste treatment systems adequate to handle PCB's? Do special measures need to be taken when PCB's are part of the waste effluent being treated?

By trying to get some of these answers now, we may find that we are in a position to control the escape of PCB's into the environment before additional damage is done. So frequently action is taken only after it is evident that massive damage has resulted from a particular pollutant. In the case of the PCB's we may have an opportunity to resolve the situation before this happens.

Additional Reading

- Hubbard, H. L., "Chlorinated Biphenyls and Related Compounds," *Encyclopedia of Chemical Technology*, 2nd ed., 5, Interscience Publ., New York, N.Y., 1964, pp. 289-298.
 Reynolds, L. M., *Bull. Environ. Contam. Toxicol.* 4, 128 (1969).
 Risebrough, R. N., et. al., *Nature* 220 (1968).



Carl G. Gustafson, chairman of the Department of Chemistry of King's College, Briarcliff Manor, N.Y., received a Ph.D. in organic chemistry from the University of Delaware in 1957. During the 1969-70 academic year, he was on leave at the FWQA Southeast Water Laboratory in Athens, Ga., where he studied trace organic analysis in waste effluents. As a member of the National Water Contaminants Characterization Research Program, he worked with PCB's and pulp and paper mill effluents.

MITSUBISHI MONSANTO CHEMICAL COMPANY

FROM LOCATION : Tokyo

DATE : March 22, 1972

SUBJECT : PCB IN JAPAN

REFERENCE :

TO : Mr. P. G. Benignus
St. Louis
(B2SC)

Messrs.

J. R. Durland	- Tokyo
W. R. Corey	- St. Louis
H. S. Berger	- "
T. L. Gossage	- "
C. Paton	- "
J. Mason	- Brussels
P. J. A. Marsh	- "
W. R. Richard	- St. Louis
R. H. Munch	- "
W. B. Papageorge	- "
C. R. Coleman	- Newport

Dear Paul:

I am pleased to answer your questions in your letter of March 20, 1972.

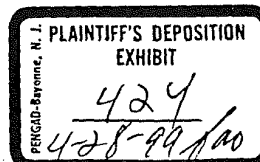
The Ministry of International Trade and Industry (MITI) issued notice yesterday to almost every industrial association concerned, as summarized in the following:

- a. No electrical machinery and equipment which contain PCB must be manufactured after Sep. 1, 1972.
- b. No heat exchange equipment must be produced after July 1, 1972 which use PCB as a transfer medium.
- c. Exceptions to the above are those which are sold to the specific users and which can be returned after use to the producers or manufacturers for PCB disposal. They must periodically report to the ministry how PCB is used, shipped, stored, recovered, returned and disposed, including machinery, in addition to the quantity dealt with and so and so forth.

Every user of PCB-containing machinery and equipment will have to be recorded and registered in the official list to insure strict supervision in the future.

- d. Import of such machinery and equipment will be possible only if permission is granted by the Government, after September 1, 1972.
- e. PCB containing machinery and equipment already in use must be identified and reported to the authorities so that the disposal of PCB is to be made complete.

FUR 004169



You will understand that the above action is not the total ban of PCB usage. However, who can meet such stringent regulatory requirements to continue using PCB, other than non-civil organisations?

We called the MITI yesterday to learn the following:

1. The MITI foresee by the action taken-yesterday the use of PCB fluid will be limited in the near future to the transformers used by the Japan National Railroad and certain electronic parts in missiles belonging to the Defense Ministry, in addition to the high voltage electro-furnace capacitors as a possibility.
2. Thermal transfer systems with PCB will sooner or later undergo change in fluid or the whole line will have to discontinue operation.
3. Kaneka agreed to follow the recommendation by the MITI to discontinue the production of PCB, probably after September of this year.
4. Those who are able and obliged to use PCB will have to import PCB, possibly from Bayer, with permission from the Government.

You rightly pointed out that the actions being taken by the Japanese Government appear out of line from the rest of the world today. I can agree to Mr. Terasaki's statement in this respect that the folks go all the way when they decide to do something in this country.

I think the latest happening sensationally moved the Government to this direction - the analysis of mothers' milk in Osaka showed PCB level of 0.7 to 0.1 PPM, as against the FDA's 0.2 maximum level for cows' milk. In the Diet committee the Welfare Minister was at a loss when asked if or not babies can drink milk with 0.7 PPM PCB without any danger to their healthy growth.

You might recall Yodo River flows from Lake Biwa to Osaka Bay. Two capacitor plants are located by the Lake-Nichicon's and Nisshin Electric's. Samples of the soil were taken from the vicinity of Nichicon to run analysis of PCB with an unfortunate result showing 1,000 PPM PCB!

FUR 004170

People associated the contamination of the soil with the mothers' milk case. Thus Nichicon was forced to announce last week that they plan to discontinue production of PCB capacitors, after coming September.

Today the world seems to be ruled by feeling and not reason. The pressure against PCB usage is far from logical. It is quite emotional and at the same time political, It was this pressure that led Kaneka to the discontinuation.

It has not been 100% confirmed but I think you may rest assured Kaneka will not go after overseas markets after the fall of this year, although they are exporting substantially today.

The grand funeral of PCB in Japan is close at hand. What will replace PCB in the dielectric markets is yet known to nobody exactly. We only are aware a number of products ranging from silicone to polyisobutane, wax and DOP are competing. The strongest candidate on the longer term basis seems to me entirely new systems after technological innovation.

I wish you good luck.

T. Katayama

T. Katayama

TK/ym

P.S. Just before I had this letter typed, Kaneka announced that they decided to discontinue the production of Kaneclor by the end of June, which was confirmed by myself today with Kaneka.

Also Nichicon was forced to terminate their production of PCB capacitors at the end of April.

FUR 004171

Chairman: Mr. W. B. Papageorge
Manager, Product Acceptability
Monsanto Industrial Chemicals Co.

Objective:

The purpose of the meeting was to share information, experiences and impressions to help each of the participating companies in taking appropriate actions which are mutually supportive and effective in persuading the Administration of EPA to modify the proposed PCB Effluent Standard.



FUR 004497

PARTICIPANTS
PCB STANDARDS MEETING
February 28, 1974

CERTIFIED BALLAST MANUFACTURERS

Mr. N. R. Clark

Universal Manufacturing Co.

E.I.A.

Mr. Arnold S. Doty
Dr. E. M. Moore
Mr. Rudy Carlson

P. R. Mallory & Co., Inc.
Electrical Utilities Co.
Electrical Utilities Co.

GENERAL ELECTRIC COMPANY

Mr. James S. Nelson
Mr. Stuart Richel
Dr. Edward L. Simons

JARD COMPANY, INC.

Mr. Richard Rollins

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

Mr. A. M. Salazar

WESTINGHOUSE CORPORATION

Mr. H. Sheppard
Mr. N. H. Smith

FUR 004498

MINUTES OF PCB EFFLUENT STANDARDS MEETING

1. Mr. Howard S. Bergen, Jr., Director, Specialty Products Business Group of Monsanto Industrial Chemicals Company, welcomed the participants.

2. Introduction - W. B. Papageorge

Mr. Papageorge summarized the timetable past and future on toxic pollutants:

- July 6, 1973 - Toxic Pollutants list published
- September 7, 1973 - Final toxic pollutants list published including PCBs and 8 other chemical classes (e.g. cyanide, mercury, DDT, cadmium, etc.)
- December 27, 1973 - Proposed Effluent Standards published
- January 18, 1974 - Filing date for status as participant at proposed EPA Hearing on Standards
- January 25, 1974 - (i) Prehearing Conference with EPA
 - (ii) NEMA, Monsanto, G.E. and Westinghouse recognized as participants.
 - (iii) A total of 38 objectors expressed an interest. They represented industry or trade associations with the exception of the Michigan Water Research Commission and two powerful environmental groups (Environmental Defense Fund and National Resources Defense Council).
 - (iv) Presiding officer made it clear that Hearings will be strictly for cross-examination of participants' testimonies in affidavit form only.

FUR 004501

- March 15, 1974 - Written testimony by 38 objectors to be submitted in affidavit form.
- April 8, 1974 - Hearings open for cross-examination and rebuttal evidence. CN⁻/Cd/Hg - first three. PCBs are 7th (third from last).
- Mid-May, 1974 - Hearings completed. (Evenings/week-ends may be used.)
- June 25, 1974 - Final standards published - effective in one year.

It should be noted that others who are affected by these standards can still comment by March 25 to:

Dr. C. Hugh Thompson,
Chairman-Hazardous and Toxic Substances
Regulation Task Force
Office of Water Protection Agency,
Environmental Protection Agency
Washington D. C. 20460

Industry representatives still wishing to comment and who need more background information can contact any of the industry participants (see attached list) or Mr. W. B. Papageorge of Monsanto (314-694-4051).

