Monsanto

St. Louis - General Offices

May 11, 1970 W. B. Papageorge

TO : H. S. BERGEN
J. E. SPRINGGATE

Attached hereto are copies of charts I used in the presentation with the CMC this morning.

The CMC gave its approval for us to implement the plan as outlined on the two sheets marked "PRESENT PLAN".

We are required to report to the CMC should we make any major deviation from these plans and we are also required to make a progress report probably around the 1st of August. Would you please go ahead and take the necessary action within your individual business groups and keep me advised of progress.

JOHN MASON

Att.

PLAINTIFF'S EXHIBIT 417

STR 001479

84092

16

WATER_PCB-SD0000073946

COST OF RAPID PHASE-OUT - ALL CHLORINATED BIPHENYLS EXCEPT DIELECTRICS

1970

LOSS IN SALES - $ 5.4 M

LOSS IN GROSS PROFIT - $ 2.6 M

IN ADDITION COGS WOULD INCREASE GIVING TOTAL LOSS IN GROSS PROFIT OF - $ 2.75 M.

1971

LOSS IN SALES - $ 12 M

TOTAL LOSS IN GROSS PROFIT - $ 6.1 M

PLUS POSSIBLE WRITE-OFF OF SOME $ 2.6 M KRUMMRICH AROCLOR FACILITIES.

STR C014RC

WATER_PCB-SD0000073947

OBJECTIVE

TO MAINTAIN A PROFITABLE BUSINESS SERVING THE NEEDS OF FUNCTIONAL FLUIDS USERS AND THE CARBONLESS DUPLICATING PAPER INDUSTRY WHILST MINIMIZING THE ESCAPE OF NON-BIODEGRADABLE BIPHENYLS INTO THE ENVIRONMENT.

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ACTION TO ACHIEVE OBJECTIVES

1) MARKET NON-BIODEGRADABLE CHLORINATED BIPHENYLS ONLY FOR CLOSED SYSTEM APPLICATIONS WHERE CONTROL IS POSSIBLE.

2) PHASE OUT OF ALL NON-CONTROLLABLE APPLICATIONS REPLACING WITH BIODEGRADABLE CHLORINATED BIPHENYLS OR OTHER SATISFACTORY PRODUCTS.

STR C01482

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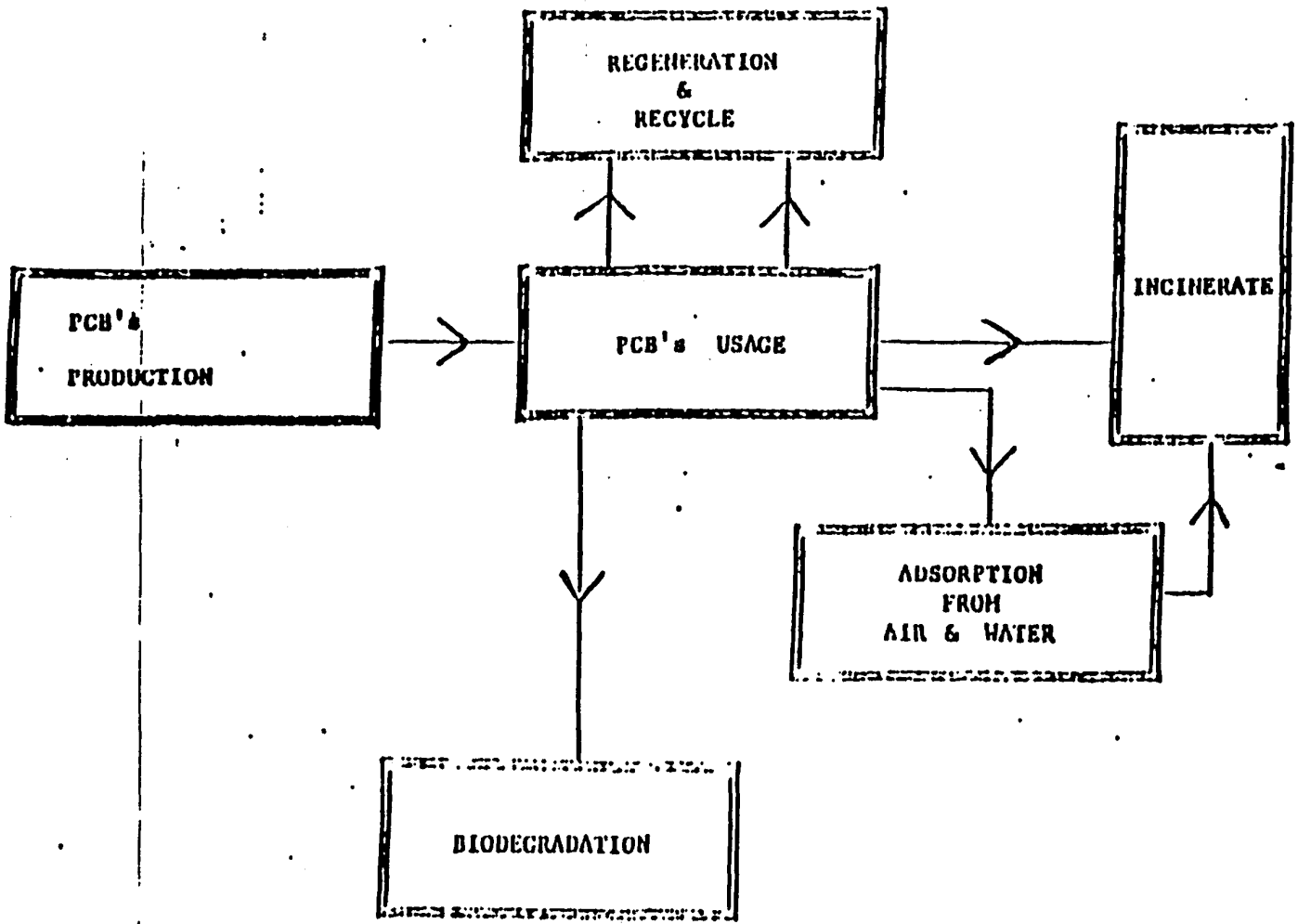
THE CLOSED LOOP



