

ORGANIC CHEMICALS DIVISION
SALES INFORMATION BULLETIN

THIS INFORMATION SHOULD BE
USED WITH DISCRETION AS IT
HAS NOT BEEN CHECKED FOR AC-
CURACY AND SUCH CONSIDERA-
TIONS AS TOXICITY AND PATENT
CONFLICT EXCEPT WHERE SPECI-
FICALLY STATED.

DATE August 9, 1957

SUBJECT AROCLOR USE TO INCREASE THE
INSECTICIDAL LIFE OF LINDANE

The attached recent publication again points out the marked influence of Aroclor 5460 to enhance the insecticidal value of Lindane.

While your customers in this field probably have the Journal of Economic Entomology, we have ordered sufficient reprints so that you can pass copies along for your customer's convenience.

It costs a good deal to spray trees, shrubs, etc., and the effective life of the insecticides may not be more than a few weeks. If it rains, most ordinary sprays are washed away.

The attached article indicates what Aroclor does to improve this, and you can see that its use with Lindane offers considerable economic advantage.

Technically, it is believed that Aroclor may do the same thing when used with other chlorinated insecticides where mutual solubility prevails; in fact, the function of Aroclor resin as a "sticker" seems worthy of investigation for every insecticide.

P. G. Benignus

PGB:nb
Att.

TNGS 019125

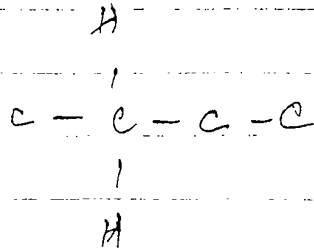
MONSANTO ACCEPTS NO LIABILITY FOR LOSS OR DAMAGE RESULTING FROM THE USE OF PRODUCTS DESCRIBED ABOVE

PLAINTIFF'S	
EXHIBIT NO.	82
FOR IDENTIFICATION	
DATE	9-14-55
RPTD	AS

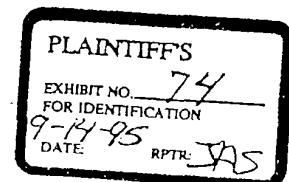
STLCOPCB4024859
WATER_PCB-SD0000042975



AROMATIC



ALIPHATIC



Brussels, Belgium
26th January, 1967
SWEDEN, AROCLOR

DW:gb

G. R. Buchanan - St. Louis

P. G. Benignus - St. Louis
D. S. Cameron - Brussels
Dr. D. V. N. Hardy - London
Dr. R. Emmet Kelly - St. Louis
R.A. Steenrod - St. Louis

THIS COPY FOR

We recently sent you a translation of a Swedish newspaper article referring to the identification in nature of polychlorinated biphenols. Because some of the uses claimed for the materials fell in line with the uses of our own chlorinated diphenyls, we made a point, during our recent visit to Sweden, of visiting the research institute involved and discussing their particular programme of work.

To eliminate any earlier confusion that there may have been, I should like to emphasise that there is no doubt that the chemical which is the subject of the investigation and the news release, is chlorinated diphenyl i.e. Aroclor.

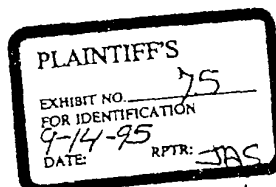
The company that supplied the mass spectrometer which was used in the research programme, in fact have recently put out a press release on this work. Although I am horrified by some of the headlines in this press release, it does basically describe the research programme carried out in Sweden, and describes in clear terms how chlorinated diphenyls were identified. I therefore, enclose a copy for your files.

Jensens only aim in life as an analytical chemist, was to identify the substances found in his research work on the occurrence of insecticides in nature. The unfortunate aspect of the situation is the comments which have been added to Jensens work. He showed what was present and unqualified people have made statements as to the possible effect of what he has found.

Summarising the publication position, there were original articles covering the Stockholm conference in the Swedish daily press, and these reports were picked up also by the Danish press. You will have seen from D.V.N. Hardy's memo of the 12th January that it has also been picked up by the Shell Chemicals Laboratory in Kent, U.K. Jensen also divulged that he had been contacted by the Swedish American press agency who intended to include information about this research work in their monthly review "The Swedish American Journal". There is additionally the press review issued by LKB Productor AB which I imagine to have been sent to a number of technical journals.

TRAN 056621

.../...



G. R. Buchanan
St. Louis

- 2 -

26th January, 1967

Effect in Sweden

This matter was raised with us by every capacitor manufacturer in Sweden that we visited. Fortunately there has not been too much adverse comment as yet from plant workers since they have not associated the polychlorinated biphenols mentioned in the article with Aroclor or Pyralene used in the Swedish factories. Jensen, however, stated that he had been approached personally by several workers associated with chlorinated diphenyls for non-electrical uses and these workers were quite worried as to the possible effect on their health.

Future Research

Arrangements are being made in Sweden for this work to be taken over by one of the medical institutes who hope to study the toxicology of the polychlorinated diphenyl residues at the levels of concentration found by Jensen. Additionally a geographical survey is to be carried out to try and determine where the highest concentrations of residue are appearing and, if possible, to detect from this the method of escape so that more security precautions can be taken. We were asked by Jensen if it was possible for Monsanto to supply any samples of the pure isomers of chlorinated diphenyl since his work indicated at the moment that the lower chlorinated isomers are fairly easily metabolised, and the potentially more dangerous constituents are the more highly chlorinated members. If he can get hold of pure isomers, he would like to carry out some work on comparative rates of metabolism.

Jensen is forwarding me copies of his mass spectrographs and details of sample preparation so that we have all the details of his research work.

The point that I have made to Jensen is the need for care in any further publication of his work which is made. He accepts that the toxicology of chlorinated diphenyls should only be discussed with detailed information about exposure concentration and exposure times and that generalised statements out of context can only arouse undue public concern. If any technical journal takes up the press release from the LKB Productor Company there is little that Monsanto could, or should do in the way of publishing rebuttals. We do not want, personally as Monsanto, to get too involved in this question. I am hopeful that we

TRAN 056622

..../...

G. R. Buchanan
St. Louis

- 3 -

26th January, 1967

might persuade Jensen himself to write a letter defining the true extent of his own research work and placing his results in their proper perspective. It would certainly be helpful in gaining his further support if we were able to make available to him any small quantities of pure isomers.

Since we are not alone in supplying polychlorinated diphenyls to the Scandinavian market, I have drawn this matter to the attention of the other askarel manufacturers in Europe.

As you will see from the press release one of the major points that is made is the difficulty in disposing of waste chlorinated diphenyls and again I must mention that constructive recommendations for the safe disposal of our materials would be most helpful.



D. Wood.

TRAN 056623

→ D. A. OLSON - ST. LOUIS

December 4, 1968

Aroclor Toxicity

H. S. BERGEN-HBERG
P. S. ~~BERGEN-HBERG~~
N. T. JOHNSON-NJOHN
S. SHAW

W. R. RICHARD
WRICH

MMK has just issued a market plan for Santotherm in Japan. In a discussion of the competitive chlorinated biphenyl manufactured by Kaneka (Kaneclor), the following is stated:

"It was only last month that a serious accident happened at an edible rice-brand oil manufacturing plant in Kitakyushu, where Kaneclor in use leaked out into edible oil through stainless steel piping. The authorities investigated the whole plant and found out cracks of the Kaneclor circulating stainless steel pipe. As many as 12,000 people suffered from toxication in addition to a great number of chickens fed with the oil died. The Ministry of Welfare shut down the plant. The sensation was caused. The investigation is still going on but it is certain that 5,000 to 7,000 PPM of Kaneclor contained in the food oil caused toxication. It is very unfortunate that MMK just started market campaign when Kaneclor is giving the same market notorious influence."

This is most distressing, and I thought you may want it for your meeting with Calandra.

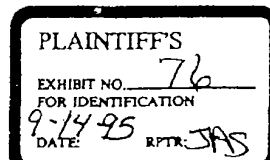
We should carefully evaluate whether there is a significant risk in selling Therminol in food applications, and what guidelines should be used.

Let ~~us~~ know if we can help you get further data from Japan.

WHY THE STAINLESS PIPE? IT IS KNOWN THAT ONLY A FEW TENS OF MILLION PPM OF CHLORIDE IONS, PAUSE TRACE OF IMPURITIES CAN CAUSE STRESS CORROSION (CRACKING) OF STAINLESS STEEL UNDER THERMAL OR MECHANICAL STRAIN. ANY AROCLOR HEATING SYSTEM WILL PROVIDE THE FACTORS NEEDED TO HAVE STRESS CORROSION IN STAINLESS STEEL. SPECIAL TREATMENT IS ALWAYS REQUIRED WHEN USING SS WITH AROCLOR HEATING. EXPERIENCE AS THE ABOVE CAN BE VERY HARMFUL TO OUR AROCLOR BUSINESS.

D. A. Olson
TALL B

TRAN 057423



FROM **MONSANTO CHEMICAL COMPANY**

At St. Louis - Roberts 2

Date August 30, 1957

cc C.E. Caspari - M.O. 2
H.C. Koehler - Robts. 3
J.M. Wagner - Robts. 2
K.E. Maxwell - S. Clara
J.W. Starrett - Robts.
M.C. Throdahl - Robts. :

To Mr. P. G. Benignus

At Roberts 3

Reference PGB Sales Information Bulletin 8-27-57
OD 1149 - "Aroclors As Agricultural
Subject Chemicals", 4-1-57 by JMM

AROCLOR USE TO INCREASE THE
INSECTICIDAL LIFE OF LINDANE

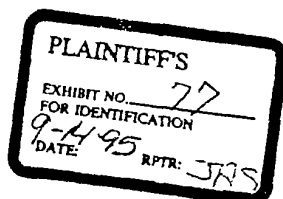
It is most surprising to see that you are recommending without restriction a use for Aroclor which has not been approved by U.S.D.A.-F.D.A. For the protection of the company it appears that salesmen who may try to promote this use of Aroclor in agriculture should be fully apprised of limitations and of risks involved if promoted for use on feed and food crops. In turn they should apprise customers of the true status of the development and advise them that if they use Aroclor in insecticide formulations on food or feed crops they should first obtain government approval.

You may already know that since Aroclors are toxic and, according to your attached reference, may extend the residual life of the pesticide, the Federal Government would require the following before selling for use on food and feed crops:

- (1) Proof of benefits from the application.
- (2) Data to show whether or not residual Aroclor is present and whether it modifies the residual amount of Lindane or other active ingredient at harvest.
- (3) If Aroclor is present or if the residual quantity of Lindane or other active ingredient has been significantly changed, tolerances for the Aroclor and for the pesticide in question must be developed.
- (4) If a toxic quantity of Aroclor is present at harvest in food or feed crops a tolerance cannot be established until after two year chronic toxicity feeding tests have been completed for the Aroclor.

Obviously, much of the above is obviated if the Aroclor-insecticide formulation is not used on food or feed crops. Even then the label must show safe handling procedures, since Aroclor is toxic.

Incidentally, the findings published by Duda, as per your attached reference, are not in accord with research findings reported in reference report OD 1149. In this report you will note that Aroclor



TRAN 053674

August 30, 1957

contributes to longevity of insecticidal action only when combined with highly volatile compounds, and then only when applied to hard, smooth surfaces such as glass...not on agricultural plants. This is called to your attention because government label approval for use in agriculture also calls for proof of performance.

Admittedly, your August 27 bulletin does not specify using Aroclor in insecticides for use on food or feed crops but neither does it specify such a combination should not be used on food or feed crops. Perhaps this is an over-sight which you will wish to call to the attention of recipients of the bulletin.


L. V. Sherwood

LVS/eb

p.s. We repeatedly find that users of formulations prepared for a specific use will apply the material for other uses. In other words, even though Monsanto may encourage the use of Aroclor in pesticide formulations for non-agricultural use you can rest assured that some of it will be used on agricultural commodities. For these reasons alone it is strongly recommended that we state very specifically in any Monsanto literature, including correspondence, that Aroclors not be used on agricultural commodities. I believe our Legal Department will confirm that there is an important legal aspect involved.

TRAN 053675

STLCOPCB4024866
WATER_PCB-SD0000042982

Monsanto

FROM NAME & LOCATION: W. R. Richard - Research Center

DATE	December 9, 1968	E. Tucker	JFQ
		R. Keller	JFQ
SUBJECT	<u>AROCLOR TESTING</u>	W. Johnson	WJOHN
	-1	K. Wells	KWELL
REFERENCE		P. Benignus/J. Bryant	PBENI
TO	E. Wheeler - EWHEE	R. Munch	JFQ

The issues on Aroclor toxicity testing are complicated. I know you plan to issue written program objectives. My understanding after last meeting 12/6/68 is as follows:

1. Determine whether Jensen and Co. really have Aroclor or not in tissue of birds:
 - (a) by putting Aroclor through rats and chickens and seeing if we get the same or different peaks than found in Jensen paper. (Use mass spectrograph for check.)
 - (b) by getting hold of tissues from nature which others say is Aroclor but which could be many other compounds. Use mass spectrograph to check vs. known Aroclor results.
2. Determine a tolerance level for Aroclor in feeding studies. Run a material balance on Aroclor to find out where it ends up.
3. Determine whether Aroclor is an enzyme inducer which affects steroids and Ca metabolism. (I really don't know what I am saying here but you can clarify.)
4. Keep track of what Govt. research labs are doing in way of testing, plus interpret their results for Monsanto.
5. Keep track of what Govt. research labs are finding in the way of geographical location of so-called PCB peaks, and in what species of animals. What does this mean in the way of product control by Monsanto. Check with Johnson of Callandras Laboratories.
6. Contact Bayer in Germany to see if they have taken any action. Keep track of Japan incident through EMS.