Mr. Richel (G.E.):

- (i) Made a plea for greater industry participation. Comments can still be made up to March 25 with sound excuse for tardiness.
- (ii) EPA at January 25 prehearing Conference were reluctant to expose themselves to cross-examination. Dr. Hugh Thompson to be available for cross-examination at Hearings.
- (iii) Many objectors had common interest (e.g. environmentalists). EPA suggested a common counsel for this group.
- (iv) On each of first 3 pollutants, EPA would offer 2 witnesses.

Mr. Doty (P.R. Mallory) asked about bearing of economic factors on standards.

Mr. Richel (G.E.) stated:

- (i) Law is clear-economic factors are not relevant in establishing standards.
- (ii) EPA is somewhat of a split personality on this. The

FUR 004502

"Polychlorinated biphenyls (PCBs) means materials containing the biphenyl group which is chlorinated and which have been shown to persist and rapidly bioaccumulate in the aquatic environment. These chlorinated biphenyls are identified as those components having gas chromatographic retention times greater than 54, relative to p, p-DDE = 100, under the standard conditions recommended in the EPA PCB test method."

Mr. Sheppard (Westinghouse) said Monsanto's proposed definition was relevant to persistence but was it relevant for standards directed toward toxic materials? Are persistent materials non-toxic?

Mr. Wright (Monsanto) stated the proposed effluent standard had two parts:

- (i) acute limits directed to toxicity of materials and specifically limits PCB concentrations on that basis.
- (ii) daily load in effluent - based solely on bio-magnification (relevant to persistence).

Dr. Simons (G.E.) pointed out that section 307-A of the proposed standard refers to persistence as being a critical factor to be considered.

Dr. Tucker (Monsanto) stated we were badly hurt if all PCBs are regarded as persistent and if biomagnification factors of 200,000 are used. Researchers other than Monsanto have found bacterial degradation of PCBs and that PCBs have been found to undergo metabolism in both avian and mammalian animals.

Mr. Nelson (G.E.) asked if proposed PCB definition would exclude Aroclor 1016.

Dr. Tucker (Monsanto) Aroclor 1016 would be excluded for the most part (98.9% is lower than pentachlorobiphenyl). Aroclor 1242 would be excluded to 65% or better. Aroclor 1254 however would not be excluded.

Mr. Papageorge (Monsanto) pointed out that of the factors listed as being critical in determining which pollutants made the EPA list of 9/7/73 only biomagnification appeared relevant to PCBs.

Dr. Simons (G.E.) agreed.

FUR 004504

Mr. Wright (Monsanto) stated that an acute toxicological level is defined in the EPA Basis & Purpose document as ≤ 10 ppm (96 hour LC-50). He also believes that differences in toxicity among PCBs are minor until chlorinated as high as Aroclor 1260.

Mr. Nelson (G.E.) stated that words should be used in a discourse on definition to properly screen us on acute toxicity.

In reference to a comment that Aroclor 1254 would not be excluded by the proposed definition, Dr. Tucker (Monsanto) offered the opinion that transformer fluids were easier to recover than capacitors.

(b) Analytical Methodology

Dr. Tucker (Monsanto) stated the EPA's proposed method for PCB analysis was being submitted to ASTM. He thought the method was well written and capable of detection to ppt (parts per trillion) but it was untried and the quantitative accuracy is in question. The method was not submitted for round-robin testing before EPA adopted it. Monsanto has found that by spiking distilled water with 500,000 ppt or 500 ppb of PCBs we get values for PCB that vary by $\pm 55\%$. The EPA, however, claims a capability of detecting absolute values at 50 ppt. The EPA method ignores interfering substances.

Mr. Clark (Universal Manufacturing) said that with a proposed upper limit for PCB discharge of 0.0648 lb./day the sensitivity of the analytical method would vary "all over the lot" depending on the size of the water "reservoir" into which the PCBs discharge.

Mr. Sheppard (Westinghouse) commented that if the analytical techniques on determining PCB levels are so difficult, how valid are the determination of toxic values for PCBs.

Mr. Clark (Universal Manufacturing) asked if analytical techniques differentiate between different chlorine levels. Dr. Tucker (Monsanto) said it would depend on the PCB mixture. Aroclor 1242 could probably be identified quantitatively in a mixture with Aroclor 1260 but addition of Aroclor 1254 to the mixture would prevent identification because Aroclor 1254 contains PCB homologs that overlap both Aroclor 1242 and 1260.

Dr. Munch (Monsanto) said that the proposed EPA method does not use high resolution and hence handicaps identification of individual peaks.

Dr. Simons (G.E.) mentioned that after EPA set automotive emission standards (NIOX) the analytical methodology was found faulty and the standards were delayed. In this case, EPA is not setting the effluent standard on analytical methodology but

on factors such as toxicity and persistence. The methodology is relevant in enforcement and monitoring. This then leads to the possible argument that the effluent standard is correct and justified on the basis of toxicology et al, but is not enforceable due to lack of an accurate method for absolute value determination of PCB discharge.

Mr. Richel (G.E.) pointed out that EPA won't buy an answer to that argument which seeks to raise the effluent standard to a level that can be accurately measured. Mr. Savage (Monsanto) felt strongly, however, that this dilemma needed to be in the record. Others agreed.

Dr. Tucker (Monsanto) said ASTM would hold a round-robin on the EPA method and that Monsanto would participate. He will send the name of the ASTM contact to the participants so that they can decide if they want to join the round-robin test.

Mr. Sheppard (Westinghouse) said he was not prepared to accept that the proposed EPA method for determining quantities and types of PCB in samples and animals was accurate enough so that toxic limits could be defined on the basis of PCB levels of questionable accuracy.

Toxicity

Mr. Hosmer (Monsanto) stated that the original EPA publication on Water Quality Criteria came from a publication by McKee and Wolfe for the State of California. The McKee/Wolfe volume was well done and EPA did not change much of it. There is now a new 2-volume EPA edition extracted from the work of 10 committees of the National Academy of Sciences.

The toxicity of PCBs is related to salmon egg studies and Monsanto doubts the validity of this. Monsanto has made their feelings known to Dr. Thompson of EPA but he thought the criteria were sound. Since then Russell Train has been sued by NRDC and other groups on the grounds that the toxic pollutants list is not long enough and the proposed standards are too lenient.

Mr. Wright (Monsanto) went through the rationale used by EPA in arriving at a PCB discharge maximum of 0.0648 lb./day. He also showed how the standard could be changed and yet be consistent with published data on PCBs. Details follow.

(a) FDA set arbitrary proposed tolerances:

- 5 ppm in fish for human consumption
- 5 ppm in components for animal feed
- 0.5 ppm in complete animal feed

FUR 004506

- (b) Monsanto would not disagree with these tolerances.
- (c) FDA has presented - acute toxicity limits (point sources)
 - chronic toxicity limits (daily load)

Acute toxicity limits:

96 hour LC-50 studies for PCBs show:

- ~280 ppb in fresh water (bluegill)
- ~10 ppb in coastal or seawater (pink shrimp/oysters)

Published data based on materials leaving an outlet and going into a body of water. Acute limits have no direct relation to chronic limits.

Chronic toxicity limits:

The EPA equation is:

Chronic limit X water flow rate X safety factor = gm/day discharge

In Marine organisms the chronic limit is set as

$$\frac{0.5 \text{ ppm}}{30,000} = 0.0167 \text{ ppb}$$

In fresh water the chronic limit has been determined by using 0.5 ppm as toxic limit for salmon eggs and a 200,000 bio-magnification factor. This gives a chronic limit of

$$\frac{0.5}{200,000} = 0.0025 \text{ ppb}$$

The biomagnification level of 200,000 is based on unpublished data from Stalling & Meyer (Fish Pesticide Lab, U. S. Dept. of Interior, Columbia, Mo.). Dr. Simons said that in response to repeated requests by G.E. to the Columbia Lab the only reference they have been given is a Stalling & Meyer paper presented in Carolina in 1971 and which contains no mention of a 200,000 factor. Mr. Wright (Monsanto) stated he has seen only one literature reference to an accumulation factor of ~200,000 and that was in the hepato pancreas of a pink shrimp. If the PCB level was calculated on the basis of the total shrimp then the accumulation factor was only 22,000. Other references give accumulation factors of 1000-75,000 for whole tissues of various fresh water organisms. Accordingly, Mr. Wright proposes that a biomagnification factor of 30,000 and not 200,000 be used. He also proposes that we retain the chronic limit of 0.5 ppm without debating the salmon egg issue.

FUR 004507

This would lead to a discharge level for PCBs:

$$\frac{0.5}{30,000} \times 10,000 \times 0.5 \times 5.4 = 0.459 \text{ lb./day}$$

(flow rate) (safety factor) (conversion into lb./day)

This compares to the proposed standard of 0.0648 lb./day.