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DO WE HAVE THE CAPABILITY TO CLOSE

THE LOOP ?

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BIODEGRADATION

1) GOOD PROGRESS AT BOTH RIARON AND ST. LOUIS.

2) LOWER CHLORINATED ISOMERS RESPONDING WELL, BUT 5 & 6 CHLORINE ISOMERS EITHER NOT RESPONDING OR VERY SLOW.

3) CRITICAL PRODUCT IS 1242, CONTAINS SOME 50 ISOMERS — GOOD RESPONSE ON 2, 3, & SOME 4 CHLORINE ISOMERS.

4) WORK IN HAND ON FRACTIONATED 1242 GOOD PROGRESS TO DATE.

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FIGURE 1

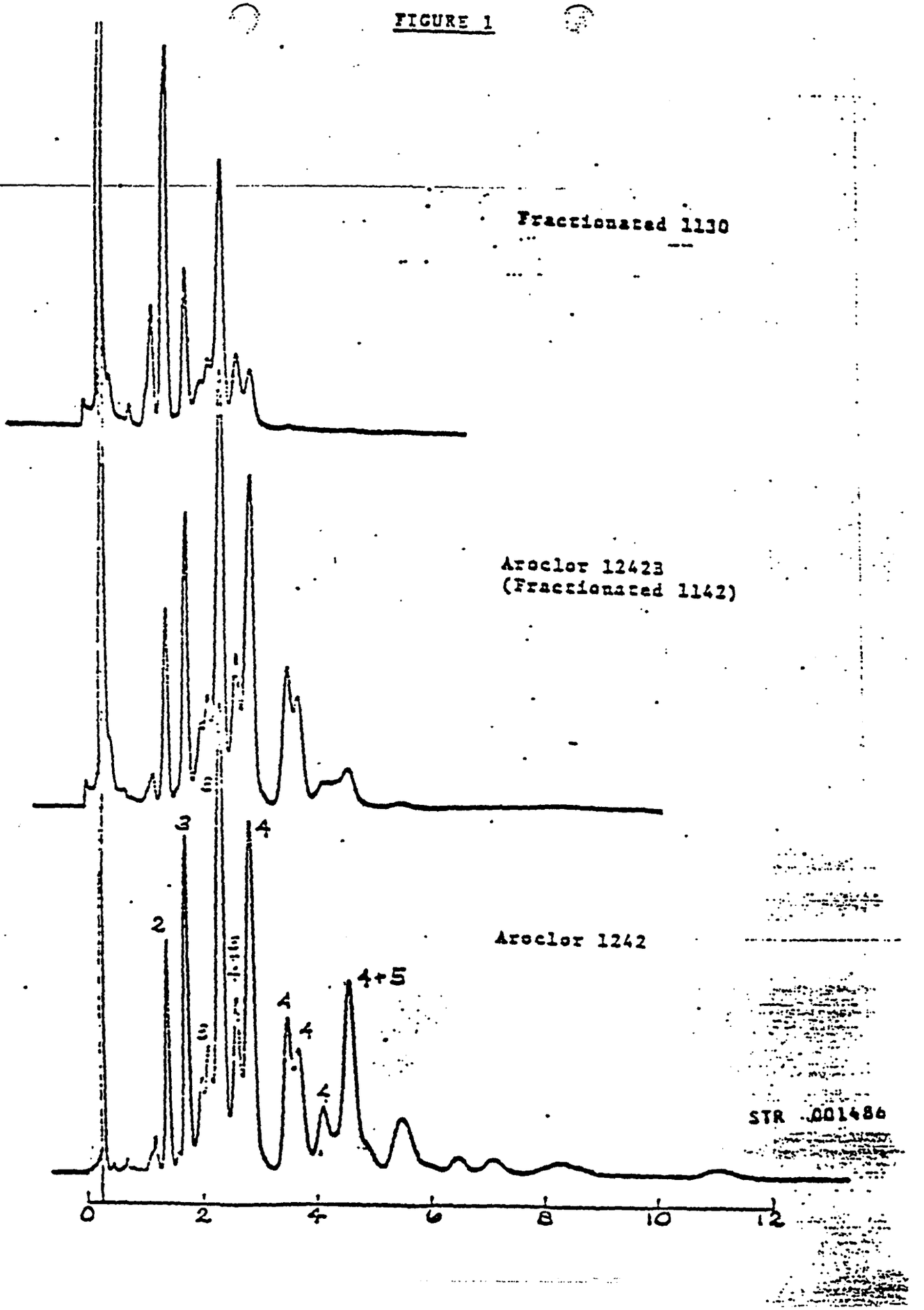

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FIGURE 2

Semi-Continuous
Activated Sludge
Biodegradation