TRAN 057342

Bill R
W. R. Richard

PLAINTIFFS	
EXHIBIT NO.	78
FOR IDENTIFICATION	
DATE	9/4/95
RPTR:	JAS

STLCOPCB4024867
WATER_PCB-SD0000042983

Transanto

FROM (NAME & LOCATION) W. R. Richard - Research Center

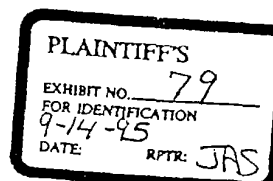
DATE December 9, 1968
SUBJECT DEFENSE OF AROCLOR

TO : Ralph Munch
Paul Benignus/J. Bryant
J. Herber/J. Sullivan
Q. Thompson/R. Weiss

I would appreciate your thoughts. Admittedly, this letter is too defensive because we may find that Aroclor is safe and has been misidentified in the environment. However, here goes on the defensive side.

1. Toxicity Defense - Callandra to determine safe level of exposure on a long term basis in ppm by feeding studies.
2. Is chlorinated biphenyl identified in environment? Do chicken work, and compare with what is being found and reported as PCB.
3. Find out whether PCB is an "enzyme inducer".
4. Clean up stream and air pollution from:
 - our Aroclor plants
 - our customers' plants
 - our customers' products
 - restrict sales from specific uses
5. See if Aroclor handling facilities and operation of customers
 - capacitor plants
 - transformer plants
 - heat transfer systemscould be improved to minimize exposure.
6. Seek replacement derivatives which are different, less toxic, but which use our plants.
 - ØØ - ØØClx - ØØBr or ØØClFx or ØØFx
 - ØØØClx ØØØClx or ØSØClxTest toxicity, electrical properties, economics.

TRAN 057681



STLCOPCB4024868
WATER_PCB-SD0000042984

7. Expand the product line to minimize effects of Aroclor decreases.

Use hydrocarbon + (10% invention)

Control of DK with another reagent

Control stress on plastic

Control solubility of polypropylene

Could control DK be by ØØFx?

(Westinghouse wants DK >3.0 in fluid)

8. Examine silicate esters for transformers; capacitors if compatible with polypropylene

Examine Flutec perfluoro compounds for specialty transformers and capacitors.

Examine sales of polyisobutylene - low M.Wt. thickeners for oil impregnated cable.

Examine RØClx for toxicity, for electrical properties.
RØFx

9. Enter the business for solid insulation by buying into capital

Polyethylene

Polypropylene

Polystyrene

} film production

Thanks,

W. R. Richard

ms

TRAN 057682

(2A)

E. P. Wheeler

December 23, 1968

Bran Oil Poisoning by
Kaneclor
Your memo December 9, 1968

W. R. Richards
P. C. Benignus
D. Roush

S. J. Shaw

D. A. Olson

I think the following comments are pertinent with regard to the recent incident in Japan:

1. In the U. S. the only "hygienic regulations" referring to chlorinated biphenyls are the Threshold Limit Values (TLV) for Aroclors 1242 and 1254. The values are 1.3 mg/cubic meter of air and 0.5 mg/M³, respectively. These limits have been set by the American Conference of Governmental Industrial Hygienists, a quasi-official group with no legal authority for establishing Federal standards.

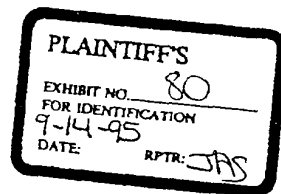
These levels are time weighted averages deemed to be safe for 8-hour daily exposures in industry for a lifetime of work. Although they are intended as guidelines, a number of individual states have considered the TLVs as appropriate for adoption in state codes and regulations. Further, by reference, the TLVs can be enforced by the U. S. Department of Labor in industrial plants subject to the Walsh-Healey contract act.

2. There are no regulations concerning the Aroclors in applications where there might be oral ingestion of these materials. For example, there are no direct food additive or indirect food additive uses approved by the Food and Drug Administration. To our knowledge none of Monsanto's customers have applied for a petition for regulations permitting such use although currently a petition for the use of Aroclor 5460 in adhesives for food packages is in development.

Similarly there have been no applications in the pesticides field where the U. S. Department of Agriculture would have to be consulted.

In the absence of prospective uses which would require such governmental clearances, there has been no incentive to undertake the extensive animal toxicity studies which would provide data necessary for establishing a human diet tolerance.

TRAN 006445



December 23, 1968

3. If there were extensive animal toxicity data available, I do not believe the Food and Drug Administration would set a tolerance level in foods where the presence of the chlorinated biphenyl resulted from leakage from a heat transfer system. Such presence would result from leakage or other accidental contamination and would not be accepted as being "necessary" or adding anything beneficial to a food grade substance.

I don't know of any U. S. regulations which give either the Food and Drug Administration or the Department of Agriculture approval authority for heat transfer materials. Obviously, the food and drug agencies have the general authority to avoid and seize food products that are "adulterated" or "contaminated". It is on this basis that the Medical Department has stated that any cooking oil or other food product containing more than .0 ppm should be destroyed if the manufacturer or processor of the food product is to avoid government action.

4. The data or literature concerning effects of chlorinated biphenyls on humans relate only to excessive vapor inhalation or excessive skin exposures. It is not possible at this point to extrapolate from any of the animal toxicity data or human accidental exposures to a "safe" ingestion level for humans.

5. The chlorinated biphenyls are not "poisons" or "drugs". There are a number of definitions in the U. S. relating to the classification of industrial chemicals and household products. Included are definitions of the Interstate Commerce Commission, the Federal Hazardous Substances Labeling Act, the National Safety Council recommendations, etc. Each of these establishes levels of toxicity and poison categories by the results of specific animal tests. The chlorinated biphenyls would not be classed as "poisons" by any of these definitions. They would be considered "toxic" but no more so than many common industrial chemicals and, as a matter of fact, many formulated products used around the home.

TRAN 006446

D. A. Olson

-3-

December 23, 1968

I don't know how much of the above will help in the situation in Japan but I leave it to your judgement as to what should be forwarded.

Elmer P. Wheeler

CE

TRAN 006447

MONSANTO CHEMICAL COMPANY

Firm LOCATION

Washington, D. C.

DATE

October 23, 1961

SUBJECT

AROCLORS - FDA

REFERENCE

cc P. Benignus-St. Lou.
R. Davis-St. Louis
W. Hunt-St. Louis
R. E. Kelly-St. Louis
H. Weingarten-St. Louis
R. S. Wobus-St. Louis
K. H. Maddy-St. Louis

172

me

TO H. S. Bergen
St. Louis, Missouri

Dr. William Horwitz, of the Food Division of FDA, is hot on the trail of a chlorinated "compound X" which is a causative factor in chick edema. You will recall in July, I had indicated that O'Dell at the University of Oklahoma was publishing an article in the Journal of Poultry Science which seemed to indicate that Aroclor 1242 used in paint for chicken coops caused chick edema. At that time, we transmitted a sample of 1242 to Horwitz who was unable to find compound X in the sample. This seemed to give our Aroclors a clean bill of health.

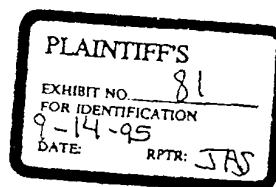
Horwitz is now back on the trail. Because of the use of Aroclors as "extenders" for insecticides against roaches etc. in the poultry field, among others, he feels the Aroclor line should be more fully checked out. He called this week indicating that the FDA might like to know all about our Aroclor process of manufacture, our methods of analysis - including chromatographic, our toxicity studies and anything else related to the Aroclors. In addition, he indicated that FDA might desire to send a man to St. Louis to spend some time learning the "Aroclor business". I calmed Horwitz down temporarily by transmitting our latent Aroclor general sales booklet. I indicated if he did not get everything he desired from this booklet, to get in touch with me and I would proceed from there. When Horwitz has had a chance to look over the bulletin, I will be in touch with him again.

What is our experience on the use of Aroclors as extenders in insecticides? I am aware that Deltsville in '59 indicated 1 to 2% Aroclors in an insecticidal formulation such as Lindane for non-crop use seemed to be quite effective. Do we have any later data in this area? I will be in touch when the situation gets here.

C. J. Eby

CJE/mgo

TRAN 012383



STLCOPCB4024873
WATER_PCB-SD0000042989

Monsanto

NAME & LOCATION: W. R. Richard - Research Center

DATE: March 10, 1969
SUBJECT: NOTES ON MEETING 3/6/69
REFERENCE: FF INDUSTRIAL BIO-TEST LABORATORIES, INC.
Aroclor & Wildlife
TO: FILE
cc: H. Bergen/D. Olson
P. Benignus/J. Bryant
J. Fallon/D. Roush/
S. Shaw
J. Springate/Schalk/
Waychoff
R. Keller/E. Tucker
C. Payton/K. Wells
B. Wildt

Those present:

Joe Calandra - Pres.-Chemist PhD and M.D. + Staff
Northwestern U-Pathology
Otis Fancher - V. Pres.-Chemist PhD + Drug Research
M. L. Keplinger-(Kep) PhD Biological evaluation
Ray Kary - Air Pollution - Rad. Health
Lawrence Beer- Environmental Services
Monitor chemical plants - Nuclear Power Plants
E. Wheeler } - Monsanto
W. Richard }

E. Wheeler and W. Richard reviewed background on Aroclor properties, recent analytical results by Scott Tucker, history of Aroclor, application uses, ref. to Risebrough's Dec. 1968 paper in Nature; effects by public relations, legal and scientific findings on Aroclor and its products. We discussed amount of material-15,000 lb/yr, passing through Santa Clara warehouse, questioned whether PCB could really be present to affect wildlife as reported in Risebrough's paper on San Francisco Bay.

We asked for consideration of problem from public relations, DDT Wisconsin hearings, legal actions, and scientific aspects. We discussed problem from:

Analytical chemistry

Acute and chronic toxicity - animal-fish-bird studies

Enzyme enhancer

calcium metabolism - thin egg shells
hormones - human involvement

Terrestrial ecology

The last subject, ecology, was just mentioned because Bill Johnson, Bio-Test man in this field, was at U. of Wisconsin. The name of Dr. Thomas Parks, U. of Chicago, was mentioned as a possible consultant - may be retired. Logistics of Aroclor exposure and likelihood of contamination not discussed enough.

TRAN 005788

PLAINTIFF'S

EXHIBIT NO. 83
FOR IDENTIFICATION
DATE 9-14-85
RPT: JAS

STLCOPCB4024874
WATER_PCB-SD0000042990

The question of a grant to Newall - at Stanford, was mentioned. Possible listening post for West Coast activities. - No decision.

The problem of contacting and maintaining contact with the University and Govt. people who are seeking biological information on PCB's was discussed. Names of Bill Johnson and perhaps Lawrence Beer were mentioned.

We discussed possible consultants who might be of help on this problem.

Monsanto Consultants

Alan Mehler	Marquette U - biochem and enzymes
Robert Metcalf	U. of Illinois-entomologist
Bert Vallae	Harvard - enzymes
Jean Mayer	Harvard - nutrition

Possible Bio-Test Consultants

Wayland Jack Hayes	Vanderbilt
Thomas Parks	U. of Chicago - ecologist-Dept. of Biology

Agreed to convene at earliest possible date at either Bio-Test or Monsanto with appropriate consultants. Job of educating Monsanto consultants, and getting permission, to fall to E. Wheeler and W. Richard. (March 21 tentative date)

Bio-Test consultants job to J. Calandra - Otis Fancher.

E. Wheeler will report on program to date:

- I. Rat tissue residue study and acute levels for Aroclor 1242, 1254, 1260 and 5460.
- II. Chicken tissue residue study and acute levels.
- III. Fish toxicity TLM.
- IV. Chicken toxicity - reproductive egg and meat residue (6 months)
To go ahead with study but add enzyme and hormone experiments plus calcium metabolism studies and egg shell thickness.
- V. Mallard Duck - (Aquatic Bird) - Same type study as for chickens.
- VI. Three generation reproduction in rats (18 months).
Start now.
- VII. Two year study in rats (26 months)
Start now.
- VIII. Two year study in dogs (26 months).
- IX. Subacute Fish Study.
Start immediately.
Consider possibility of reproductive cycle.
- X. Metabolic studies -
No decision, question on need for radio tracers.
Seem inclined to do without radio tracers.

TRAN 005789

Francis T. Mayo
Chief Federal Water Pollution
Regional Enforcement Office
San Francisco District

} Friend of Lawrence Beer.

Discussed requirements of sampling fish and water in San Francisco Bay, location of a lot of Risebrough's accusations vs. PCB and possible site of very low Aroclor usage. L. Beer indicated \$40,000 for this kind of job. Wheeler and Richard said \$4,000 plus a rowboat.

Defense seems to have these elements.