The safety factor comes from the EPA's Basis and Purpose document supporting the proposed effluent standards. It is supposed to take account of non-point sources of PCBs and is the same as 6 of the 9 toxic pollutants proposed for EPA standards. Monsanto's Medical Department feels this safety factor is arbitrary and confers no real toxicological benefit. If deleted, the revised Wright PCB discharge level would be 0.918 lb./day.

One of the most critical parts of the discharge equation is the water flow rate. A significant number of dielectric PCB manufacturers have plants on rivers where the flow rate is under 100 cfs or 1% of the EPA cut-off flow of 10,000 cfs. Several plants discharge into sewage plants which in turn have treated liquid flowing into rivers or streams with very low flow rates. For a river with 100 cfs flow the EPA maximum discharge would drop to 0.000648 lb./day or 0.152 lb. in a 250 work-day year. Even a revised standard of 0.918 lb./day at 10,000 cfs would only be 0.00918 lb./day at 100 cfs or ~2.3 lb. per 250 work-day year. Clearly this is a staggering target to have to meet.

Mr. Doty (Mallory) pointed out that in the present language of the EPA standards municipal sewage systems are not considered point sources.

Mr. Richel (G.E.) was of the opinion that where a plant discharged into a sewage system without treatment and hence into navigable waters the plant could have to comply with effluent standards on toxic pollutants. Mr. Papageorge (Monsanto) felt we should not be complacent and regard discharge to sewage plants being the answer to problems. Mr. Hosmer (Monsanto) stated that 10,000 cfs represents the largest flow the EPA will consider on the grounds that all industry would move to the largest river. The opposite of that argument is that it encourages small plants on every stream in the country.

Mr. Sheppard (Westinghouse) raised the issue of sedimentation. Since it appears that all the experiments to establish toxic values were run without sediment effects being considered, the real-life values were questioned. PCBs attach themselves to sediment. Furthermore the sediment moves down river and so PCB would be dispersed from the point source. It was pointed out by Dr. Richard (Monsanto) that Aroclor 1254 is soluble in water up to 50 ppb and that in time partitioning between sediment and

FUR 004508

water could take place. Mr. Wright (Monsanto) agreed that the discharge limits were extreme cases in the absence of sediment considerations and this was worth study and incorporation into arguments against the proposed levels.

Dr. Simons (G.E.) queried whether we were correct in concentrating our attacks on the criterion of toxic effects of mammals eating fish and ignoring the possible argument that fish per se must be protected. Mr. Wright (Monsanto) said the proposed standard says both. In salt water, standards are proposed that would protect the species that eat organisms containing PCB. In fresh water, if 0.5 ppm in salmon eggs correlates with <5 ppm in salmon then we are protecting salmon. He also said that the chronic limits and biomagnification limits he was proposing would protect the species themselves. We should, however, beware of arguing for higher levels in fish because we could draw EPA and FDA into conflict. The FDA levels in food, fish etc., are temporary tolerances and any arguments against their validity could lead to a reduction in these tolerances.

Mr. Savage (Monsanto) queried whether raising the level in organisms could cause possible danger to predators.

Dr. Simons (G.E.) quoted from page 39 of the Basis & Purposes document which states that the body burdens of birds and mammals should not increase over present levels. Page 51 of the same document cites a Nat. Acad. Sci. report which gives 2.0 ppm PCB as tolerable level in flesh of whole fish. $\frac{2.0}{200,000} = 0.1 \text{ ppm PCB}$

is given as tolerable level in water divided by a safety factor of 5 to give a maximum PCB concentration in water of 0.002 ppm. Thus EPA accepted 2 ppm PCB level in fish but got to water concentration of 0.002 ppm by using a high level of 200,000 for biomagnification and an arbitrary factor of 5.

If we were to revise the proposed EPA standard by:

- (i) using 2.0 ppm as chronic limit in fresh water species instead of 0.5 ppm;
- (ii) substituting 30,000 instead of 200,000 for biomagnification factor;
- and
- (iii) ignoring safety factor of 0.5

then the maximum permissible discharge in lb. PCB per day would be:-

$$\frac{2.0}{30,000} \times 10,000 \times 5.4 \approx 3.6 \text{ lb.}$$

FUR 004509

For the plant situation on a river with a flow of only 100 cfs the discharge would be 0.036 lb/day or 9.0 lb. per 250 work-day year. These levels are still far below the 5 lb./day given in ANSI C-107.

It is therefore apparent that other aspects of PCBs must be highlighted in order to get away from PCB discharge levels as low as even our "revised" proposals.

Aspects to concentrate on are:

- (1) Definition of PCBs that excludes biodegradable homologs.

This could exclude 90% or better of Aroclor 1016 and 65% or better of Aroclor 1242. On that basis, discharge levels would be as follows:

PCB Type	Stream Flow (cfs)	Discharge (lb.PCB equivalent/day)		
		EPA	Wright	Simons/Wright
Any PCB	10,000	0.0648	0.918	3.6
Any PCB	100	0.000648	0.00918	0.036
Aroclor 1016	10,000	0.648	9.18	36.0
Aroclor 1016	100	0.00648	0.0918	0.36
Aroclor 1242	10,000	0.194	2.75	10.8
Aroclor 1242	100	0.0019	0.027	0.10

- (2) Try to change stream flows from the present value of the flow rate in cubic feet per second (cfs) expressed as the probable low rate occurring during a 7 consecutive day period once in 10 years at the effluent point.

If the average flow rate over a period of time (to be agreed on) was used, the lowest flow rate in the equation could conceivably be raised by a factor of 10 from 100 to 1000. In the Simons/Wright version for a standard the Aroclor 1016 discharge could be raised to 3.6 lb./day at 1000 cfs flow and Aroclor 1242 to 1.0 lb./day at 1000 cfs flow.

- (3) Magnitude of PCB Point-Sources

It is possible that EPA and environmentalists are totally misinformed on the number of plants still using PCBs. In the U.S. today there are:

FUR 004510

Proposed Effluent Standards

Dr. Simons (G.E.) summarized the points he felt had to be dealt with in trying to change the proposed standard:

1. Higher persistence of higher PCBs versus alleged lower acute toxicity
2. Background levels of PCBs
3. Written testimony of participants and correlation

Toxicity

EPA Basis & Purpose document (page 50) states that 96 hour LC-50 to fish cannot adequately measure toxicity of PCB. Where is time demarcation between acute and chronic. Chronic effects can be either lethal or non-lethal.

Why are PCBs on the list on toxic grounds?

LD-50 for PCB is such that it is not considered toxic to humans.

For protection of aquatic life the Nat. Aca. Sci. set a 96 hour LC-50 of 10 ppm or less.

In proposing a definition for PCBs, Dr. Simons (G.E.) felt we should stress:

- (a) lack of persistence of homologs below tetra-chlorobiphenyl.
- (b) chronic toxicity does not arise for the lower homologs because they are non-persistent.
- (c) ignore acute toxicity - no real differences between Aroclor 1016, 1242 and 1254.

Participants need to consider: Do we have the best definition?

In the tentative EPA analytical method we should take note that in the table on p.3-22, the percentage of PCB was not controlled.

Mr. Carlson (E.U.C.) pointed out that in its present form the standard could saddle present PCB users with all other discontinued uses. Dr. Richard (Monsanto) pointed out that FDA and Boxboard Manufacturer's Association had agreed on a protocol that protected recycle paper users from just such a situation. Mr. Bergen (Monsanto) asked that copies be circulated to participants.

FUR 004512

We need to word our definitions to exclude residuals. Participants should exchange proposed drafts on wording regarding residuals by March 7.

G. E. stated we should not approach the hearing on the basis that things can't be done. Rather take the proposed standard and point out what it means in real life. In G.E.'s case they use X M lb./year and yet can't lost 0.5 drops per day. Stream flow rates make the matter worse. This is a point on which Dr. Thompson should be cross-examined.

Of the participants present, 5 plants discharge into sewers with outlets into rivers (very small except in 2 cases). Three plants discharge into small rivers.

No one at the meeting could cope with the EPA standard as it is proposed. Only Jard expressed an opinion on what level they could live with. (Jard stated 27 lb. Aroclor 1016 per day. This would be 2.7 lb. PCB by our proposed definition.)

FUR 004513

Monsanto

SPECIALTY & PROCESS CHEMICALS DIVISION

MONSANTO INDUSTRIAL CHEMICALS CO.
800 N. Lindbergh Boulevard
St. Louis, Missouri 63168
Phone: (314) 894-1000

March 18, 1975

Mr. Dan A. Albert
Staff Supervisor
Personnel Relations
Westinghouse Electric Corporation
Highway 58 West
South Boston, Virginia 24592

Dear Mr. Albert:

Attached are responses to the questions listed in your letter dated February 3, 1975.