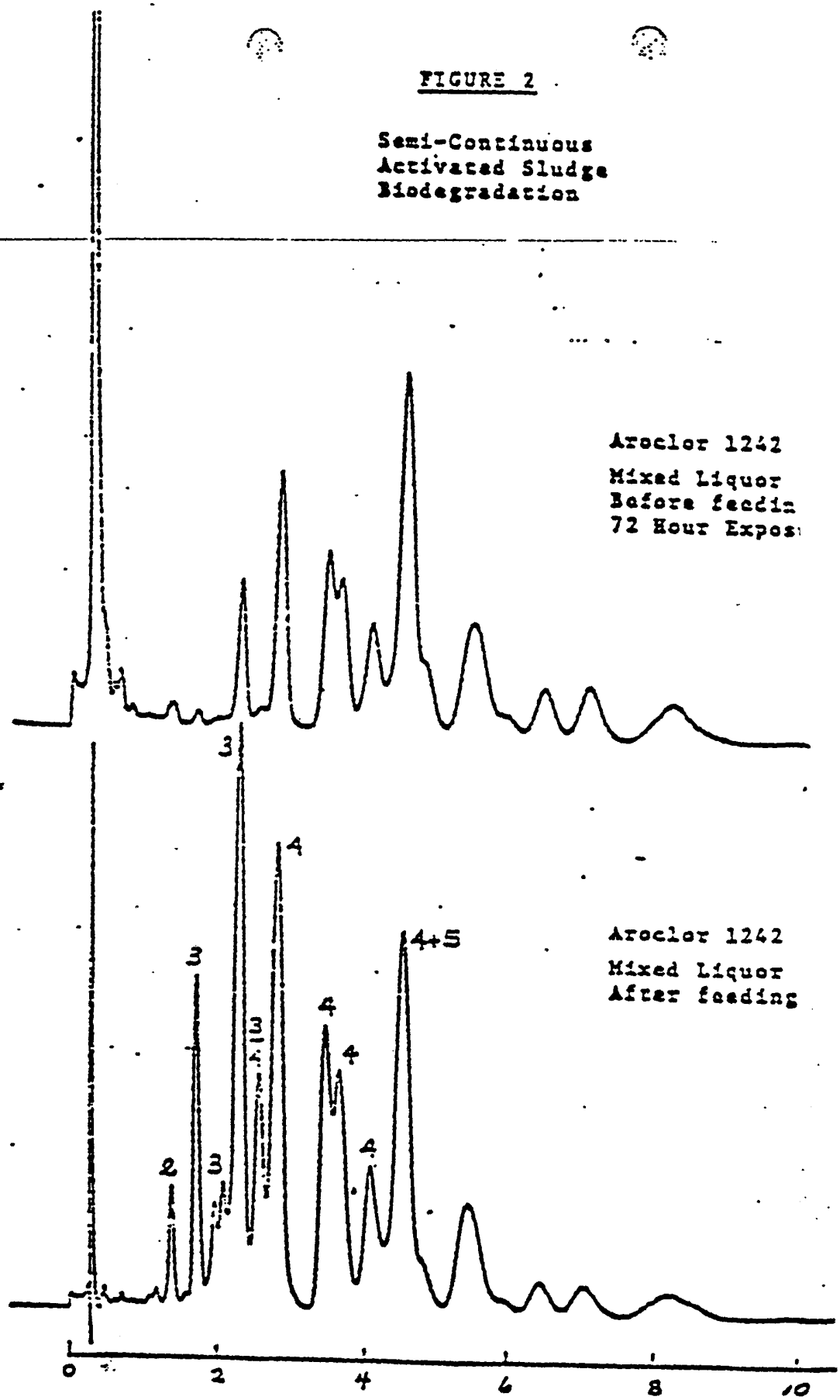

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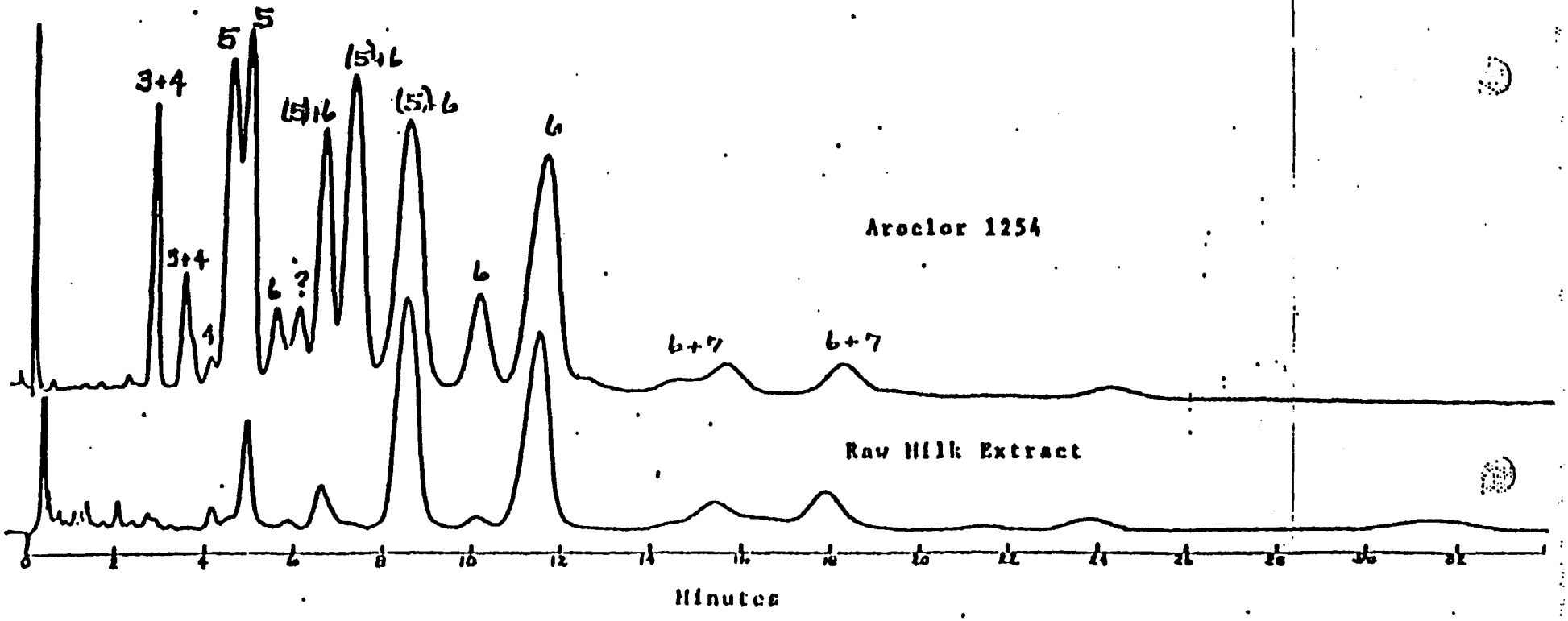
FIGURE 3



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REPLACEMENT PRODUCTS

1) 1242B SHOWS GOOD PROPERTIES AS CAPACITOR DIELECTRIC - NOW MAKING 500 GALS. AT DAYTON FOR CUSTOMER TRIALS. - ALSO WORKING ON 1230B.