- I. Aroclor not intended to be spread around. Used in closed systems, recycle of material, limited exposure. - most but not all Aroclor uses meet the above description.
- II. Aroclor identification in nature. Is it really identified? Is it a metabolic product of something else like 2-4D or 2,4,5T or chlorophenols? For example, hard to see that 15,000 lb/year could pollute San Francisco Bay even if were all dumped in.
- III. Atmosphere and streams around our mfg. plants and major customers. Need to establish a norm and an acceptable standard.
- IV. Establishing a tolerable limit. Here the Wisconsin EDF type will want 0 tolerance. They will be driving on this subject as they are against DDT. Even if they fail, they will drive people from product use. This is already happening with DDT because of public relations aspect.
- V. Not discussed but possibly obvious. Can we find out whether product degrades in nature so that it does not accumulate? Only real way out long term.

Joe Calandra again mentioned need for soil and bug experiments so that PCB's could be shown to degrade. If Aroclor is an enzyme enhancer, does that mean enzymes attack it? This program is not in gear.

W.R.

W. R. Richard

ms

Att. 1

TRAN 005790

MONSANTO

FROM (NAME & LOCATION) W. R. Richard - Research Center

X

DATE	May 13, 1969	cc:	R. Keller	A-L2
			E. Wheeler	EWHE
SUBJECT	AROCLOR - ANALYSIS IN PESTICIDE		E. Tucker	Res.
	RESIDUES		H. Bergen	HBER
REFERENCE	(Visit to Prof. G. Widmark		D. Olson	DOLS
	U. of Stockholm - May 5, 1969)		W. Kuhn	WKUH
TO	File		R. Kountz	RKOU
			R. Davis	RDAV
			P. Benignus/J. Bryant	PBEN
			J. Fallon	JFAL
			Q. Thompson	QTHO
			R. Weiss	RWEI
			L. Stark	LSTAI
			J. Springate	JSPRI
			M. Farrar	Res.
			W. Waychoff	WWAYC
			C. Paton	CPATC
			R. Baxter	RUABX

Widmark was finding

Cl₅ and Cl₆ chlorinated biphenyls from extraction of salmon and from extraction of waste sewage sludge.

low Cl₇ and Cl₈ chlorinated biphenyl

Some Cl₁₀ " "

No Cl₁₁ and Cl₁₂ " "

This corresponds roughly to Clophen 50 or Aroclor 1254.

The isomers found in nature are not the same ratios as in either Aroclor 1254 or Clophen 50.

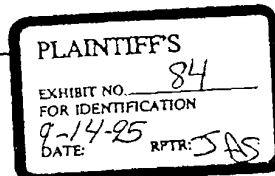
Widmark has examined 2000 samples from the Baltic Sea. Another group of ecologists is examining the sea around Scotland. Their results are a bit different according to Widmark's knowledge.

Widmark had been in contact with transformer manufacturers in Sweden. They reported very low loss of chlorinated biphenyls, an occasional spill. Widmark kept hitting at marine paints as a source of the product.

He wanted Monsanto to restrict sale to those closed system applications. He asked if the economic value of PCB's was worth the bad publicity which would come to Monsanto.

We countered with a question. What products would he recommend as substitutes? What kinds of synthetic compounds are biologically acceptable? Would he help establish a safe tolerance level of synthetic compounds in wild-life?

TRAN 086181



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WATER_PCB-SD0000042993

0

He reported that he had not isolated or found much chlorinated biphenyl with 1 through 4 Cl atoms. This might be because Aroclor 1242 and below is more biodegradable; (or it could be due to the analytical isolation and separation methods; or perhaps Aroclor 1242 is less exposed in the world.)

Widmark is dedicated to better and more accurate analysis. He is in sympathy with most of the ecologists demanding elimination of chlorinated pesticides. His knowledge of scientific evidence and its requirements makes him slightly hesitant in condemning Aroclor itself or demanding its total eclipse.

Keller and Wheeler should have a more complete report.

Widmark reported not finding chlorinated naphthalene, chlorinated paraffin, chlorinated benzene, chlorinated terphenyl. He thought he had identified and accounted for 80% or more of the lipid soluble extractable chlorine containing compounds.

Based on these remarks of Widmark we might consider alternate products and actions.

What is the Cl₁ and Cl₂ content of Aroclor 1242?

The Aroclor 1242 has 31% dichloro,
53% trichloro
16% tetrachloro

The Cl₁ content must be very low in our present material. If Aroclor 1242 is indeed biodegradable we might restrict usage to minimize and control its concentration in nature to acceptable levels.

However, the use of Aroclor 1248, 1254 and 1260 would seem to require further restrictions in exposed systems.

Scott Tucker reported that Aroclor 1242 could be destroyed by HNO₃/H₂SO₄ treatment. Widmark may or may not have been destroying Aroclor 1242 before his analysis.

We could also expect that Cl₁ might go undetected based on Widmark's evidence; and apparently chlorinated paraffin and chlorinated terphenyl have so far escaped detection or are absent in the tissues of birds or fish.

Again, Keller and Wheeler should have a more complete report.

WRR

W. R. Richard

ms

TRAN 086182

STLCOPCB4024878
WATER_PCB-SD0000042994

MONSANTO CHEMICALS LIMITED

6/5/69
→ MS

PRODUCT TOXICOLOGY - AROCLORS

Toxicity *py*

Report summarizing present knowledge concerning chlorine-containing residues in wild life and visits made to organisation implicated therewith during the period April 28th - May 1st, 1969.

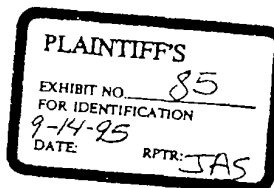
by: D.V.N. Hardy*

Circulate!
→ ~~H. B. Keller~~
~~W. R. Richard~~ / PG B
3) ~~H. B. Keller~~
4) ~~H. B. Keller~~

Circulation

J.W. Barrett, London.	R.E. Keller, St. Louis.
R.A. Baxter, Ruabon.	E.P. Wheeler, St. Louis.
H.A. Vodden, Ruabon.	R.E. Kelly, St. Louis.
H.R. Newman, Newport.	W.R. Richard, St. Louis.
A.C.W. Pemberton, Newport.	M.S. Bergen, St. Louis.
W.J.S. Budd, London.	
J. Herefousse, Brussels.	
D. Wood, Brussels.	

*Formerly Research Services Manager, MCL, and now Consultant to MCL in the area of Product Toxicology and Safety in the Use of the Company's products.



TRAN 021762

INTRODUCTION

The wide agricultural usage of insecticides in the post-World War II period and consequent effects on wild life have led in certain circles to apprehension concerning the overall effect on man. The situation has been under study for many years and Government agencies and manufacturers of insecticides have been implicated in the various aspects, particularly in the assay of such residues in many species of wild life. Fish, fish-eating birds and mammals have been subjected to wide ranging study, and it became clear that terrestrial usage of insecticides could have far reaching and hitherto unsuspected effects on wild life, part of it making an important contribution to the diet of man and domestic animals.

The size of the wild life specimens and the minute concentrations of insecticides therein demanded highly sensitive methods of assay, which have been progressively refined. Gas liquid chromatography using electron-capture or microcoulometric detection has become established as the most suitable technique. It appears that the chromatograms of the residues showed not only the peaks corresponding to the insecticides and their known metabolites, but additional peaks of unknown chlorine-containing substances.

Towards the end of 1965 these unknown substances were identified by Sören Jensen, a research worker at the Institute for Analytical Chemistry, University of Stockholm, under the direction of Gunnar Widmark. Using a combined gas chromatograph mass spectrometer (LKB-9000) it was shown that the peaks are due to polychlorinated biphenyls (PCB's). The evidence and reasoning are available and the conclusion can hardly be in doubt.

Unfortunately the announcement was coupled with sensational statements concerning the poisonous nature of the PCB's, which were calculated to cause misgivings both to public authorities and to the general public.

Jensen and Widmark found PCB's in specimens of pike from different parts of Sweden, fish spawn, a dead eagle and in human hair, and even on fire cones! The conclusion reached was that the PCB's originated from burning industrial wastes and were washed down by the rain. Examination of feathers from museum specimens of sea birds suggested that contamination commenced in 1944.

The original work of Jensen and Widmark has been extended and generally confirmed, notably by workers at the following establishments and much of the detail has been published:-

TRAN 021763

Great Britain

1. Laboratory of the Government Chemist,
Cornwall House,
London, S.E.1.
(Notably Mr. O'G. Tatton)
2. Freshwater Fisheries Laboratory, (Ministry of
Faskally, Agriculture, Fisheries
Pitlochry, Scotland. and Food)
(Mr. A. Holden)
3. Tunstall Laboratories,
Shell Research Limited,
Sittingbourne, Kent.
(Dr. J. Robinson and Mr. A. Richardson)
4. Monks Wood Experimental Station, (*Nature Conservancy)
Abbots Ripton,
Huntingdonshire.
(Dr. N.W. Moore)

*Established by Royal Charter to (1) provide scientific advice on the conservation and control of the natural flora and fauna of Great Britain, (2) establish, maintain and manage natural reserves in Great Britain including maintenance of physical features of scientific interest, (3) develop research and scientific services related thereto.

At 30th September, 1963 there were 144 scientifically qualified staff and in 1963-4 there was a Government grant-in-aid of £701,000.

Holland

5. University of Utrecht
(Professor H. Van Genderen)

U.S.A.

6. University of California
(Drs. R.W. Riseborough, P. Rieche and S.G. Herman)
7. Cornell University
(D.B. Peakall)
8. San Diego Natural History Museum
(M.N. Kirven)

TRAN 021764

This report is written following discussions with staff from Establishments 1, 2 and 3 in which Dr. R.E. Keller and Dr. E.P. Wheeler (1 and 3 only) were associated. Drs. Keller and Wheeler are proceeding to visit 5, University of Stockholm, to see Jensen and Widmark. They are also visiting Bayer to ascertain its reactions as manufacturers of PCB's (Clophens).

SUMMARY

1. There can be no doubt that traces of PCB's (Aroclors) are to be found in wild life, fish and certain items of human diet.
2. There is little evidence to show how serious this minor contamination will prove to be, but what evidence there is is reassuring.
3. There is little evidence to show how the PCB contamination arises. It may be by run off of wastes into rivers, or by burning of industrial wastes with consequent washing down by rain. It is remotely possible that the PCB's might arise by biochemical action on insecticides and other chlorine-containing materials which are similarly discharged into the rivers, seas and oceans. It could be that among the vast quantities of materials destroyed on land and at sea during the 1939-45 war, significant quantities of Aroclors and Aroclor-containing materials found their way into the rivers, seas, etc., and are being slowly released by corrosion, extraction, etc. (see footnote at end of report).
4. A considerable Monsanto effort will be necessary to obtain the necessary analytical and toxicological information for dealing with this threat to our commercial operations.

A. Visit to Freshwater Fisheries Laboratory, Pitlochry* Monday, April 28th, 1969.

Mr. A.V. Holden - Officer in Charge.
Dr. R.E. Keller - MC
Dr. D.V.N. Hardy - MCL

This visit was made not so much on account of contributions made to the subject but because Mr. Holden acts as Co-ordinator

*Dr. E.P. Wheeler was prevented from taking part in this visit due to the sudden indisposition of Mrs. Wheeler.

TRAN 021765

for the programmes of the O.E.C.D. countries concerned with the influence of biocides on natural environments, wild life, etc. He might therefore be expected to have a wider appreciation of the overall problem and of its assessment in terms of the hazard to man. On this latter aspect he was of the opinion that there had been a tendency to overplay the hazard to man of insecticides and PCB's, and that it was very doubtful whether the toxicities of PCB's were greater or similar to those of the insecticides. Experiments with rainbow trout in water containing 1 part of DDT in 10^9 of water had shown that death occurred in six weeks after which the concentration in the fish muscle was 1 in 10^6 . In other words there was a concentration factor of 1000 in 6 weeks: this would take place mainly by absorption in the gills. He believed that some similar experiments with Aroclors had been carried out in the Ministry's London laboratory, and phoned for confirmation but was unable to get this during our visit. I am therefore endeavouring to get the answer to this perhaps significant experiment.

Mr. Holden's analytical work has been concerned largely with extracts of seals and fish taken in Scottish waters, and he has observed similar peaks to those found by Jensen and the Government Laboratory. Extracts from freshwater and seawater fish show fairly low amounts of PCB's, while seal blubber contains considerably more. Reprints of relevant papers were given to Dr. Keller and there was a discussion on analytical work, much of which was carried out for other bodies, e.g. the Nature Conservancy. Much of the work remains unpublished and he saw little chance of rectifying the situation.

B. Visit to Tunstall Laboratories, Shell Research Ltd.,
Sittingbourne, Kent.
Tuesday, April 29th, 1969.

Dr. J. Robinson - Biologist
Mr. A. Richardson - Analyst
Dr. Stevenson - In charge of Experimental
Animal House.
Mr. De Corsen - Laboratory Administrator.