In addition to the industrial hygiene practices described in our responses to your questions, I cannot overemphasize the need to properly control the use and handling of Inerteens to prevent their escape into the environment. Also, in discussing this information with your employees, I strongly recommend that the perspective gained from over 40 years of experience in which no human harm has resulted, be emphasized. In summary, the proper handling of Inerteens should pose no environmental or human health problems, permitting society's continued use of a very valuable material.

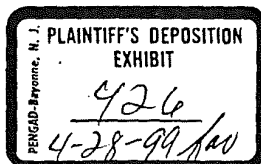
I hope the above information is useful to you. If I can be of further service please let me know.

Sincerely,

W. B. Papageorge

W. B. Papageorge
Manager, Product Acceptability
Specialty & Process Chemicals

WBP:pd



FUR 004516

• unit of Monsanto Company

WATER_PCB-SD0000071519

1. Question: Does Inerteen have permanent effects on the human body? If so, what type of permanent damage and how long a period of time does it take for this to develop? If not, explain why, if possible.

The polychlorinated biphenyls in Inerteen can have permanent effects on the human body.

The length of time or period of exposure necessary to develop symptoms depends on the degree or amount of exposure. In general, a single exposure for a few minutes to atmospheric concentrations that cause irritation to the eyes and/or respiratory tract would not be expected to cause either the skin eruptions or demonstrable liver injury. The problem arises from repeated and prolonged exposure to atmospheric concentrations in excess of the accepted Threshold Limit Levels or repeated and prolonged skin contact.

The polychlorinated biphenyls have not been recognized as skin "irritants" in the same sense that caustic materials or many organic chemicals are irritants. Because of their "solvent" action in removing the natural fats and oils from the skin, leaching, drying and chapping, repeated and prolonged skin contact should be avoided.

When the polychlorinated biphenyls are mixed with other chlorinated hydrocarbons, the mixture may be classified as a skin irritant.

The potential toxic effects in humans from excessive exposure to polychlorinated biphenyls include injury to the liver and chloracne. In animals, the liver effect is demonstrated by increased liver weights and injury to cellular tissue. Although chloracne is difficult to evaluate in animals, in humans, this takes the form of comedones (large blackheads with typical acute pustules) and may be an external symptom of over exposure preceding serious liver injury.

Animal data and human experience indicate that the toxic effects are similar whether exposure results from ingestion, inhalation of vapors, or absorption of the liquid material through the unbroken skin.

(See AIHA Hygienic Guide Series - "Chlorodiphenyls" attached.)

2. Question: Several hourly employees have mentioned recently that many chemicals such as Inerteen cause sterilization after prolonged use. Is this true?

There is no evidence that polychlorinated biphenyls cause "sterilization" in humans.

FUR 004517

3. Question: Since Inerteen affects birds and other animals, if there is no real effects to human beings, how do you explain it to employees in such a way that they will understand why it can kill a bird and not a human?

There is a potential real effect to humans - including death - as discussed in the answer to Question 1.

Due to differences in metabolism of food (and food contaminants) in birds and humans (and particularly the difference in the reproduction process in birds and mammals - including humans), birds are particularly sensitive to many chlorinated hydrocarbons including polychlorinated biphenyls.

4. Question: If an employee spills Inerteen on his clothing and later takes the clothing home to be washed with other clothes, will this have any effect on he or his family and should he carry his clothes home to be washed?

There should not be any effect on an employee or his family from home laundering of work clothing. If washed with other clothing, there may be residual odor of the chlorinated hydrocarbons in the clothing.

5. Question: Employees carry Inerteen home on the soles of their shoes and complain quite a bit about the effect Inerteen has on wearing out their shoes. Is this a serious problem? Will Inerteen in the soles and leather of shoes, over a long period of time, have an effect on the feet and skin since the shoe is the only protective equipment we wear on our feet and the Inerteen penetrates through the leather.

There should not be polychlorinated biphenyl on the floor for workmen to contaminate their shoes to carry home. The plasticizer or solvent action will destroy or shorten the life of the shoes. More importantly, the wearing of contaminated shoes could lead to absorption of the liquid through the soles of the feet as through any other unbroken skin surface.

6. Question: There is one employee in our plant who had no problem whatsoever with Inerteen years ago. After six years of using, now when he works in Inerteen (which is a part of his job) he develops a swelling on the inner bicep of his left arm, only in one location. Could this be from Inerteen or not? It goes away as soon as he gets out of the Inerteen. It is similar to the swelling after taking an injection.

FUR 004518

We do not believe there can be any association between "a swelling on the inner bicep" of the arm and exposure to polychlorinated biphenyls.

7. Question: Are there hand cleaning solvent materials that we should be using when working in Inerteen to coat our skin before working in it and to wash it off-- after we finish working in it? Please give your recommendation. Our employees working in Inerteen are not able to use gloves since it is an assembly area. Even if they could, the Inerteen would destroy the protective glove..

We assume the question refers to the use of "Barrier Creams" rather than a "hand cleaning solvent".

There are a number of barrier creams available to protect workers against water insoluble solvents. Probably the most effective include silicone "to provide an impenetrable shield". A problem with such creams is that they may offer a false sense of security.

Proper use includes a discipline which requires liberal application at the beginning of a work shift and after each washing of the hands during the work day.

FUR 004519

Industrial BIO-TEST Laboratories, Inc.

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TOXICOLOGY
ENVIRONMENTAL SCIENCES
CHEMISTRY
PLANT SCIENCES
MEDICAL SCIENCES

AREA CODE 312
TELEPHONE 272-303

April 18, 1975

APR 21 1975

Dr. George Roush, Jr.
Monsanto Company
800 North Lindbergh Boulevard
St. Louis, Missouri 63166

Dear George:

I fully appreciate that the meeting on PCB's today was not completely satisfactory and that many nagging questions remain. The enclosed is a brief summary of my personal views and I would appreciate any open and frank comments that you all may have.

Please let me know of any action that you contemplate in the way of seeking additional assistance in pathology or in contacting federal agencies. We will be pleased to be of help in any way that you may wish.

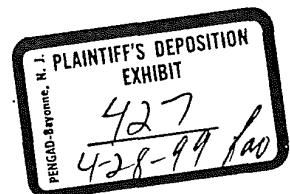
It is my feeling that we need to get together again within the next few weeks to continue our discussions.

Very truly yours,

J. C. Calandra
President

JCC:AR

cc - Dr. George Levinskas
Mr. Elmer Wheeler
Mr. William Papageorge



FUR 004520

REVIEW OF PCB MEETING

The central issue in question is whether the PCB's are carcinogens or not. The long term studies conducted at BIO-TEST indicate that the answer is no. Drs. Ward Richter and Donovan Gordon are of this opinion which is shared by M. L. Keplinger and J. C. Calandra.

On the other hand, a study conducted by Dr. Renata Kimbrough presents evidence that in female rats of the Sherman strain, liver carcinomas were found. This is the only study in which this finding is reported in rats. BIO-TEST has no basis for refuting the findings of Kimbrough except to take exception to the design of the experiment that used only female rats and to point out that to our knowledge no one else has reported similar results in rats. It should be noted that the earlier allegation by Kimbrough that bladder cancers developed in female rats fed PCB was successfully counteracted by BIO-TEST and Monsanto personnel.

Kimura¹ worked with Kanechlor-400, a commercial brand of PCB and in a rat study of 400 days' duration concluded that "PCB's induced a benign neoplastic change, though it seemed to be still short of malignancy, and that the change appeared exclusively in the females." The author expressed concern that the benign nodules in the liver may progress to carcinomas if "specific or non-specific stimuli are introduced into the animal."

FUR 004521

Ito² conducted a study in mice and found "hyperplastic nodules and well-differentiated hepatocellular carcinomas" at a dose level of 500 ppm of Kanechlor 500. Hepatocellular carcinomas were not induced by Kanechlor 300 and Kanechlor 400.

The evidence to date indicates that male rats are more resistant than females to the formation of nodular hyperplasia as well as hepatocellular carcinoma. Rats also are more resistant to the induction of these lesions than mice.

To return to the BIO-TEST studies on PCB, it should be noted that the liver sections which were read by the pathologists and reported in IBT No. 641-06672 and dated March 24, 1975, were not the same slides or sections as those reported on originally. The preserved livers were reprocessed by taking 4 "cuts" from different areas to obtain as large a representative sample as possible. It is not surprising that under these circumstances a different tabulation of the various primary liver lesions was found. Studies on thyroid hyperplasia and by Richter's associate, Dr. Stanley Vesselinovitch, have shown that this procedure generally results in a different qualitative and quantitative line-up of lesions that are reported by the same pathologist.