2) GOOD PROGRESS ON PHOSPHATE ESTER REPLACEMENTS FOR HYDRAULIC FLUID APPLICATIONS. — TCP — CDP — TBP — NONYL PHENYL/CONYL PHENYL DIPHENYL PHOSPHATE.

3) HEAT TRANSFER FLUIDS — USING MAINLY ESTABLISHED PRODUCTS, E.G. HB-40 — EXAMINING POSSIBLE ENTRY INTO DIPHENYL OXIDE PRODUCTION EITHER OWN PROCESS OR LICENSING.

STR 0014

WATER_PCB-SD0000073956

TOXICITY

1) NO CHANGE SINCE LAST REPORT - HAVE DISCUSSED RESULTS WITH DR. BURGER, EXECUTIVE OFFICE OF THE PRESIDENT.

2) WE HAVE ANALYZED AROCLORS 1248 AND 1254 FOR OCTOCHLORO DIBENZO p-DIOXIN -- NONE FOUND.

3) CENTRAL INSTITUTE FOR NUTRITION AND FOOD RESEARCH, ZEIST, HOLLAND -- EXAMINED BAYER, PRODELAC AND MONSANTO CHLORINATED BIPHENYLS FOR DIBENZO FURANS -- NONE FOUND IN MONSANTO MATERIAL.

STR 001490

WATER_PCB-SD0000073957

INCINERATION

1) SUCCESSFUL TRIAL AT JOHN ZINC CO., TULSA. 1242, 1260, 1254 DESTROYED AT 2000° F. -- OFF GAS HCl. ENGINEERING WORK NOW IN HAND TO BUILD SUITABLE INCINERATOR. ESTIMATED COST $250,000 M.

2) INTEND TO CARRY OUT FURTHER TRIALS ON STILL BOTTOMS.

3) INCINERATOR PROBABLY LOCATED AT KRUGERSDORP.

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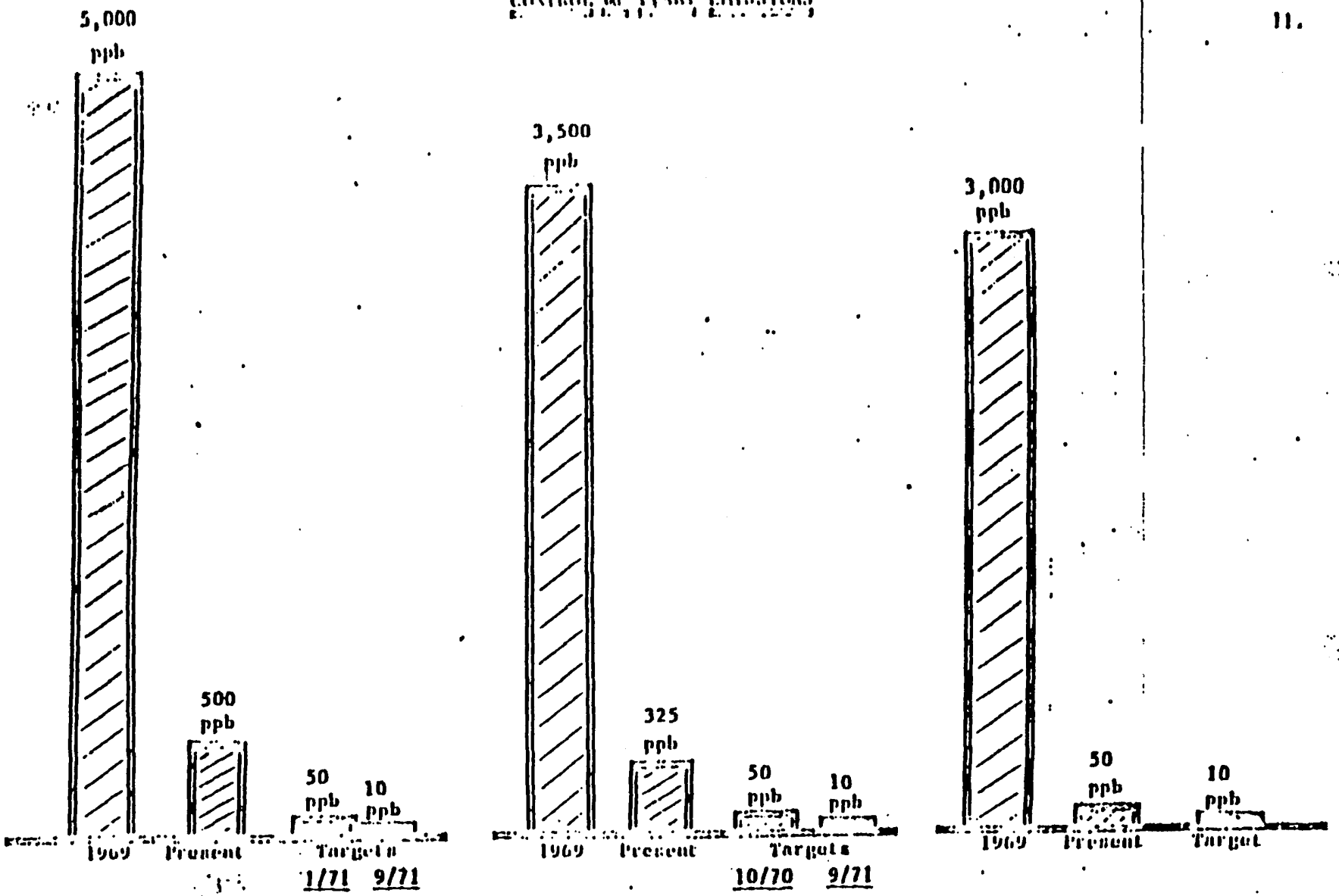
CONTROL OF PLANT EMISSIONS