Dr. R.E. Keller - MC
Dr. E.P. Wheeler - MC
Dr. D.V.N. Hardy - MCL

Shell has naturally been concerned with the problem of insecticidal residues from the outset and the cost of the analytical effort and its interpretation must have been very considerable. To Shell the PCB aspect has been simply one of analytical complication, and although at times there have been suggestions from their commercial people that the focus of

TRAN 021766

toxicological interest might be transferred from insecticides to PCB's, there has been no attempt to do so. In fact papers by Robinson do not refer to PCB's but make a very sound approach to the insecticides problem and to its true perspective. Nevertheless they had collected some information on possible usage of Aroclors, for example, they had noted that the Coal Board disposes of 1,000,000 gals. of high pressure lubricant each year. Did this contain Aroclor? We thought it unlikely but questions concerning safety in use of Aroclors had certainly been referred to MCL by the Coal Board and it was therefore likely that some minor uses have been developed. There might conceivably be a small content of Aroclors in the high pressure lubricant. Usage of insecticides was of a high order, and in Kent alone 1000 tons of DDT had been consumed since its introduction after the 1939-45 war. Reference was also made to usage of Aroclors in cutting oils; the Government Laboratory had suggested that this was a possible source of contamination. Cutting oils are normally sold as proprietary formulations and it would be difficult to estimate how much Aroclor is consumed in this form.

Shell would much prefer to have a direct method for estimating insecticides. Now, owing to the stability of PCB's, it was necessary to estimate insecticides and PCB's, then PCB's by destroying or removing the insecticides and getting the insecticides by difference.

Aroclor 1254 had been fed to chicken at 100 parts per million of the diet and no adverse effect observed over a period of 12 months. The Nature Conservancy has carried out feeding tests on Bengalese Finches with DDT and found no adverse effects, and similar results have been with chicken and quail fed on 10 and 20 parts per million of Dieldrin. Other workers found some effect on mallards and chicken. At the Government Laboratory it has been shown that human fat (from mothers' milk) may contain PCB. Reference was also made to the work of Mr. Alabaster, Ministry of Agriculture, Fisheries and Food, on toxicological levels with fish.

It was agreed that many of the specimens submitted for analysis were not representative of the total population, e.g. predators were heavily weighted, and of the sick and dead birds, were most frequently collected. There must be large numbers of each predator much less contaminated than those submitted for analysis.

Samples of fish oils and margarine (supplied by Unilever) have been examined, and while PCB's can be found in the oils, they disappear during the hardening process so that margarine is free.

TRAN 021767

C. Discussions with Representatives of the Government
Laboratory at Monsanto House
Thursday, May 1st, 1969.

Mr. J.O'G. Tatton - Laboratory of the Government
Chemist

Mr. G.B. Collins - " " " "

Dr. R.E. Keller - MC

Dr. E.P. Wheeler - MC

Dr. D.V.N. Hardy - MCL

Mr. Tatton said that the possible danger of Aroclors used as plasticizer (in food packaging and in lacquers for cans) had been considered quite early on and reference is made thereto in the Annual Report of the Government Chemist 1953-4. He will send me a photostat copy. As regards residues in wild life peaks not due to pesticides were observed in 1963-4 and this caused trouble in view of the complicating effect on insecticide determination. Attempts to identify the disturbing material failed until Jensen showed their nature. Jensen's work has been fully confirmed and extended and PCB's have been found in eggs, predatory birds, rarely in human food, and traces in cod liver oil. Human fat seems to be free from PCB but there may be 2 - 12 parts/ 10^6 of insecticide. Some PCB found in human lung samples. Work has been carried out on air and on circumstantial evidence PCB must be present. 1 part DDT compounds/ 10^{12} parts of air has been found. The analysis is complicated by the presence of hydrocarbons. Tatton will supply references to this work which was carried out on sample of about 1200 litres. The content of insecticides in air and water is variable, generally higher in London due to soot particles acting as absorbent, and also depending on when spraying is in progress. Dr. Kroll (Water Research Association) has failed to find PCB in river waters at parts per 10^9 .

Many samples are sent to the Government Laboratory by the Nature Conservancy, but having carried out the analysis nothing more can be done as the source and significance of the sample are known only to the Nature Conservancy.

The peaks seen in the chromatogram represent only part of those observed in commercial samples of Aroclor 1254. Probably the middle components are favoured by the analytical procedure: certainly peaks due to higher boiling material can be obtained by raising the operating temperature of the column.

Recently high PCB figures have been found on herons (several hundred parts per million in the liver), kestrels, owls

TRAN 021769

and kingfishers. Dr. N.W. Moore (Monkswood Experimental Station) might be prepared to discuss their significance and the geographical factor. Tatton considers that Jensen's peaks are more in line with Bayer's Clophen. He thinks that some of the bird samples are representative as they were taken from colonies.

Tatton also referred to possible traces of PCB nature in occasional food samples, e.g. milk, mutton and beef fat. He will supply me with copies of all relevant papers, including a report on some new detectors for VPC analysis. Dr. Keller will reciprocate by sending chromatographic curves for the various Aroclors.

I referred to MCL work now starting on the biodegradation of Aroclors and suggested that our workers should contact him on the analytical techniques. He would be most happy to do so.

D. Discussion with Representatives of Cremer & Warner,
Consultants, 140 Buckingham Palace Road, London, S.W.1.
Thursday, May 1st, 1969.

Sir Frederick Warner	-	Cremer & Warner
Dr. David Train	-	" "
Dr. R.E. Keller	-	MC
Dr. E.P. Wheeler	-	MC
Dr. D.V.N. Hardy	-	MCL

This was a lunch discussion arranged to determine the possible value of this firm of consultants in the assessment of the PCB problem.

Cremer & Warner have contracted with the Port of London Authority (and possibly with others too) to study the effect of certain contaminants in the Thames. They are concerned specifically with detergents and Mr. Cremer is Chairman of the Government Committee which has been advising on the problem due to hard detergents. Cremer & Warner are also advising on atmospheric pollution due to sulphur dioxide and smoke, and on the design and interpretation of data from the recording stations.

They have also acted as consultants for the new potash project in relation to the effluent disposal problem. They have advised that the effluent should be discharged 1 mile from the shore at a minimum depth of 75 feet.

TRAN 021770

They were interested broadly in our problem and fully appreciated that after all the analytical work had been done it would be necessary to interpret the data and to correlate it to safety standards in a way which would carry conviction with the authorities. They seemed confident that this area was one of their strong suits, but it is far too early to assess their ability to contribute to the present problem.

D.V.N. HARDY

JWB/HMH
6.5.69.

Footnote (See p.4 - Summary, Item 3)

Compare Jensen's findings that no contamination was observed prior to 1944.

TRAN 021771

Monsanto

FROM (NAME & LOCATION): R. H. Munch - St. Louis Organic Research - South Second Street

DATE December 5, 1969

cc

P. G. Benignus

D. A. Olson

H. S. Bergend ~~_____~~

SUBJECT FUTURE POSTURE - DIELECTRICS

REFERENCE

TO : W. R. Richard

Don Olson MS
RM

Don Olson has asked how we should go about reaching our objective of being the world leader in the Aroclor business. Under present conditions this question should probably be changed to: How should we go about achieving maximum profit from dielectric fluids or dielectrics in general? There are two reasons for changing the question. One is the environmental pollution problem. The other is that technological needs in the dielectrics area are changing with ever increasing rapidity. Both are compelling reasons.

Attached is a copy of an outline of our current electrical fluids technical program with the items listed roughly in order of priority. We discussed pertinent parts of this with Paul Benignus, Bill Kuhn, Bob Kountz, Quentin Thompson and Don Olson.

In the dielectrics business area we have reached a situation where it is necessary to have a more and more detailed knowledge of how our fluids will be used by our customers in order to promote sale of our products. This led Don to ask whether our capacitor technical facilities are adequate or whether equipment additions are necessary.

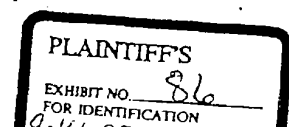
I agree that we must have a more detailed understanding of capacitor technology. To get this, we must have available:

- | | |
|--|-----------|
| 1) Capacitor winding facilities | \$100,000 |
| 2) Capacitor impregnation facilities | 10,000 |
| 3) High voltage Schering bridge to test the resulting capacitors | 5,000 |
| 4) Corona inception and extinction measuring equipment | 10,000 |
| 5) Accelerated life test equipment | 10,000 |

We have more or less adequate equipment for items 2, 3 and 4. We have had capacitor rolls wound for us by Electric Utilities. This has enabled us to start to get the desired information. We could decide to purchase items 1 and 5. Each of the above five areas present many complex problems which take time and capable, experienced manpower to master. It

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TRAN 058300



STLCOPCB4024888
WATER_PCB-SD0000043004

is risky to assume that we can master all five of these areas in time to achieve our objective. We certainly cannot do it without adding at least one technical and one non-technical man to our group even if we buy the equipment.

This leads me to propose that we should try to work closely with an established ~~capacitor manufacturer~~ to take advantage of his existing equipment and competence in the five areas mentioned. The organization chosen should be:

- 1) Highly competent technically
- 2) Trustworthy and cooperative
- 3) Located close to St. Louis if possible
- 4) One that will foster our business objectives.

It would be ideal if we could work with G. E. on this basis. However, they are dedicated to a "do it yourself" policy. They are succeeding well enough at it that they probably would not be receptive. Two other possibilities would be Electric Utilities and Cornel Dubillier. Both of these would probably be receptive. I recommend that we explore the possibility of this approach to our problem.

We should also have a policy on how we will use any technical advances made through this program. In the past, we have only considered giving such results to our Aroclor customers as a free present to keep them happy. We should consider whether or not there is any more profitably way to use the results of our research. Perhaps we should have a joint manufacturing agreement with the organization we work with on testing our research developments.

We expect Mr. Bill Robinson of Cornel Dubillier to visit us on December 12. We need to clarify our thinking on the points raised in this memo. This is particularly true since Mr. Robinson has expressed a willingness to do testing work up through and including capacitor life tests on materials we recommend.

We will arrange a meeting including you, Paul Benignus, Don Olson and me for early next week to discuss this situation and decide on a recommended course of action.

R. H. Munch
R. H. Munch

js

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TRAN 058301

X

THE PCB-POLLUTION PROBLEM
January 21 and 22, 1970
St. Louis Meeting With General Electric Co.

GENERAL ELECTRIC REPRESENTATIVES:

Mr. Edward L. Raab, GE Pittsfield, Mass., representing all GE locations

Mr. H. Gerade, GE toxicological consultant

Dr. K. Murphy, GE Schenectady, New York, Environmental Pollution Control

MONSANTO REPRESENTATIVES:

H. S. Bergen, D. A. Olson, E. P. Wheeler, Dr. W. R. Richard, Dr. R. H. Munch, Dr. R. Keller, Dr. S. Tucker, W. B. Papageorge, J. G. Bryant, P. G. Benignus

A. Presentation and Discussion of Published Articles About Chlorinated Aromatic Hydrocarbon Insecticides, (DDT etc.) and PCBs

Mr. Wheeler presented to Mr. Raab a booklet containing most of the pertinent publications, to date, and indicated that additional articles will appear shortly.

He mentioned that manufacturers of DDT and chlorinated aromatic hydrocarbon insecticides will tend to emphasize the finding and interference of PCBs as the Government hearings limiting or banning use of the insecticides are held.

This lead GE to seek understanding of the scope, reproducibility, reliability and validity of the analytical procedures used by various investigators who reported finding PCB in concentrations as low as parts per billion.

B. The Analytical Procedures

Drs. Keller and Tucker presented details of Monsanto's GLC - Mass Spectrometric analytical capability and apparatus, as portrayed in Table 1. The sophistication of our analytical capability was emphasized to assure that our approach is the ultimate and is not surpassed. On this basis our views of the validity of results given in various publications are indicated in the attachments to Table 1.

General Electric were impressed and completely satisfied with the scope of our analytical capability and work.

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TRAN 022030

PLAINTIFFS	
EXHIBIT NO.	87
FOR IDENTIFICATION	
DATE	9-14-95
RPTR:	JAS

C. Biodegradeability of PCBs

Mr. Wheeler related that while Aroclor 1254 and 1260 are being found, especially in aquatic environment, the lower chlorinated biphenyls are not being observed. It is anticipated that the lower chlorinated members may be largely biodegradeable.

Drs. Richard, Keller and Tucker discussed biodegradeability studies by Monsanto at Ruabon and elsewhere.

These studies appear preliminary and not conclusive. Much more needs to be done in this area to allow GE to draw conclusions.

Since the literature indicates that trichlorobenzene and tri-tetrachlorobenzene are not susceptible to biodegradation, GE are intrigued with the absence of reports about finding these materials in the environment. The obvious implication is that since these materials are used with the higher chlorinated PCBs found -- the source of the latter is not from dielectric fluids. However, it was reasoned that chlorobenzenes may not remain due to their relatively higher vapor pressure or may not be found to date because they have not yet been zeroed in to the analytical spectrum.

D. Status of Aroclor Studies At Industrial Bio-Test. Table 2.

In essence results reported by Mr. Wheeler on chronic animal toxicity tests and animal reproducibility studies underway are not as favorable as we had hoped or anticipated. Particularly alarming is evidence of effect on hatchability and production of thin egg shells regards white leghorn chickens. The studies involved Aroclor 1242, 1254 and 1260. Some of the studies will be repeated to arrive at better conclusions.

E. The Location of Askarel Transformers. Table 3.

Messrs. Raab and Benignus formulated Table 3 to portray the use and locations of askarel transformers throughout industry and our commercial and residential areas.