Ideally one would like to be able to reaffirm the original findings by this procedure, but this is not always possible because of the additional variables introduced. Serial sections of the liver would

FUR 004522

eliminate some of the covariants. The important point in the most recent study of the sections is the fact that no hepatocellular carcinomas were found which is in agreement with the earlier findings. It must be emphasized that the diagnosis of "hepatoma" by Gordon and Richter connotes a benign process and must not be confused with the classical definition of the term by "human" pathologists.

Further, Dr. Squires reviewed a number of the same slides on Aroclor 1260 with Drs. Gordon, Levinskas, Kimbrough and Richter and agreed with the BIO-TEST pathologists that liver carcinomas were not present in the slides. In addition, the original slides have been in the possession of FDA since June, 1973 and to date we have not been informed of any disagreement with BIO-TEST findings.

Dr. Squires has stated in a letter to Dr. Kimbrough dated November 12, 1974, that "I define 'discrete nodules' and 'trabecular (basophilic) hyperplasia' as precancerous lesions and thus indicative of carcinogenic response." This reflects a viewpoint which is not shared by all pathologists and there is nothing that BIO-TEST can do to change this definition except for its pathologists to accept or reject the view. Drs. Richter and Gordon do not accept Dr. Squire's definition.

Workers in the field have published extensively on the pathogenesis of hepatocellular carcinoma in recent years and the concepts have undergone considerable changes since the preparation

FUR 004523

of the final BIO-TEST report on chronic oral toxicity studies. One must note that Popper³ in his studies on Aramite in 1960 postulated that hyperplastic nodules were transformed into hepatocellular cancer; however, this concept was not generally accepted by the scientific community.

An excellent paper which describes "the highlights of some newer developments in our understanding of liver carcinogenesis" has been published by Farber.⁴ If the concepts presented in this paper as well as those of Squires, Saffiotti and others are accepted, a number of substances would have to be reclassified as liver carcinogens. Carried to extreme, we could argue that any substance that results in stimulation of liver microsomal enzymes or possesses hepatocytotoxic properties to any degree is a potential liver carcinogen.

BIO-TEST is unwilling to accept these concepts. The lesions seen in the livers of the rats in its PCB studies for Monsanto do not show vascular invasion, metastases or anaplasia - all classical features of carcinoma. We continue to view the lesions seen to be benign.

Several additional things need to be done by BIO-TEST and these include:

- (a) Re-examine the original liver slides.
- (b) Cut new sections at different levels from original paraffin blocks and read slides.
- (c) Tabulate liver findings separately in female and male rats.
- (d) If possible, develop information on the reversibility of the liver changes.

FUR 004524

It is important to point out the following:

1. The BIO-TEST position was and remains that the PCB's were not shown to be liver carcinogens in its studies. This conclusion is the opinion of its resident pathologists as well as its independent consultant.
2. The BIO-TEST results show that a no-effect level for the development of hyperplastic nodules was found in each of its studies.
3. BIO-TEST has no means at its disposal to dispute the findings of Kimbrough that Aroclor 1260 in female Sherman rats is a liver carcinogen except on the basis of experimental design.
4. BIO-TEST is not in agreement with the classification by Squires et al. that considers hyperplastic liver nodules to be pre-cancerous.
5. BIO-TEST studies on PCB's meet the scientific standards of Toxicology and Pathology and we are prepared to assist Monsanto in any adversary situation in or out of government.

J. C. Calandra

April 18, 1975

References

- 1 Kimura, N. T. Gann 64:105 (1973).
- 2 Ito, N. J. Nat. Cancer Inst. 51:1637 (1973).
- 3 Popper, H. Cancer 13:1035 (1960).
- 4 Farber, E. Arch. Path. 98:145 (1974).

FUR 004525

~~CONFIDENTIAL~~

July 18, 1975

11-69

Dr. J.C. Calandra
Industrial BIO-TEST Laboratories
1810 Frontage Rd.
Northbrook, Ill. 60062

re: AROCLOR 2-year Rat Feeding Studies

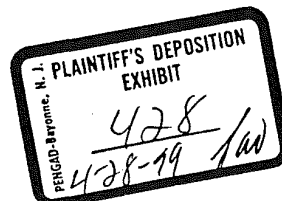
Dear Joe:

The attached table summarizes a comparison of the 3 revised AROCLOR reports (1242, 1254, 1260).

In 2 instances, the previous conclusion of "slightly tumorigenic" was changed to "does not appear to be carcinogenic". The latter phrase is preferable. May we request that the AROCLOR 1254 report be amended to say "does not appear to be carcinogenic".

The number of hepatomas reported for AROCLORS 1260 and 1242 have been interchanged. This appears to have arisen from confusion regarding the numbering of the animals. The original reports show tumors in animals with numbers in the 100-300 range for AROCLOR 1260 and in the 500 to 800 range for AROCLOR 1242. This leads me to conclude that the numbering scheme shown in the second set of reports is correct. With AROCLOR 1254 confusion is compounded. The original report showed tumors in animals with numbers in the units to teens, but the revised report shows animal numbers ranging from 40 to 1000. Can this be straightened out?

I was unable to reconcile the differences in the animal numbers between the first supplemental report and the original reports, I had inquired as to the changes in the numbers. As I recall, I was told that the sections had been renumbered when the new slides were made and that a key relating to the sets of numbers



FUR 004526

Dr. J.C. Calandra
July 18, 1975
Page - 2 -

would be supplied. This has not been done. It may not be necessary for AROCLORS 1260 and 1242, but AROCLOR 1254 remains unresolved.

Insofar as I can see, the remainder of the reports appear acceptable.

Kindest personal regards,

Sincerely,

George J. Levinskas, PhD
Mgr., Environmental Assessment
and Toxicology

/bkp

att.

cc: Dr. George Roush, Jr., M.D.

FUR 004527

WATER_PCB-SD0000071530

<u>Product</u>	<u>Supplemental Report #1 (mailed)</u>	<u>Supplemental Report #2 (JCC delivered)</u>
<u>AROCLOR 1260</u>		
conclusion	slightly tumorigenic	does not appear carcinogenic
hepatomas	3	7
range of test animal nos:		
p. 9	600 to 800	100 to 300
p. 10	1000 series	800 to 900
p. 11	70 to 100	100 to 40
p. 12	500 to 600	80 to 200
p. 13	600 to 700	200 to 300
p. 14	700 series	200 to 300
<u>AROCLOR 1254</u>		
conclusion	slightly tumorigenic	slightly tumorigenic
hepatomas	6	6
<u>AROCLOR 1242</u>		
conclusion	slightly tumorigenic	does not appear carcinogenic
hepatomas	7	3
range of test animal nos.	as in report #2 for AROCLOR 1260	as in report #1 AROCLOR 1260

FUR 004528

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AREA CODE 312
TELEPHONE 272-3030

August 4, 1975

Dr. George J. Levinskas, Manager
Environmental Assessment and Toxicology
Monsanto Company
800 North Lindbergh Boulevard
St. Louis, Missouri 63166

Dear George:

Re: Aroclor - 2 Year Rat Studies

In regard to the comments and questions covered in your letter dated July 18, 1975, pertaining to the above, please note the following:

1. We will amend our statement in the last paragraph on page 2 of the Aroclor 1254 report to read, "does not appear to be carcinogenic" in place of "slightly tumorigenic" as requested.
2. In regard to the animal numbers in the Aroclor 1242 and 1260 reports, they are correct in our final revised report. In the original reports, the Aroclor titles for these two materials were reversed.
3. The animal identification numbers appearing in the reports on evaluation of additional liver sections are the same as those in our original report. The animals were not renumbered.
4. We cannot find any discrepancy in animal identification numbers in the reports (original, re-evaluation, final revision) on Aroclor 1254. However, in the report on re-evaluation of additional liver sections dated March 24, 1975, there was a typographical error on page 1 which referred to Aroclor 1260 instead of 1254. Perhaps this is the basis of your confusion.

I hope that this will serve to further clarify the situation. Thank you for your assistance and cooperation.

Sincerely yours,



J. C. Calandra
President

FUR 004529

ICC:AR



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OCT 17 1975

OFFICE OF ENFORCEMENT

Monsanto Industrial Chemicals Company
800 N. Lindbergh Boulevard
St. Louis, Missouri 63166

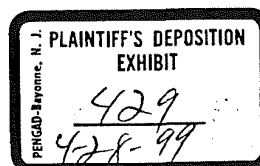
OCT 22 1975

Gentlemen:

Recent governmental sampling data indicate the presence of Polychlorinated Biphenyls (PCBs) and comparable chemical substances in the air, in water bodies, and in fish in several areas of the country. In order to determine the nature and extent of the possible adverse effects resulting from the presence of PCB compounds in the environment, the Environmental Protection Agency (EPA), in cooperation with other federal and State agencies, is attempting to determine the sources and amounts of PCBs entering the environment. It is important that this effort be carried out without delay.