On discussing these askarel transformer applications Mr. Raab was most impelling and forceful about the non-replaceability of transformer askarel fluid and the critical or essential use and need for askarel transformers, which have safety from fire as their outstanding virtue. Without dwelling on details and instead carried to the ultimate, the consensus is that without availability of askarel transformers large cities like New York would be shut down with no power. Certain industries that rely mainly on askarel transformers would go down with no power. Without Aroclor capacitors most of the lights across our country would go out and motors in air conditioners and many industrial applications would not run.

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TRAN 022031

Frankly, no one could think of a suitable replacement for transformer askarel fluid. Fortunately, Aroclor 1242 with promise about biodegradability is used in most all of the Aroclor type capacitors. Moreover, possible favorable isomer rearrangements are foreseen in the case of Aroclor 1242.

Need to control, accumulate and properly dispose of scrap askarels is unquestionable in light of the PCB pollution problem, and essential toward maintaining the use of askarel dielectrics. At GE alone apparatus in which askarel fluid is used represents 100 million dollars annually. About 60% is in the capacitor area and 40% represents transformers.

GE requested and we were pleased to give Dr. Murphy their Environmental Control man, a list of all GE and other locations receiving Pyranol shipments in 1969. This amounts to about 16 million pounds of askarel fluids with economic worth of near 2.5 million dollars. This listing included 244 different locations of which 115 were GE plants and service shops scattered throughout our country.

Of course in addition to dielectric use in hermetically sealed capacitors and transformers major amounts of PCBs are used as Plasticizers, Industrial Hydraulic Fluids and Heat-Transfer media.

F. Environmental Sources of PCBs From Dielectric Applications

1. Spills
2. Disposal of waste
3. Ultimate disposal of product -- for failed apparatus
4. Ventilation of operation for employe protection
5. Waste from containers
6. Field on service failures
7. Repair and return apparatus "service shops"

G. Considerations of Degradation Disposals

1. PCBs up to and including 3 chlorine atoms appear biodegradable in preliminary laboratory work.
2. Thus far there is no evidence that higher chlorinated biphenyls will biodegrade.

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TRAN 022032

3. According to the literature TCB and TCCB biodegrade at a very slow rate.
4. Chemical, catalytic breakdown would probably require high temperatures.
5. Incineration will require 800°C. and 5 second sojourn time. HCl scrubbing would be required.

H. Estimated Annual Amounts of Contaminated and Scrap PCBs From The Electrical Industry

1. From The Transformer Industry:

- a) In plant and field spills are small and controllable with adsorbents, which should be incinerated.
- b) Near 2 million pounds a year of transformer askarels are sold to service and repair shops. These people do not manufacture new transformers, although on occasion they may fill new transformers sent into the field without fluid. As these service shops are devoted primarily to repairing faulty transformers, we can assume that as much as 1.0 million pounds annually of "scrap" is generated. Most of this has been dumped or disposed of in streams.
- c) We estimate that probably 150,000 pounds of this is arced beyond reworking and needs to be incinerated. The remainder may be reworkable by distillation.

2. From The Capacitor Industry:

- a) Collectable waste from normal capacitor impregnation operations amounts to about 850,000 pounds annually. Most of this should be reworkable via simple take-over distillation.
- b) Scrap, badly contaminated with polypropylene, epoxides, solvents, oil, grease and "junk" is generated at not over 50,000 pounds a year. This material should be incinerated, along with the 150,000 pounds of scrap from transformers.
- c) Power capacitors are designed to last over 30 years. Modern motor runs may last 10 years and the small lighting ballast usually last not over 10 years.

Eventually and cumulatively there is a large potential of field-failed capacitors. Fortunately Aroclor 1242 has been used almost exclusively since about 1950.

COMPANY
CONFIDENTIAL TRAN 022033

The failed units are disposed of in industrial dumps. In case of ballasts the Aroclor capacitor along with the transformer imbedded in asphalt or encapsulated in epoxy resin, all encased in a metal box are discarded as a unit. This is emphasized to indicate that incineration of such apparatus is not applicable.

3. From Containers:

Most askarel moves in bulk, tank cars or tank wagons, which do not present a problem.

It is questionable that drum shipments may present a problem. The drums can be used for returning scrap.

I. Monsanto's Program To Handle Scrap

1. GE asked what is Monsanto's plan about reclamation of scrap PCB from GE plants, service shops, utilities, industrial users, commercial users, etc.?
2. What is our view about a "Buy-Back" arrangement?
3. What arrangements will Monsanto make for incineration? Disposal in suitable land-fills? Reclamation by distillation at Monsanto?
4. To date Monsanto's posture is:
 - a) We have taken "good quality" scrap from GE's capacitor plant at Hudson Falls and had it reworked by simple filtration at Findett. This Findett arrangement is not practical nor economical. We paid GE 1 ¢/lb. for this "quite good" Aroclor, plus 1.9 ¢/lb. freight. Findett charged 2.1 ¢ to filter this material, making our cost 5 ¢/lb.
 - b) 130,000 pounds of somewhat lower quality scrap from Westinghouse capacitor plant has accumulated at Findett for lack of distillation equipment.
 - c) Scrap from GE's Ft. Edward plant appears to need reprocessing by distillation.
 - d) About $\frac{1}{2}$ million pounds of "bad scrap" from GE Hudson Falls, has been disposed to a land-fill in New Jersey. Monsanto paid half of the freight cost.
 - e) A car load of scrap transformer askarel from Westinghouse, South Boston, Virginia is being sent to W. G. Krummrich for reprocessing.

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TRAN 022034.

- f) We advised Westinghouse, Sharon to incinerate 12,000 gallons of oil contaminated askarel.
- g) We talked with Sangamo, Picken, S. C. and strongly urged them to discontinue present disposal.
- 5. The above "take-back" arrangements have been made on an individual and experimental basis. We have no fixed "buy-back" arrangement, regards answering GE's question.
- 6. We have no established process for reclaiming either capacitor or transformer scrap.
- 7. We have no incinerator for disposal of totally unreclaimable material.
- 8. To date and for the foreseeable future our only effective disposal is to a land-fill. While this is not desirable, it is better than indiscriminate dumping.

J. Transformer Askarel Blends Discussed With GE. Table 4.

Table 4 lists the transformer askarel blends reviewed with GE.

- 1. GE Rome has discontinued use of Blend A due to combustibility of arc formed gas. For this same reason, as dictated by their legal people they will not use Blend B.
- 2. Today both GE, Pittsfield, Mass. and Rome, Ga. use Blend C (Pyranol Al3B3B), which they mix themselves.
- 3. Blend D optimizes the Aroclor concentration in conformance with GE's requirements for non-combustibility of the arc formed gas and with the pour point requirements. The price is in direct conformance with our previous quotation for Aroclor 1242, when GE was using this at a concentration of 80% by weight.

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6. PCBs have been brought into hearings proposing restrictions or elimination of DDT, PCHI.
7. As manufacturer of PCHI's fight for their life, attention will be directed to PCBs.
8. To our knowledge PCBs are not being found in terrestrial birds or animals, but DDT and PCHI's are found.
9. PCBs are not being found in the eco system without the presence of DDT or PCHI's.
10. PCHI's residue are found without PCBs.
11. We have no evidence that anyone has found lower PCBs except that Dutch researchers found PCBs in roaches.
12. There is no evidence of natural sources of PCBs nor any source other than industrially produced and used.
13. PCBs in a single dose have a low order of acute toxicity and are no significant problem to rats, dogs, chickens, fish and humans.
14. Based on six months of chronic studies in rats and dogs some PCBs are "moderately" toxic and more so than DDT, but less toxic than some of the other chlorinated hydrocarbon insecticides.
15. Some PCBs affect rat reproduction, (10 ppm. apparent no effect levels).
16. Some PCBs affect leghorn chicken reproduction (100 ppm.). PCBs have no affect level for chickens, estimated 10 ppm.
17. Some environmentalists are claiming that the PCBs pose a threat to humans, are so "philosophizing" in publications.
18. One published page indicates that PCBs are as bad (or worse) than DDT in microsomal enzyme effect. What is significant? Since many chemical compounds react similarly!
19. Human experience in production of PCBs and their use has been favorable. Less than 20 instances of illness known to Monsanto Company since 1940-45. Proper precautions were not always followed.
20. GE Company's use of PCBs as dielectric fluids, has been extremely favorable without illness throughout 40 years.
21. Monsanto Company is convinced that analytical techniques and data from some laboratories investigating PCBs are reliable and that conclusions being formulated are valid.

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TRAN 022037

22. Monsanto Company has not run duplicate analysis on samples reported in the literature.

L. What GE Desires

1. GE seeks that Monsanto take no precipitous reaction to the PCB problem that would result in withdrawing supply of Aroclor 1254 or 1260 to GE.
2. The consensus is that no suitable replacement for transformer askarel fluid is foreseen.
3. In event of development of a suitable fire-resistant fluid replacement for askarel, Mr. Raab emphasized that a minimum of 2 years testing work would be required before commercial use could be adopted.
4. In reply to Monsanto's legal question whether with continued use of Aroclor 1254 and 1260 GE would assume sole and complete liability -- Mr. Raab answered, No! To substantiate his reply, Mr. Raab cited case examples involving GE where damages were sought and collected, even though GE was only the third party. He further stated that any arrangement seeking to delegate and confine liability to GE relative to the PCB problem would be worthless.
5. GE seeks to know the magnitude and time of Aroclor price increase that would result if Monsanto discontinues sale of Aroclor for non-electrical uses, or if pollution control expenses warrant a price increase (as anticipated).
6. GE seeks to send a letter to their plants and service shops and major users of transformer askarel, such as the utilities giving notice of the PCB problem and guidance about the most suitable controls.
7. In the case of GE service shops scattered throughout our country it is unrealistic that these people would assume any expense to return scrap to Monsanto.

The minimum we can expect is that Monsanto pay the freight charges, and reimburse for a suitable container to avoid additional and excessive contamination.

This emphasizes need for Monsanto to have an effective reclaiming process. Otherwise, the best we can expect from service shops and many other users is to continue to dump in a land-fill and stop discarding into the sewers.

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TRAN 022038

8. GE realizes that Monsanto is caught between the explosiveness of arc-formed gasses problem and on the other hand the PCB pollution problem. Realizing possible unfavorable outcome of the arc-formed gas problem, GE desires to withhold the PCB problem from involvement at NEMA, ASTM, IEEE, EEI and ASIA at this time, (making it an industry-wide problem) pending better in-depth understanding of the PCB problem.
9. GE strongly seeks to continue manufacture of askarel type transformers, because in many applications this apparatus cannot be replaced with mineral oil nor open dry, nor seal gas dry type units.

Mineral oil burns. Open dry accumulates dust, lint, moisture and can then fail with explosion and burning. Sealed gas dry types are very expensive, space consuming and very difficult to maintain sealed.

Transformer design and application is governed by National Electric Code, by local building codes, Fire Underwriters, NEMA, IEEE, ASTM, IEC, ASA, Insurance companies and others. Because of the diversity of organizations involved a directive to discontinue askarel transformer manufacture would assume highly complex proportions.

P. G. Benignus
January 26, 1970

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TRAN 022039

THE PCB-POLLUTION PROBLEM
SUMMARY OF JANUARY 21 AND 22, 1970
ST. LOUIS MEETING WITH GENERAL ELECTRIC COMPANY

- I. Monsanto has highly sophisticated capability, not surpassed by others to detect PCBs in the parts per billion range.
- II. Aroclor 1254 and 1260 are being found, especially in aquatic environment. Aroclor 1242 and lower chlorinated PCBs are not being observed.
- III. Studies are underway to better define the possible biodegradability of lower chlorinated PCBs.
- IV. Literature citations indicate that tri and tetra chlorobenzene do not biodegrade, however, they are not being identified in the environment.
- V. PCBs have been brought into hearings proposing restrictions or elimination of DDT and other chlorinated hydrocarbon insecticides. PCBs are incriminated by association subject to rechecking.
- VI. Due to combustibility of arc-formed gas, GE will not use Aroclor 1242 nor any blend with less than near a 1 to 1 ratio of chlorine to hydrogen, for transformers. This judgement is based on GE legal people citations of precedent court actions assigning liability against GE for transformer accidents.
- VII. As no suitable replacement for GE's transformer Pyranol blends are foreseen, GE seeks that Monsanto take no precipitous reaction to the PCB problem that would result in withdrawing supply of Aroclor 1254 or 1260 to GE.
- VIII. In reply to Monsanto's legal question whether with continued use of Aroclor 1254 and 1260, GE would assume sole and complete liability -- their spokesman answered No! He cited legal case examples to substantiate his response.
- IX. GE strongly seeks to continue manufacture of askarel type transformers because in many applications this apparatus cannot be replaced with mineral oil types, nor with open or sealed dry types.

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TRAN 022028

PLAINTIFF'S
EXHIBIT NO. <u>88</u>
FOR IDENTIFICATION
DATE <u>9-14-95</u> RPTR: <u>JAS</u>

- X. GE urges control of the PCB problem through accumulation and proper disposal of "scrap". Incineration, distillation, catalytic and bio breakdown are to be investigated by Monsanto.
- XI. At the present time, land-fills continue as our sole disposal for arced or "poor quality" transformer askarels.