It is our understanding that your company handles PCB compounds or mixtures or comparable chemical substances in its operations. I am therefore requesting, pursuant to the authority provided by Section 308 of the Federal Water Pollution Control Act, as amended, 33 U.S.C. 1318, and Section 114 of the Clean Air Act, as amended, 42 U.S.C. 1857c-9, that your company furnish EPA with information pertaining to your use and handling of PCBs and comparable chemical substances. In addition to a general description, which should include information as to sources, quantities, uses, and ultimate disposition, you should respond in detail to the enclosed questions. If any question is not applicable to your company or operations, please so indicate by responding "not applicable."

The information requested herein must be provided notwithstanding its possible characterization as confidential information or trade secrets. Should you so request, however, any information (other than effluent or emission data) which the Administrator of this Agency determines to constitute methods or processes entitled to protection as trade secrets will be maintained as confidential, pursuant to procedures specified in 40 CFR Part 2.



FUR 004530

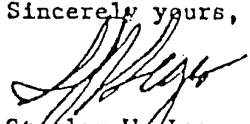
Within 14 days of receipt of this letter, your company must provide all information concerning your current status and activities and covering the twelve month period immediately preceding receipt of this letter.

Within 30 days following receipt of this letter, your company must provide all information for all of the prior years indicated.

The information required herein should be sent directly to the address indicated below. If you have any questions you may call the person indicated below or Mr. Blake A. Biles of our office at (202) 755-8731.

We appreciate your prompt cooperation in this matter.

Sincerely yours,


Stanley W. Legro
Assistant Administrator
for Enforcement

Enclosure

Regional Contact:
Mr. Earl J. Stephenson
Director, Enforcement Division
Environmental Protection Agency
1735 Baltimore
Kansas City, Missouri 64108
Telephone: (816) 374-2576

FUR 004531

POLYCHLORINATED BIPHENYL (PCB) COMPOUNDS OR MIXTURES

Within 14 days of receipt of this letter, your company must provide all information concerning your current status and activities and covering the twelve month period immediately preceding receipt of this letter.

Within 30 days following receipt of this letter, your company must provide all information for all of the prior years indicated.

FOR PURPOSES OF THIS LETTER, THE PHRASE "PCB COMPOUND OR MIXTURE" INCLUDES ALL CHEMICAL SUBSTANCES KNOWN OR BELIEVED BY YOU TO BE PCB COMPOUNDS OR MIXTURES OR OF A SIMILAR CHEMICAL NATURE, IRRESPECTIVE OF TRADE NAME, AND SPECIFICALLY INCLUDING CHLORINATED TERPHENYLS.

1. For each PCB compound or mixture produced or imported by your company, for each company facility, during each year of 1971, 1972, 1973, 1974, and the first two quarters of 1975:
 - a. The total amount of each PCB compound or mixture produced or imported.
 - b. The name and address of each of your company's facilities which handle PCB compounds or mixtures (including production facilities and wholesale and retail outlets), and the amount of each PCB compound or mixture distributed through each facility.
 - c. The name and address of each customer of each PCB compound or mixture, the amount of each PCB compound or mixture obtained by each customer from each facility, and each customer's delivery point(s) for the receipt of each PCB compound or mixture.
2. For each PCB compound or mixture incorporated by your company into its products, for each company facility, during each year of 1971, 1972, 1973, 1974, and the first two quarters of 1975:
 - a. A description of each product.
 - b. For each product the total amount incorporated of each PCB compound or mixture.

FUR 004532

2. (continued)

- c. For each product the name and address of each source from which your company obtained each PCB compound or mixture, and the amount of each PCB compound or mixture obtained from each source.
 - d. The name and address of each of your company's facilities which handle such products (including production facilities and wholesale and retail outlets), and the amount of each product distributed through each facility.
 - e. The name and address of each customer of each product, and the amount of each product obtained by each customer from each facility. For consumer products list only the total production of each product at each facility and the total number of customers. Do not provide the name and address of each customer of consumer products.
3. For each PCB compound or mixture used by your company in its operations other than for incorporation into its products, for each company facility, during each year of 1971, 1972, 1973, 1974, and the first two quarters of 1975:
- a. A description of each use.
 - b. For each use the total amount of each PCB compound or mixture.
 - c. For each use the name and address of each source from which your company obtained each PCB compound or mixture, and the amount of each PCB compound or mixture obtained from each source.
4. For each PCB compound or mixture reclaimed by your company, for each company facility, during each year of 1971, 1972, 1973, 1974, and the first two quarters of 1975:
- a. A description of each method of reclamation.
 - b. For each method of reclamation, the total amount of each PCB compound or mixture reclaimed.
 - c. The total amount of each PCB compound or mixture reclaimed.

FUR 004533

- b. The flow and/or composition of any discharges or emissions by the company (into waters of the United States or Publicly Owned Treatment Works, or into the air) which contain PCB compounds or mixtures.
 - c. Concentrations of PCB compounds or mixtures in receiving waters (both upstream and downstream) of any discharges by the company which contain PCB compounds or mixtures and concentrations of PCB compounds or mixtures in the air in the area of the company.
8. The methods by which PCB compounds or mixtures are transported to, by, and/or from your company, including:
- a. A description of each method of transportation, and the form in which PCB compounds or mixtures are transported by each method. Where different methods of transportation are used at different facilities specify which transportation method is used at each facility.
 - b. The names and addresses of all known transportors of PCB compounds or mixtures.
9. All occasions (including spills) of which you are aware on which PCB compounds or mixtures have or may have been introduced into the environment. In particular, describe such occasions insofar as they involved PCB compounds or mixtures in their liquid state, as incorporated into closed systems, or as incorporated into open systems. For each occasion, indicate name and address of party involved; dates, time, and location of the discharge or spill; and the amounts involved.
10. A description of any adverse health or environmental effects which you know or believe to have resulted from the introduction of PCB compounds or mixtures into the environment. Indicate any specific occasions including dates, times, locations, amounts, and parties involved for which such effects are known.
11. Any and all other information which you possess concerning:
- a. The production, importation, reclamation, use, distribution, and disposal of PCB compounds or mixtures.

FUR 004535

- b. The discharge of PCB compounds or mixtures into the environment.

In addition to the above, EPA would appreciate receiving any other information which you possess concerning the distribution and discharge of PCB compounds or mixtures by sources other than your company, including your company's customers and sources.

FUR 004536

Monsanto

FROM NAME & LOCATION: David Wood-St. Louis-B2SD

DATE

October 30, 1975

cc: f-EPA

SUBJECT

~~by EPA~~

REFERENCE

COMMENTS ON EPA LETTER REC'D 10-17

TO

W. B. Papageorge
B2SK

1. Bill, this seems to be a new version.
2. Page 1. Cl. Terphenyls specifically mentioned.
3. a) Production records answer 1(a).
b) Remember we warehoused PCBs for short period 1974 ahead of labor contract renewal.
c) Question 1c raises a problem that has been at back of my mind. #2 report is supposed to show "ship to" address, but if this is case, why do 3rd party W/GE shipments appear under "bill to" locations.
4. Q2 a) No problem
b) No problem
c) No problem
d) No problem
e) Policy - Hanley level?
5. Q3-No problem except 71/72
6. Q4-No reclamation.
7. Q5-a) No problem
b) Difficult. Can split Dielec/HT/Pydraul
But some returns mixtures of oil/PCB, etc.
c) Can do.
d) Difficult
e) Difficult
8. Q6 - Available
9. Q7 - a) Guess we have
b) Guess we have
c) Guess we have
10. Q8 - a) Bulk Rail
Bulk R - 3 accounts
Drum - Specify drum construction
b) E. M. Potter

FUR 004537



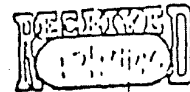
11. Q9 - Should answer from our activity?
12. Q10 - None? Yusho? Cloracne years ago - Dangerous Question.
13. Q11 - a) Might get HUB again?
b) Should write this one very carefully - can make some positive points in this section.

David Wood

/deb

FUR 004538

Monsanto



1-E

3

MONSANTO INDUSTRIAL CHEMICALS CO.
800 N. Lindbergh Boulevard
St. Louis, Missouri 63165
Phone: (314) 694-1000

December 11, 1975

Mr. Earl J. Stephenson
Director, Enforcement Division
Environmental Protection Agency
1735 Baltimore
Kansas City, Missouri 64108

Dear Mr. Stephenson:

Attached is a response to the questionnaire which accompanied
Mr. Stanley Legro's letter dated October 17, 1975.

To the best of my knowledge and belief, the information contained
in this response represents the best information available to Monsanto.

If I can be of further assistance, please let me know.

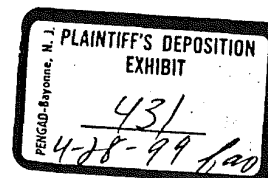
Sincerely,

W. B. Papageorge
Manager, Product Acceptability
Process Chemicals Division

ajt

Attachment

CC: Mr. Stanley W. Legro
US Environmental Protection Agency
401 "M" Street, SW
Washington, D.C. 20460



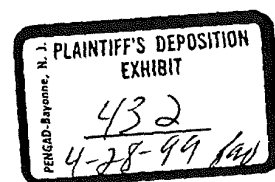
FUR 004539

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Mortality of PCB Workers at
the Monsanto Plant in Sauget, Illinois

Judith A. Zack and David C. Musch
December 14, 1979

FUR 003370



HAVING BEEN DULY CAUTIONED AND SWORN TO TELL THE
TRUTH, THE WHOLE TRUTH AND NOTHING BUT THE TRUTH,
TESTIFIED AS FOLLOWS:

DIRECT EXAMINATION

BY MR. POHL:

Q Would you state your full name?

A Phillip, middle initial "S", Smith.

Q And where do you live?

A Barrington, Illinois.

Q Are you a former employee of Industrial
Biotest Laboratories, Inc.?

A Yes, I am.

Q Now, prior to your testimony here before the
Court today, have you visited with anyone from
Monsanto in your home in recent months?

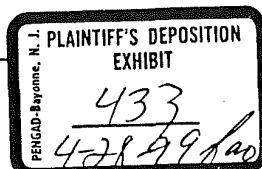
A Yes, I have.

Q Who was that?

A A Mr. Tim Peck.

Q And, very, very briefly, what was the
substance of that visit and the nature of the
visit?

A Mr. Peck wanted to discuss Aroclor compounds



FUR 005028

MINUTES OF MEETING OF THE CORPORATE DEVELOPMENT COMMITTEE

November 17, 1969

Present: Messrs.

E. J. Bock, Chairman
 H. H. Bible
 J. R. Eck
 J. L. Gillis
 E. J. Putzell
 C. H. Sommer
 J. N. Ehlers, Secretary

CHEMICAL MEETING

The President reported that a chemical meeting is to be held in Washington on Wednesday, November 19, with Secretary Stans and officials in the Shultz Committee. It was decided that Mr. Reese should attend on behalf of Monsanto and also Mr. Bible, if indicated.

TV SPECIALS

The President advised the meeting that the rash of complaints about the most recent TV special indicated a need to re-examine our position on them. It was the consensus that the most recent specials were not satisfactory and did not portray a desirable image of the company to the viewing public. The balance of the TV specials should be examined with the view of canceling them or if firm commitments exist, to dispose of them. Also, that the advertising firm in charge of them should be replaced, with public announcement of the change. He requested Mr. Gillis to look into this matter and to recommend a course of action on it.

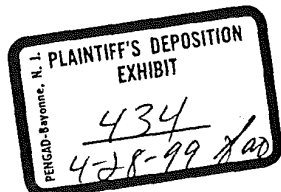
ADVANCED MATERIALS AND COMPOSITES REVIEW - NEW ENTERPRISE DIVISION

Present: Messrs. R. S. Gordon, L. E. Klein, T. L. Gossage

Cerex

Production from the Mark II machine is meeting our commitment and will produce nearly double the sales commitment in November. The plant construction is completed, the machines are being installed, and the testing program will commence December 15.

- Total capacity of the four machines will be 2 M lbs. with sales of approximately \$9 M annually.
- 1970 forecast is for sales of \$5 M and after-tax loss of \$.8 M. This reflects a \$3.1 M SARE, an increase of \$1.1 M over 1969. The increase is to cover development of new stretch materials and other products which has been delayed six months due to the pressure of production commitments.



FUR 003935

- Future plans include U.K. production with an appropriation request to be submitted in mid-1970. This is being deferred until the start-up of the Mark III production is complete and an assessment of this operation can be made.

Decision: The Division should present to the CDC a review of the start-up operations of the Mark III machine in mid-February when this is completed.

Metal Fibers Program

This program is running approximately 6 - 12 months ahead of its R & D plan.

- 60 hours continuous run of 6 mil aluminum wire has been demonstrated.
- Steel technology is 6 - 10 months ahead of schedule. Can reproducibly spin 3 mil steel wire.
- Aim to develop in-line takeup of steel wire within six months.
- Steel represents the greatest opportunity to Monsanto, although development programs are being conducted with both aluminum and copper.

Conclusions: The President complimented the Division on the real accomplishment that they have made in this program which is an exciting one. The Division is requested to develop a business plan for this field for consideration by the Committee.

Graphite Fiber Program

Graphite fiber is the stiffest and strongest material per unit weight commercially feasible today. The market for this material is dependent upon the ultimate price. At \$300 per pound a limited market of \$3 - \$15 M is foreseen. At \$20 per pound the market would exceed \$200 M annually.

Laboratory evaluations indicate a \$20/lb. price is commercially feasible. This reflects an \$8.25/lb. cost of manufacture at a 1 M lb. production level, and a \$2.00/lb. cost of special acrylic precursor.

Monsanto franchises in this field consist of strong technical strength in fibers and their treatment.

- Properties of the finished graphite fiber are completely dependent on the properties of the precursor. A high quality acrylic precursor is a necessity.
- Possibility of patent shelters exist in process steps but not in the material itself.

FUR 003936

Research Objectives

- Develop defect-free, high tenacity precursor.
- Reduction of precursor manufacturing cost.
- Increased rate of throughput in pre-treatment and graphitization steps.
- Increased volume of throughput with greater numbers of fibers.

Brake Disk and Turbine Blade Programs

Progress in the development stage is very satisfactory. Several companies have expressed an interest in an arrangement to obtain the benefit of our technical strengths in these product lines.

Business Plan

Monsanto technology extends through sub-components level. Main issue is to develop the business plan for components such as brake discs and turbine blades. The division recommends continued approval of the June 9 recommendations --

1. Proceed with development of raw material, sub-component and finished parts technology with projected A.T. losses of \$1.25 M in 1969 and 1970, and \$1 M in 1971.
2. Explore, without commitment, possible acquisition candidates during the next six to twelve months.

Conclusions: The President expressed the interest of the Committee in the technical accomplishments of this program and concluded that it should be pursued further. The business plan as proposed by the Division is not accepted at this time but may be operated under as an interim development plan. The projected potential for the business of \$13 - \$35 M with \$1 - \$2.5 M net income by 1974 is not acceptable to warrant continuation of the program. The Division is requested to develop a full business plan with strategies to make the project a commercial success in the shortest possible time. The Division is instructed to present the business plan for the Committee's review in June 1970.
(Excerpt to Dr. R. S. Gordon.)

ORGANIC DIVISION, LAW AND MEDICAL DEPARTMENTS -- REPORT ON POLY-CHLORINATED BIPHENYLS

Present: Messrs. C. J. Smith, J. Mason, T. K. Smith, H. S. Bergen, J. E. Springgate, R. E. Kelly, E. P. Wheeler, Rodney Harris, Jr., D. W. Miller, W. C. Robinson

Monsanto's worldwide Aroclor business amounts to 104 M lbs./yr., 70M used in functional fluids and 34 M in plasticizers. This represents \$22 M in sales. Products range from monochlorobiphenyl

FUR 003937

to decachlorobiphenyl, terphenyls, and chlorinated terphenyls. Production locations are at Anniston, Alabama, Sauget, Illinois, Newport, U.K. and Yokkaichi, Japan.

Environmental Aspects - E. P. Wheeler

The 5 and 6 chlorinated biphenyls (Aroclor 1254 and 1260) have been found at limited locations in water, in birds and some forms of aquatic life. Recent indications are that such biphenyls may affect reproduction of fowl life and may be toxic to shrimp. These products are not toxic from the acute standpoint to man or fish but there is some evidence of ecological buildup in certain water deposits, in fish and ultimately in bird life.

- Aroclors 1248 and lower in number are believed to be biodegradable but this has not been conclusively established as yet.

Plan of Action - H. S. Bergen and J. E. Springgate

The availability of alternate products to satisfy customer requirements was reviewed. Main problems are that no replacement product is available for capacitors and replacement products for other uses pose a pollution problem.

In plasticizer uses, evidence is not available as to whether Aroclors escape from end products, either through leeching or by dispersal in burning.

The recommended plan of action is to establish a tailored program for each business group and each customer market situation to assure that the loss of PCB's in the environment, if any, is minimal.