P. G. Benignus

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TRAN 022029

X

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VENEZUELA - H. H. Schlaubitz
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TNGS 008493

PLAINTIFF'S	
EXHIBIT NO. <u>89</u>	
FOR IDENTIFICATION	
9-14-95	
DATE:	RPTR: JAS

STLCOPCB4024901
WATER_PCB-SD0000043017

F.J. Camargo/C. Paton-St. Louis

October 1, 1971

POLYCHLORINATED BIPHENYL PRODUCTS

See Distribution List

J. E. Tucker-St. Louis

N. J. Kamper-St. Louis

bcc: W. B. Papageorge-B2SK

J.J. Roder-B2SQ

P.O. Benignus-B2SH

D. R. Pogue-B2SJ

W. S. Clark-B3NE

T. L. Gossage-B2SL

The public concern over environmental pollution due to PCBs continues in U.S.A. and Europe. The public and governmental agencies are becoming increasingly concerned with the levels of PCB found in fish, eggs and poultry. In fact there have been several seizures of eggs and turkeys made by U.S.D.A. in the past several months.

Here is a status report by country:

1. U.S.A. and Canada

Monsanto has voluntarily banned sales of PCB for all applications except dielectrics and a few restricted heat transfer systems.

2. UK

Monsanto follows the same voluntary ban as in U.S.A.

3. Sweden

The Swedish Government has banned the import of all PCBs and PCB-containing products except for the dielectric industry.

4. Holland

As the attached news item shows Holland is actively considering a ban on PCBs.

5. Germany

Monsanto will attend a meeting on PCBs at the German Ministry of Public Health in September.

TNGS 008494

Please note that no Aroclor product should be used in any system processing or handling food or related products, food wrapping or container materials, pharmaceuticals, animal feed stuffs or potable water systems. Labels to this effect will appear on all Aroclor drums.

You may wonder where this places us with regard to competition. We think we are in a stronger position than Prodelec or Bayer, etc. Why?

1. You have had replacements for plasticizer PCBs in your hands for over a year. There is no sign that Prodelec or Bayer have any yet.
2. Our PCB competitors cannot claim this is solely a Monsanto problem. Bans in U.K. and Sweden and a proposed ban in Holland mean European producers have a problem too. In Japan there is a clamor for a ban. A customer will gain little insurance by switching suppliers.
3. U.N. restrictions on PCBs is a real possibility at their meeting which is only about six months away.

Monsanto is genuinely interested in preventing ecological problems from its products. We would rather restrict our sales on a voluntary basis and help our customers use replacements than be suddenly legislated out of business. We want to adopt a responsible attitude towards all countries, peoples and communities where we operate. We want no violations of our policies on PCBs anywhere.

The PCB situation has engaged a lot of the time of higher Monsanto management, e.g. John R. Eck of our main Board of Directors and John Mason (former Assistant General Manager of Organic Division and now a Group Director in Monsanto Industrial Chemicals Company.) We, therefore, ask your active co-operation in putting these policies into effect without delay. If you have any questions, please contact Frank Camargo.

Thank you.

F. J. Camargo

TNGS 008497

C. Paton

FJC/CP:10511

N. T. Johnson St. Louis

DATE

February 16, 1970

cc

SUBJECT

POLLUTION LETTER

REFERENCE

TO :

Aroclor
T. Brown → *ms*
py
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 - Brussels
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

TNGS 008683

Px 60

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

TNCS 008684

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 Monsanto's Aroclors specifically mentioned in these articles?
If so, which ones?

TNGS 008685

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 phase." 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.

TNCS 008686

Articles generated by the Wisconsin DDT hearings generally discussed PCB as an interfering substance discovered in scientific search for DDT in the environment. Dr. Rischbrough 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

TNGS 008687

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 DDT 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

TNGS 008688

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.

TNGS 008689

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?

TNGS 008690

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.

TNCS 008692

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 all right. I personally don't know the exact date.

CONTAINERS

Question 1

For how long did you use Aroclor drums without me having a wash drum? I got a wash drum a piece. I can't afford to wash it at home. Even if I did, what would I do with the washings?

TNGS 008694

Answer (5):

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 a bad name -- 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.

TNGS 008696

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.

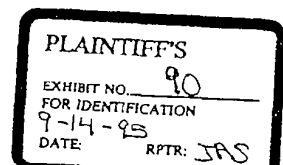
Gene, of all the plants I personally toured, yours had the biggest challenge to reach the objectives we are striving for. I tell you this not to embarrass you but, hopefully, to give you some feel for the magnitude of the problem.

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.

COMPANY
CONFIDENTIAL

TRAN 061672



STLCOPCB4024915
WATER_PCB-SD0000043031

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. O. 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.

COMPANY
CONFIDENTIAL

TRAN 061673

Monsanto

R. H. MUNCH - JFQ
D. A. OLSON - DOLSO
W. B. PAPAGEORGE - WPAPA

ORGANIC CHEMICALS DIV

Monsanto Company
800 N. Lindbergh Boulevard
St. Louis, Missouri 63185
Phone: (314) 584-1000

August 6, 1970

MCS 1016

Since environmental probes for PCB's reflect the presence of the more highly chlorinated biphenyl compounds, Monsanto prepared an experimental amount of Aroclor 1242 from which a significant portion of the more highly chlorinated compounds have been removed.

This experimental material is called MCS 1016. The amount you requested for your capacitor studies is enroute to your attention, delivered at no charge.

Attached is our comprehensive analysis, indicating the properties typical for MCS 1016. The enclosed list of Aroclor 1242 properties is for your convenience in comparing these two materials.

The comparison reflects what one would expect after removing a significant amount of the more highly chlorinated biphenyl compounds from Aroclor 1242.

The excellent resistivity and power factor values given for MCS 1016 do not reflect a decimal point in the wrong place. However, it is not to be misconstrued that the electrical values of MCS 1016 are intrinsically superior to those obtainable with Aroclor 1242. Both materials attain these excellent electrical values when highly refined by adsorbents.

PLAINTIFF'S	
EXHIBIT NO.	91
FOR IDENTIFICATION	
9-14-95	
DATE:	RPTR: JRS

TRAN 092667

August 6, 1970

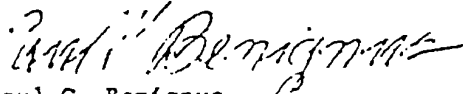
The electrical values given for MCS 1016 are not based on a sample from the storage tank. Instead, they are based on individual analysis of about ten samples removed from the drums in which the material was packaged. To account for the good results, we wish to indicate that handling, sampling, and analytical work on this experimental material was supervised by Dr. Ralph Munch in our Research Laboratories. He employed his recently-developed procedure which encompasses special care required for the proper analysis of the power factor and resistivity of highly refined Aroclor.

In light of this careful handling and testing at our end, and the wide simultaneous distribution of this material to the capacitor makers, we have good opportunity for a "round-robin" test of power factor and resistivity. We will appreciate it if you will sample your shipment promptly and give us your readings of power factor and resistivity.

In any event, the prime purpose of sending the MCS 1016 is to give you an opportunity to run capacitor life tests. Looking ahead, it appears likely that we will need to convert to the MCS 1016 type material as a step in the direction of helping on the PCB pollution problem.

Thank you for your assistance.

Very truly yours,


Paul G. Benignus
Market Manager
Dielectric Fluids

PGB:PH

Attach.

TRAN 092668

STLCOPCB4024918
WATER_PCB-SD0000043034

Recipients of P. G. Benignus letter dated August 6, 1970 are as follows:

Mr. Abe Kalstein
AEROVOX CORPORATION
740 Belleville Avenue
New Bedford, Massachusetts

Mr. Kurt Lopes
CORNELL-DUBILIER
1605 Rodney French Boulevard
New Bedford, Massachusetts

Mr. Ray Clark
ELECTRONIC COMPONENTS, INC.
902 Crescent Avenue
Bridgeport 8, Connecticut

Mr. Robert E. Abbe
GENERAL ELECTRIC COMPANY
Capacitor Department
John Street
Hudson Falls, New York

Mr. Howard Brown
HERCULES, INC.
P. O. Box 5038
Terre Haute, Indiana

Mr. Ralph Meyers
MC CRAW EDISON IND.
Line Materials Company
South Milwaukee, Wisconsin

Mr. H. B. Vaught
P. R. MALLORY
Waynesboro, Tennessee

Mr. T. Katayama
MITSUBISHI MONSANTO CHEMICAL COMPANY
C. P. O. Box 879
Tokyo, JAPAN

Mr. C. R. Coleman
MONSANTO CHEMICALS, LTD.
Ruabon
Denbighshire
North Wales, UNITED KINGDOM

Mr. Boyce Whitman
SANGAMO ELECTRIC COMPANY
Pickens, South Carolina

Mr. Howard Davis
SPRAGUE ELECTRIC COMPANY
North Adams, Massachusetts

Mr. Donald L. McClain
WESTINGHOUSE ELECTRIC CORPORATION
P. O. Box 341
Bloomington, Indiana

Dr. L. Mandelcorn
WESTINGHOUSE RESEARCH
Beulah Road
Churchill Borough
Pittsburgh, Pennsylvania

TRAN 092669

AROCLOR 1242 (Trichlorobiphenyl)
Specification Properties - September 27, 1962

<u>PROPERTY</u>	<u>TYPICAL</u>
Visc. at 37.8°C. (ASTM D88-56)	82 - 92 seconds Saybolt Universal
Specific Gravity at 25/15.5°C. (ASTM D1810)	1.381 - 1.392
Color, APHA	50 max.
Condition	Clear
Acidity, mg. KOH/g. (ASTM D974, D664)	0.01 max.
Pour Point, °C. (ASTM D97-57)	-14 or lower
Inorganic Chlorides (ASTM D1821)	0.05 ppm. max.
Refractive Index at 25°C. (ASTM D1807)	1.6240 - 1.6260
Distillation Range (ASTM D20-56)	
°C. corrected for stem and barometric pressure	10% 325 min. 90% 360 max.
Water content (ASTM D1533-60)	35 ppm. max
Resistivity, 100°C. 500 volts DC at 0.1 inch gap. (ASTM D1169)	500 X 10 ⁹ ohm-cm. min.
Dielectric constant, 100°C. at 1,000 cycles (ASTM D924-49)	4.7 to 4.9
Flash Point, Cleve. open cup (ASTM D92-57)*	170° to 200°C.
Fire Point*	None to boiling point
Sulfates (ASTM D117-31)*	None
Fixed Chlorine Content (Carius)*	43 ± 0.5%
Specific Heat at 25°C.*	0.29
Evaporation at 100°C. for 6 hrs.*	0.4% max.
Dielectric strength (ASTM D877-49) at 25°C. KV min.*	35
Hydrolyzable Chlorine Compounds, (ASTM D1820-61) ppm. chlorides, max.	0.5
Thermal Stability (ASTM D1936) ppm. chlorides, max.	0.4
Coefficient of Thermal Expansion* (ASTM D1903)	0.00068 cc./cc./°C.

*Not determined unless by special request.

TRAN 092671

X
bcc: P. Benignus
G. R. Graham

October 1, 1970

Mr. F. R. Viland
Senior Buyer
Purchasing Department
Transformer Division
Westinghouse Corporation
469 Sharpsville Avenue
Sharon, Pennsylvania 16146

Dear Fred,

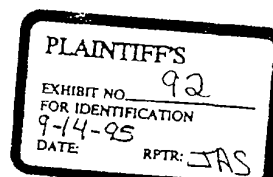
I apologize for not responding sooner but I was waiting for some laboratory data which I hoped would be helpful in resolving the solid material disposal problem with your State agency.

I telephoned Dr. Loughry on August 18 and found him to be very opinionated regarding the types of waste he would tolerate in a land fill. He insisted he had to have research data on the behavior of askarels on the various Pennsylvania soils over long periods of time. I, therefore, did not succeed in convincing him that disposal in a landfill was safe since I could only refer to generalities.

He did soften his position somewhat by stating that he understood you wished to dispose of liquid waste rather than solid waste. I assured him this was not your intent. Perhaps you can pursue this opportunity.

The laboratory information I was waiting for relates to a study made by Monsanto in the Gainesville, Florida area in 1938. Aroclor 1242 was one of several materials applied to soil in holes 15" in diameter and 16" deep. The walls were sprayed with a solution of Aroclor 1242 and the soil was replaced with each layer sprayed with additional Aroclor 1242. When the hole was completely filled, the remaining solution was poured on top. A total of 4 ounces of Aroclor was applied. We have

NEV 003895



STLCOPCB4024921
WATER_PCB-SD0000043037

Mr. F. R. Viland

-2-

October 1, 1970

estimated that the Aroclor content was about 2200 ppm.

In 1969, we secured samples from the Aroclor 1242 hole at 6", 6"-16" and 16"-26" from the top. Aroclor was present in these quantities:

<u>Probe Depth</u>	<u>ppm Aroclor 1242</u>
6"	2820
6"-16"	510
16"-26"	26

This data would indicate that after 30 years the Aroclor has not migrated to any significant degree.

I have not shared this information with Dr. Loughry since he seemed to indicate that studies with soils from other states would not be indicative of what would happen in Pennsylvania.

It is my opinion that only a soil chemist familiar with Pennsylvania will be able to communicate with Dr. Loughry. Gary Wilburn was considering approaching a consultant at VPI. Perhaps he could help.

I am sorry I was not able to help. Apparently we do not have anyone within the Monsanto organization who can talk Dr. Loughry's language.

Very truly yours,

W. B. Papageorge
Manager
Environmental Control

WBP:ms

NEV 003896

P. G. Denignus - St. Louis

January 25, 1971

H. S. Bergen - HBERG
T. L. Gossage - TGOSS
C. R. Coleman - RUABON
→ R. H. Munch - OUKENY
J. R. Fallon - JFALL

P.J.A. MARSH
BRUSSELS

Dear Peter:

You will recall that at the IXC-10B meeting in Brussels Pierre Jay of Prodelec kindly gave me his detailed analysis reflecting Prodelec's views that they are not the source of PCB pollution in Sweden, as result of their sale of Pyralene 1499 to Liljeholmens, the sole user of askarel in Sweden.

I have two reasons for pursuing this thing:

1. Monsanto has not achieved its marketing goals at Liljeholmens. It is my impression that Prodelec have been supplying most of Liljeholmen's annual requirement of 400 tons of Aroclor 1242.
2. Mr. Jay's contention that Pyralene 1499 contains no hexa and not over 1% of pentachlorobiphenyl was disturbing as our Aroclor 1242 has about seven times this amount of higher PCBs.

Consequently we analyzed all the materials given in the attached list. Without giving the exact detail findings, for all practical purposes the higher PCB contents are about the same for all. The only exception is our proposed MCS-1016 where we have gone to great means to remove the higher PCBs.

Thus we found Pyralene 1499-1500 and 1500S quite similar to Aroclor 1242 regarding higher PCB.

Without burdening the reader with all of Mr. Jay's calculations of the pollution situation in Sweden, the following will suffice. He concluded introducing 90 pounds of higher PCB per year into the Swedish environment. However, based on our analysis of Pyralene 1499 we conclude that the amount is 1,040 lbs. per year, from Liljeholmens capacitor operation.

Put into terms of ecological considerations and particularly sea eagles in the case of Sweden, this level of higher PCB would contaminate one trillion pounds of water to a level of one part per billion.

TRAN 037340

PLAINTIFF'S	
EXHIBIT NO.	93
FOR IDENTIFICATION	
DATE	9-14-95
RPTR:	JAS

STLCOPCB4024923
WATER_PCB-SD0000043039

Our MCS 1016 would result in a lower level of contamination by a factor of 7.

While Mr. Jay's analysis of the PCB pollution situation is comprehensive in terms of the pollution generated in a given year by Liljeholmens operation and while he mentioned that 50% of the capacitors are exported, we feel that the following point must not be overlooked as given time it is the most important consideration.

Given 10 years or 20 or 30 years, most all of the capacitors produced will have failed or become obsolete and in any event returned to mother earth. This is what the pollution problem is all about - not just one year's operation of Liljeholmen's plant.

The purpose of all of this is to get your views as to whether you feel that you can use the merit of MCS 1016 effectively at Liljeholmens in effort to obtain a significantly larger portion of their Aroclor requirements in competition against Pyralene 1499.

I am mindful of not attaching our detailed isomer analysis of all the competitive materials. It may be a little early to release these data into commercial circles as we can then expect it to come to our competitors. This will happen, eventually.

Best regards,

P. G. Benignus

cs

TRAN 037341

MOBILE

FROM (NAME & LOCATION) B2SH Cumming Paton

DATE October 14, 1971

SUBJECT Status of PCBs

REFERENCE

TO : 1070 H. R. FORD
1010 R. A. GARCIA
1800 D. R. HANSEN
1650 P. L. SLAYTON

"B2SL T. L. Gossage
B2NK W. B. Papageorge
B2SJ N. T. Johnson
W4A P. S. Park
B2SH P. G. Benignus
B2SH D. E. Roush/J. J. Roder
B2SH D. R. Pogue

CONFIDENTIAL

The following are the notes I used in the PCB "presentation" that must have held you enthralled at midnight after a 17-hour day!

Dielectrics

1. Product Changes

- CONFIDENTIAL — (a) Aroclor 1242 for capacitors changed to more bio-degradable 1015. — U.S./CANADA ONLY SO FAR. Ex-U.S.A SITU UNDER STUDY.
(b) Aroclor 1221 renamed Capacitor 21.
(c) In transformers no major changes planned.
(d) Research under way on PCB replacements. (Don't expect results in under 3-5 years.) — CONFIDENTIAL

2. Customers (DOMESTIC)

We've located about 4 plasticizers we're trying to get dielectric grade in the first 2 weeks!

- (a) Effective October 4, dielectric fluids must be approved prior to order entry by P. G. Benignus or C. Paton and W. B. Papageorge or T. L. Gossage.
(b) To prevent the need to approve all orders, a list of approved customers in both capacitors and transformers has been compiled and will be circulated by October 18.
(c) Field sales should scrutinize MIP runs re customers and order size. Follow up on doubtful ones and alert Product Group and COP.
(d) Regional managers to add one line to their monthly report:

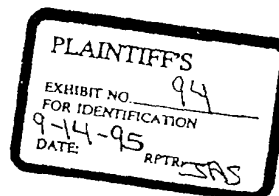
Unapproved Fluid Sales: (No or Yes)
If yes, a separate report should be sent on this.

Customer Notification (DOMESTIC)

A letter on the pollution aspects of PCBs will be sent to customers. This is being cleared with the Legal Department.

ANSI

An S.I.B. has been written on the formation of Committee C107



TNGS 008480

STLCOPCB4024925
WATER_PCB-SD0000043041

of ANSI. This committee will address itself to the problems PCBs pose for the dielectric industry.

Pollution Control

We are addressing ourselves to the pollution control or lack of it related to "service centers" for transformers or transformer users who buy only replacement fluid from Monsanto.

Heat Transfer Fluids

1. Conversions

Conversion of direct food-related users: completed.

Conversion of curtain coaters (~ 80% complete).

Conversion of film and foil producers

Conversion of adhesive manufacturers

Conversion of resin manufacturers for
paints and coatings.

D. E. Roush preparing
list of target
accounts for conversion.

2. Restrictions

No FR fluid sales for new applications will be strictly enforced. This will include hospitals and off-shore gas platforms.

3. Customers (Domestic)

- (a) All orders are being approved by two people prior to order entry.
- (b) A list of approved FR users (top-up only) is being prepared and will be circulated by October 25.
- (c) Field sales scrutiny of MIP runs is requested (as per dielectrics).
- (d) Regional managers should report on unapproved fluid sales (as per dielectrics).
- (e) We still need field sales help in completing surveys on the applications of FR customers.

4. Customer Notification

A mailing to all customers is planned. This will include: warning on PCBs; alternates to FR; non-fire retardance of T-55, 55 and 77; conversion offer and procedure; positive approach to non-FR fluids; tighter maintenance guide for all fluids.

5. Labels

New labels are being printed. This will include a stronger statement on food and food-related uses. It will also

TNCS 008481

cover the return of used fluid for incineration.

Process Fluids

1. Carbonless Carbon Paper

No sales of chlorinated bi- or terphenyls.

2. Dye Carriers

Aroclor 1221 replaced by Aroclor 1221B. (Aroclor 1221B is monochlorobiphenyl whereas Aroclor 1221 did contain up to 25% PCB. We should make no big issue out of this with any customer. Currently Ciba-Geigy is the only customer affected and this has been handled. Therefore ~~Aroclor 1221~~ any request for Aroclor 1221 will be filled with Aroclor ~~1221~~ *1221B* without comment.) [*Geigy will be sold Carrier 1103 if needed*].

3. No customer notification of Process Fluids is planned as a general mailing. Individual customer situations have been and will be handled separately.

In addition to the above, the following situations have arisen.

1. Requests by paper companies for information, help on PCBs in recycled paper. We should refer companies to The American Paper Institute which is active in this area

or to W. B. Papageorge.

If any paper company wants methods for detecting PCB, Bill has a "Methodology Packet" that can be sent.

2. Requests from Monsanto customers that we write letters stating whether or not the products supplied by any of our Divisions are PCB-free.

Specialty Product Group products: All products (except dielectric Aroclor/Inerteen/Pyranol; Aroclor 5400 and 6000 series; Aroclor 1221B; Santovac 1 and 2; Pydrauls; Thermi-nol FR series; and Turbinol 153) the regional manager should write the customer assuring him of the absence of PCBs.

On product exceptions -- contact W. B. Papageorge.

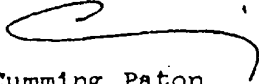
Products from other groups: Pass request to your counterpart in the region for handling.

3. Pollution Control Procedures for Customers' Plants

A draft of a bulletin on this subject has been written and is being revised.

TN6S 008482

I have been impressed by the efforts many of your men have put into turning this difficult situation around. If they have any suggestions where we can improve on our procedures and policies or problems we are ignoring we'll be only glad to hear from them. If they need specific help from anyone in St. Louis please let us know. I'll try to keep you as up to date as I can on future developments.



Cumming Paton

cs

TNGS 008483

Monsanto

FROM (NAME & LOCATION) B2SH P. G. Benignus

DATE October 22, 1971

1460 J. G. Frederiksen
B2SH C. Paton
B2SJ N. T. Johnson

SUBJECT Disposal of Scrap Askarel Fluid

REFERENCE

TO 1070
H.A. FORD

Dear Ray,

Please refer to John Frederiksen's memo to Cumming Paton October 13, 1971 indicating that he has noticed a distressing amount of indecision on the part of several dielectric fluid accounts regarding the proper disposal of scrap askarel.

Would you please list who these accounts are?

Our PCB incinerator is in full operation at W. G. Krummrich and to the best of my knowledge communications were sent to all of our customers indicating that they should send scrap fluid to us at Sauget, Illinois for incineration at 3¢/lb.

This message is also being indicated on the labels of our drums. An example relative to Arcolor 1016 is attached. Some of our other packages carry the small separate waste disposal label. Also it was my understanding that this same brief message was to be put on all invoices.

However, notwithstanding all our efforts I suppose that communication remains the world's number one problem.

Therefore, if indeed (J. G. Frederiksen) is encountering our own customers not fully informed please write to them or carry this message to them.

As this entire PCB thing has now been widely publicized we readily understand that customers of someone like Kuhlman Electric may be asking them this question about waste disposal. As we cannot cover this thing for Kuhlman's customers and the endless number of others out in the field please advise Kuhlman and our other customers to do all they can to pass along the message.

Realizing that the electrical manufacturers themselves cannot contact all these people we have formed committees at ANSI through which organization we hope to have available channels for more widely distributing this message to individual users. This program is in formative stages.

Best regards,

Paul
P. G. Benignus

CS

TRAN 088347

IN-10 REV 11-65

PLAINTIFF'S

EXHIBIT NO. 95
FOR IDENTIFICATION
9-14-95
DATE: RPTR: JAS

STLCOPCB4024929
WATER_PCB-SD0000043045

ELECTRICAL GRADE

AROCLOR 1016

CHLORINATED POLYPHENYLS BY

Monsanto

CAUTION!

CONTAINS CHLORINATED
HYDROCARBONS

Avoid prolonged breathing of vapors
or mists.

Avoid contact with eyes or prolonged
contact with skin.

If skin contact occurs, remove by
washing with soap and water.
Following eye contact, flush with water.

If clothing becomes soaked with fluid,
laundry before wearing again.

This product contains polychlorinated biphenyls,
which some studies have shown may be persistent,
an environmental contaminant and, possibly, in-
jurious to certain forms of bird, aquatic and animal
life. Extreme care should be taken to prevent any
entry into the environment through spills, leakage,
use, disposal, vaporization or otherwise.

Contact your Monsanto Representative regarding
reclamation of used fluid.

WASTE DISPOSAL

Used polychlorinated biphenyl fluids may be re-
turned freight prepaid for proper incineration at
34 per pound.

Ship to: Supervisor Dept. A-246
MONSANTO COMPANY
SAUGET, ILLINOIS 62201



NET 600 LB. 272.16

LEGAL

TARE 44 LB. 21.77 KG.
GROSS 644 LB. 293.93 KG.

LOT NO.

PACKER

MONSANTO COMPANY, ST. LOUIS, MISSOURI 63166, U.S.A.

826.12-016.01/53

TRAN 088348

WASTE DISPOSAL

Used polychlorinated biphenyl fluids may be returned freight prepaid for proper incineration at 3¢ per pound.

Ship to: Supervisor Dept. A-246
MONSANTO COMPANY
SAUGET, ILLINOIS 62201

1149/53

TRAN 088349

1
DICTATE IN SEQUENCE:

1. HEADING INFORMATION
2. NAMES OF ADDRESSEES
3. NAMES OF CARBONEES
4. IMMEDIATE ACTION NEEDED
5. REPORT ON CALL

REPORT CAPTIONS:

1. OBJECTIVE
2. PERSONS CONTACTED
3. RESULTS
4. ACTION REQUIRED

CUSTOMER NAME U. S. STEEL		DATE OF CALL 6-16-72	
CITY AND STATE BAYTOWN, TEXAS		DATE RECEIVED 6-19-72	DATE TYPED 6-21-72
CUSTOMER MAILING LIST CHANGES - SERVICE CENTER USE ONLY			
NAME AND TITLE	FW ON	MP OFF	MAG OFF
REGION SOUTHERN	SERVICE CENTER HOUSTON	SALESMAN D. W. STEGEN/sj	

TO CUMMING PATON - ST. LOUIS .CC.