FUR 003938

1. Appoint a Project Manager - responsible for the overall management of the Aroclor pollution problem. He would be assisted by a Task Force from members of each business group plus Medical, Law, Engineering and Manufacturing.
2. Notify all Aroclor customers of PCB problem.
3. Reduce and effectively control PCB effluents from Monsanto plants.
4. Educate customers on need to reduce and effectively control PCB effluents at their plants.
5. Develop and Implement new packaging systems for Aroclor 1254/1260.
6. Introduce to market, replacement products for Aroclor 1254/1260.
7. Continue and expand biodegradation test program with Aroclor series, particularly 1242, 1248 and 1254.
8. Continue toxicological test program.
9. Accelerate present analytical test program.
10. Determine feasibility and cost of eliminating 5/6 Cl₂ in Aroclors 1242 and 1248.
11. Study incineration products.
12. Develop business plan to offer:
 - Monsanto Fluid Reclamation and Recovery with Enviro Chem. (Reclamation already under way at Findett.)

Cost of this program is estimated at approximately \$400M SARE and \$700M capital to change equipment.

Conclusions: In light of the recent and developing evidence of a possible threat to certain species of bird and aquatic life, we should plan to discontinue the manufacture of Aroclors 1254 and 1260. The Division is instructed to develop a program to discontinue these products and report this to the Committee.

The status of Aroclor 1242 should continue to be tested to determine whether it contributes to this problem. Other products which might be involved should also be examined.
(Excerpt to Messrs. H. L. Minckler, Rodney Harris, Jr., R. E. Kelly, T. K. Smith.)

FUR 003939

DONATION OF LAND TO MONSANTO FUND

The President advised he would recommend to the Board of Directors the donation of the following parcels of land to the Monsanto Fund:

Nitro - 122 acres
 Revere Beach - 16 acres
 Seattle - 20 acres

The Treasury Department is requested to prepare a memorandum for submission to the Board of Directors at the December meeting. (Excerpt to Messrs. C. P. Cunningham, P. J. Dowd, Rodney Harris, Jr., J. D. Mahoney, H. L. Minckler, Finis Morgan, T. H. Rasmussen, T. K. Smith.)

APPROPRIATION REQUESTS AND RETIREMENT REQUESTS

Action was deferred on the following retirement requests:

Organic Division No. OD-2000 - Retire phthalic anhydride plant - Chocolate Bayou

Organic Division No. OD-3182 - Retire phthalic anhydride plant - J. F. Queeny Plant

The President advised that he would approve -

Organic Division AR #CEA 2109/2172 - Denora Chlorine Cell Conversion - Krummrich Plant - \$590,000; and Retirement of 22 DeNora Chlorine Cells - \$595,262 gross asset value.

MISD Appropriation Request No. 23 - IBM System 360 Model 40 to replace IBM 7740 Switching System and supply additional capacity - basic annual lease \$154,200.

OTHER BUSINESS

Mr. Putzell advised the Committee of the pendency of a proposed arbitration proceeding against Scientific Design under the contract for design and construction of the MAL Phenol Plant. Mr. Putzell and Mr. Sommer will review with Mr. Throdahl the value of our continuing relationship with Scientific Design as may be affected by instituting the arbitration proceedings, following which the matter will be reconsidered by the Committee.

A review of the Packaging Division operations is to be scheduled in the near future.

J. N. Ehlers
 Secretary

FUR 003940

October 23, 1959

AIR MAIL

Mr. H. Wilbur Speicher
Administrator, Industrial Hygiene
Westinghouse Electric Corporation
East Pittsburgh, Pennsylvania

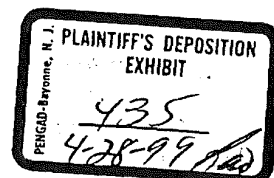
Dear Wilbur:

Thank you for your letter of October 21 inquiring about the safe use of trichlorodiphenyl and a mixture of 40% trichlorobenzene and 60% hexachlorodiphenyl.

We market trichlorodiphenyl as "Aroclor 1242". The combination of hexachlorodiphenyl and 40% trichlorobenzene is known as "Inertacn 870". The diphenyl in this combination is our "Aroclor 1260".

The physical and chemical properties of the Aroclors mentioned are shown on the table on pages 4 and 5 of the enclosed Aroclor bulletin. Enclosed also is a reprint indicating the results of chronic toxicity studies with Aroclors 1242 and 1254. The following comments answering your questions serially are based on information contained in these bulletins.

I believe prolonged and repeated skin contact with any of the Aroclors should be avoided for two reasons. In the first place, the less chlorinated products are liquids and are excellent solvents for oils and fats in the skin as well as other organic materials. Secondly, it is possible that prolonged or repeated skin contact could lead to chloracne. I know of only two cases where such experience has developed during the long history of production and use of the Aroclors. In one case, an Aroclor was being used as a heat transfer medium in a system that allowed vapors to escape when the material was heated to 600°F. Several workmen developed "blackheads" which were found by an industrial physician but which in his words were so insignificant that the men were not aware of them nor would a general practitioner notice them. This indicates to me, however,



FUR 003941

that sufficient exposure, whether by inhalation of vapors or skin contact, can result in chloracne which I think we must assume could be an indication of more serious systemic injury if the exposure was allowed to continue.

A second case of mild chloracne about which we have any knowledge resulted from workmen dipping their hands in the liquid Aroclor as if it were mineral oil or vegetable oil. In addition, their clothing sooner or later became impregnated with the material and thus exposure was magnified.

You asked at what temperature local exhaust ventilation should be provided. Although the distillation range for Aroclor 1242 is 325-360°C. and 385-420°C. for Aroclor 1260, I feel that good practice dictates that local exhaust ventilation be provided when any of the Aroclors are heated above 150°F. in open tanks or in any systems where the material is not in a completely enclosed system (vapor-proof tanks, kettles, pumps, piping, etc.). This may be ultra conservative because as the distillation ranges and vapor pressure curves (page 12 of the Aroclor bulletin) indicate, the loss of vapors at 150°F. should not be significant except in any work area where general ventilation or air changes do not exist.

Your next question related again to possible skin and systemic effects and I believe it is answered above.

In connection with the 40% trichlorobenzene-60% Aroclor 1260 combination, I believe the thoughts expressed above also apply. I understand that the trichlorobenzene which is used is a mixture of the 1,2,3-, 1,2,4-, and 1,3,5-isomers which will begin to distill at 205°C. Again, I believe this indicates a low vapor pressure for the solvent at room temperatures. The only reference we have to trichlorobenzene toxicity is contained in the Public Health Service Publication No. 414 entitled "The Halogenated Hydrocarbons Toxicity and Potential Dangers" by Dr. W. F. von Oettingen, U.S. Government Printing Office, 1955 (pages 297-298). Dr. von Oettingen refers to some work done in 1937 which indicated that the trichlorobenzene was less toxic than mono or dichlorobenzene. In my opinion, a reasonable MAC for this material would be 100 parts per million.

The enclosed publication on the toxicity of Aroclor 1242 and 1254 suggests an MAC for 1242 of 2 milligrams per cubic meter which is twice that recommended by the ACGIH for a chlorinated diphenyl of unstated chlorine content. In the case of 1254, the publication suggests that the MAC of 1 milligram per cubic meter "recommended tentatively for safe industrial practice by the American Conference of Governmental Industrial Hygienists" is reasonable. On the other hand, reference to Henry Smyth's Cummings Memorial Lecture of 1956 in which he discussed the basis for the then existing "hygienic standards" indicates that

Mr. H. Wilbur Speisner--Page 3--October 23, 1959

Henry agrees that MACs of 1 mg/cu.m. for Aroclor 1242 and 0.5 mg/cu.m. for Aroclor 1254 are more realistic. In the absence of any chronic toxicity data on Aroclor 1260, we suggest an MAC of 0.5 mg/cu.m., the same as in the case of 1254.

I have been in one plant where these materials were used for capacitors and transformers. The care and handling and the provisions of exhaust ventilation were not in accordance with the thoughts expressed above. The only reported difficulty was some mild eye irritation when impregnation cabinets where the items were heated to 110-120°C. released vapors of trichlorobenzene and the Aroclor into the workroom when the cabinet doors were opened. In my mind, such cabinets should be ventilated to remove the vapors rather than allow them to be released into the working atmosphere.

I have been told that your company has had some 20-25 years' experience with the products discussed above. It was suggested that Mr. James B. Ford, manager of transformer manufacturing engineering at your Sharon Plant would be a source of information regarding experience with Inerteen PFO. Similarly, Mr. R. E. Marbury of your Bloomington, Indiana Plant has been associated with the use of Aroclor 1242. Perhaps you have already discussed potential exposures with these gentlemen. If so, I would be interested in learning of their practical experience with these products.

I look forward to seeing you in Pittsburgh next week.

Sincerely,

Elmer P. Wheeler
Assistant Director
Medical Department

EPW:gh
Enclosures 2

FUR 003943