JERRY DAVIDSON - STL.
PAUL CRASKA - PITTSBURG
E. L. SHIMLEY - AKRON
DOUG HANSEN - S. C.
BOB BEVACQUA - L. A.

CALL MADE WITH J. J. RODER.

PERSONNEL CONTACTED: Bob Peterson - Maint. Supt.
John Rowland -

CP	DER
PCB	DER
PHL	PWG
QPP	NTJ
THD	PLG
Date Rec'd: 6/23	

PYDRAUL 230 C: Peterson had received a call from his counter-part in the Torrance, Calif. operation of U. S. Steel, indicating that Torrance was in trouble as a result of polychlorinated biphenyl pollution. Peterson is of the opinion that Torrance has already changed their system with the assistance of Monsanto from PCB to non-PCB fluids and has flushed the system to remove all residual PCB's. We discussed the entire PCB situation with Peterson and Rowland and now I feel they have a reasonably good understanding of the problem. Peterson recognizes he will not get to -0- PCB's, even if he drains and flushes his system. We did provide him with the name of the lab's which we would be willing to recommend for analytical work on PCB's. I also suggested to Peterson that he sample his affluent to determine if he has a PCB problem at this time. Peterson is agreeable to this, however, he did ask if the State of Texas had established any toleran levels on PCB in affluent. I indicated I would have Bill Pappageorge conta him in order to clarify this point.

PLAINTIFF'S	
EXHIBIT NO. 96	
FOR IDENTIFICATION	
DATE: 9-14-95	RPTR: MAS

B2SC P. G. Benignus

January 20, 1972

Askarel Dielectrics

B2SL W. R. Corey
B2SL H. S. Bergen
B2SL T. L. Gossage
B2SC C. Paton
B2SL J. R. Savage

B2NK
W. B. PAPAGEORGE

When dealing with historical production and sales figures for dielectrics it becomes quite important for all concerned to put them into proper perspective, especially from the stand point of the higher PCB (Aroclor 1254 and Aroclor 1260) content relative to the PCB pollution problem.

Product changes took place. For example in the capacitor industry:

<u>Prime Product</u>	<u>Approx. Higher PCB Content 5 Cl and higher</u>	<u>Prime Product Use Period</u>
Aroclor 1254	76%	To about 1952
Aroclor 1242	7%	1952-1970
Aroclor 1016	0.3%	1971

1970 was the historical high year for pounds of capacitor Aroclor use in the USA at near 26 M lbs. We do not expect this level to be exceeded for some years to come.

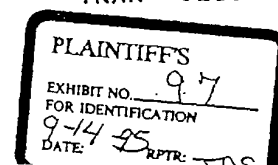
Now to reflect the elimination of higher PCBs from capacitor Aroclor taking in account product changes and using 1970 sales as basis for comparison we have:

<u>Product</u>	<u>1970 Basis for Comparison Higher PCB Involvement Pounds</u>
Aroclor 1254 25 M x 76%	19,760,000
Aroclor 1242 26 M x 7%	1,820,000
Aroclor 1016 25 M x 0.3%	78,000

1. If Aroclor 1254 had continued in use the higher PCB involvement would have been near 20 M pounds.
2. In 1970 Aroclor 1242 was the prime product and the higher PCB involvement was 1.82 M pounds.
3. Now Aroclor 1016 is used exclusively and the higher PCB involvement based on 1970 sales would have been 78,000 pounds.

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TRAN 021185



STLCOPCB4024933
WATER_PCB-SD0000043049

Conclusion

At this time and for the foreseeable future the involvement with the acknowledged non-biodegradable 5 chlorine and higher PCBs from the entire USA capacitor industry does not appear to exceed about 10,000 pounds annually.

P. G. Benignus

CS

COMPANY
CONFIDENTIAL

TRAN 021186

X
Monsanto

FROM (NAME & LOCATION): E. S. Tucker - R&D Labs - 1700 So. 2nd - St. Louis

DATE May 19, 1969

cc: R. E. Keller - So. 2nd
C. F. Buckley - WGK
W. R. Richard - GO
E. P. Wheeler - GO
P. B. Hodges - GO

SUBJECT AROCLOR SAMPLES FROM WGK

REFERENCE

TO : Michael A. Pierle
TSD - WGK

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	Aroclor 1242 Found
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GC/Mass analysis confirmed the presence of mono, di, tri and tetra polychlorinated biphenyls in the Sauget sludge sample.

E. S. Tucker

db

TRAN 007564

*Attaches
December
1967 memo
from Hardy*

Monsanto

D.V.N. Hardy, London

12th January, 1967

Aroclor - Sweden

DVNH/ARW

FILE		
Destroy		
JTG		
WHH	✓	✓
MNJ	✓	✓
REK	✓	✓
RAM		
EPW	✓	✓

JAN 16 1967

10

P.C. Benignus, St. Louis
G.R. Buchanan, St. Louis
D.S. Cameron, Brussels
Dr. R. Emmet Kelly, St. Louis ✓
G.R. Graham, New York
R.A. Steenrod, St. Louis
D. Wood, Brussels
J.A. Evans, London
R.A. Baxter, Ruabon

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COMPANY
CONFIDENTIAL


D.V.N. HARDY

TRAN 007566

STLCOPCB4024937
WATER_PCB-SD0000043053

X
Monsanto

FROM: NAME & LOCATION David Wood-St. Louis-B2SC

DATE July 18, 1974
SUBJECT DIELECTRICS SEMINAR
SEPTEMBER, 1974
REFERENCE MEETING 17TH JULY
PROGRAM COMMITTEE
TO

P. G. Benignus
T. L. Gossage
W. B. Papageorge
~~W. R. Richard~~
W. R. Richard

Ray L. Lusk
It became clear during our discussion that the program should follow a sequence:

- 1) Definition of Environmental Problems Surrounding PCBs;
- 2) Indepth Review of the Defense of PCB Continued Use;
- 3) Conclusion that Use of PCB Can Be Continued.

We wish the program to allow customer participation and to reflect a balance between capacitor and transformer manufacturers, and large and small manufacturers. Ideally, there should also be some contribution from the limited number of overseas manufacturers who may attend.

On the above basis, the following program evolved:

- 1) Status report on environmental issues concerning PCB around the world. No guest speakers would be involved in this section since we wish to concisely define the problem before the seminar without getting into over-much discussions of different corporate viewpoints. U.S.A. and Canada would be presented by Bill Papageorge, the European situation by Al Vodden, and other world areas by David Wood.
- 2) Effect of PCBs in the Environment. We believe that this heading should cover biodegradation, isomer differentiation, and test procedures to satisfy the capacitor industry problems, and secondly, migration of PCBs in soil to reflect the rather different situation of transformer manufacturers. We suggest that this is handled by Scott Tucker and Al Vodden without guest speakers.

TRAN 028069

IN 10 REV. 1/72

PLAINTIFF'S	
98	
EXHIBIT NO.	
FOR IDENTIFICATION	
9-14-95	DATE
RPTR: JAS	

STLCOPCB4024938
WATER_PCB-SD0000043054

- 3) Methods of testing PCB in effluent streams. This topic should be divided into four sections:
 - A) Presentation by Ed Stewart on clean-up of our own PCB facility;
 - B) CED Department - Monsanto ideas for controlling PCB at customer locations;
 - C) Capacitor industry comments, preferably by Mr. Hydrick of Sangamo;
 - D) Transformer customer comment by Mr. Shepherd of Westinghouse.
- 4) Disposal of waste Aroclor. We suggest that this be handled by a panel comprising Jim Savage, Bill Papageorge, and Earl Potter, and should aim to cover incineration, transportation, cleaning and disposal of drums, damage to bulk containers in transit.

We anticipate that at the end of Item 4 would form a breakpoint for lunch.

- 5) New Fluids. Under this heading, we would cover work on Aroclor 1016, Aroclor 1043, and non-PCBs with emphasis being low on non-PCBs; however, as we hope the EPA standards support the continued use of PCBs. We propose that this section be handled by R. Munch and J. G. Bryant.
- 6) Transformer Fluids. We seek a presentation by G. E. Rome, Jim Kinney covering the search for alternative fire resistant transformer dielectrics to be followed by a presentation by Bill Richard indicating that Monsanto has not neglected transformer fluids in its Research program, but that new major developments have not yet evolved. We shall seek in this presentation to ventilate the Monsanto production problem if there is a general move from higher chlorinated isomers and explore the concept of a transformer fluid based on Aroclor 1248.

Items 2 through 6 are designed to indicate the number of areas in which a defense of continued PCB use can be mounted.

TRAN 028070

- 7) Economic influence of askarel use on U. S. economy. Here we seek a presentation by Ed Raab of General Electric of the economic data presented in Washington. We hope to set a positive note with this presentation to support continued use of PCBs.
- 8) Consumer attitudes. Under this heading, we would seek positive presentations on askarel transformers and askarel capacitors. Our first choice for transformers is Niagara with Ferranti Packard as reserve. Our first choice on capacitors is Jard with Mallory as reserve.

It was suggested that after each section, we should allow a 15-minute period for questions from the floor and that as a last stage, the committee should consider whether there were any specific organizations and questions we wished to introduce into the program.

Would you please let me know if the above fairly reflects the conclusions of the meeting and whether you have any further additional comments to make before we seek final approval of this format.

*Dictated, last met
read by D. Wood*
David Wood *deb*

/deb

TRAN 028071

X
Monsanto

FROM (NAME & LOCATION) E. S. Tucker - R&D Labs - 1700 So. 2nd - St. Louis

DATE May 19, 1969

SUBJECT AROCLOR SAMPLES FROM WGK

REFERENCE

cc: R. E. Keller - So. 2nd
C. F. Buckley - WGK
W. R. Richard - GO
E. P. Wheeler - GO
P. B. Hodges - GO

TO : Michael A. Pierle
TSD - WGK

Analysis of the WGK sample by EC/GC produced the following results.

	Aroclor 1242 Found
Sludge from Sauget Village Waste Treatment Plant	0.86 $\pm$ 0.02%
Waste Water from Village Effluent	Interference*
Sludge from Mississippi River 300' downstream of Plant Outfall	16.4 $\pm$ 0.3 ppm**
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*Aroclor 1242 present but the background was so intense
a quantitative estimate could not be made. Probably
slightly less than solubility limit $\sim$ 10-100 ppb.

**Peaks with longer retention times indicated the presence
of Aroclor 1254 so the number shown is slightly high for
Aroclor 1242. Content slightly low for the total Aroclor
content.

GC/Mass analysis confirmed the presence of mono, di, tri and
tetra polychlorinated biphenyls in the Sauget sludge sample.

E. S. Tucker

db

TRAN 007564

*Attaches
December
1967 memo
from Hardy*

FORM REV. 11-68

STLCOPCB4024941
WATER_PCB-SD0000043057

Monsanto

D.V.N. Hardy, London

12th January, 1967

Aroclor - Sweden

DVNH/ARW

FILE	
Destroy	
JTG	
WHH	✓
MNJ	✓
REK	✓
RAM	✓
EPW	✓

JAN 16 1967.

10

P.G. Benignus, St. Louis
G.R. Buchanan, St. Louis
D.S. Cameron, Brussels
Dr. R. Emmet Kelly, St. Louis ✓
G.R. Graham, New York
R.A. Steenrod, St. Louis
D. Wood, Brussels
J.A. Evans, London
R.A. Baxter, Ruabon

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COMPANY
CONFIDENTIAL


D.V.N. HARDY

TRAN 007566

STLCOPCB4024942
WATER_PCB-SD0000043058

Monsanto

FROM (NAME & LOCATION) E. S. Tucker - R&D Labs - 1700 So. 2nd - St. Louis

DATE May 19, 1969

cc R. E. Keller - So. 2nd
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E. P. Wheeler - GO
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E. S. Tucker

db

TRAN 007564

Monsanto

D.V.N. Hardy, London

12th January, 1967

Aroclor - Sweden

DVNH/ARW

FILE		
Destroy		
JTG		
WHH	✓	✓
MNJ	✓	✓
REK	✓	✓
RAM		
EPW	✓	✓

JAN 16 1967

10

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CONFIDENTIAL


D.V.N. HARDY

TRAN 007566

X
Monsanto

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E. S. Tucker

db

TRAN 007564



UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE
BUILDING 18, DENVER FEDERAL CENTER
DENVER, COLORADO 80225

WReB

January 16, 1968

Monsanto Chemical Company
800 N. Lindbergh Boulevard
St. Louis, Missouri

Gentlemen:

It has been brought to our attention that presumptive evidence of chlorinated biphenyl and chlorinated polyphenyl compounds have been found in avian and animal tissues.

We are in the process of further investigation of compounds of this series and would appreciate your sending us samples of your Arochlor compounds numbers 1242, 1254, 1260, 1268 and any others which might be extensively used.

Sincerely yours,

Richard A. Wilson, Sr.
Research Chemist (Biochemistry)

TRAN 007565

Monsanto

D.V.N. Hardy, London

12th January, 1967

Aroclor - Sweden

DVNH/AHW

FILE	
Destroy	
JTG	
WHH	✓
MNJ	✓
REK	✓
RAM	✓
EPW	✓

JAN 16 1967

10

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G.R. Buchanan, St. Louis
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COMPANY
CONFIDENTIAL


D.V.N. HARDY

TRAN 007566

STLCOPCB4024948
WATER_PCB-SD0000043064