ARMISTEAD - 5 lbs./day

KRUEGER - 200 lbs./day

DEXPORT - 0.5 lbs.

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CLOSING THE LOOP FOR INDIVIDUAL BUSINESSES.

STR 0014

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TRANSFORMER & CAPACITOR DIELECTRICS

1) RESPONSIBLE INDUSTRIES USING 1254 AND 1242.

2) FIRE RESISTANCE EXTREMELY IMPORTANT.

3) COLLECTION AND RETURN OF SPENT AND ARCED FLUID.

4) REGENERATION AND RECYCLE.

5) TRIALS PLANNED FOR 12423 AND 12303 IF SATISFACTORY.

6) LABELLING OF ASKAREL TRANSFORMERS.

STR 0014

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HEAT TRANSFER FLUIDS

1) EDUCATION OF USERS WHERE FIRE RESISTANCE IS OBLIGATORY -- MAJOR INDUSTRIAL CORPORATIONS -- E.G. GOODYEAR AND CHEMICAL COMPANIES.

2) PHASE OUT OF ALL FOOD APPLICATIONS -- LETTERS WILL BE SENT OUT MAY 15th -- NO SALES AFTER AUGUST 15th -- WILL COLLECT AND DESTROY OLD FLUID.

3) INSTITUTION OF REGULAR COLLECTION REGENERATION OR INCINERATION SERVICE.

4) PHASING IN NEW PRODUCTS WHERE CONTROL NOT POSSIBLE.

STR 00145

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HYDRAULIC FLUIDS

1) RECOGNIZE THAT CONTROL OF SPILLAGE AND PUMP LEAKAGE MAKES THE USE OF NON-BIODEGRADABLE CHLORINATED BIPHENYLS UNDESIRABLE.

2) ALREADY REFORMULATED PYDRAUL 625, ACWG, 280 and F9 — REPLACEMENT COMPLETE BY AUGUST 1

3) OTHER PRODUCTS IN INTERIM STAGES (E.G. PYDRAUL AC FORMULATION ON COMPRESSOR TEST AT JFQ).

4) AIM TO COMPLETE 90% PHASE-OUT BY DECEMBER, 1970.

STR 001496

WATER_PCB-SD0000073963

N. C. R.

1) U.K. HAS APPROVED HB-40, NOW PLACED REGULAR ORDERS — EXPECT COMPLETE PHASE-OUT BY 1st JULY.

2) U.S. RUNNING TRIALS ON M.I.B.P., EXPECT DECISION 22nd MAY — PRELIMINARY INTERIUM PRODUCTION OF 40 M POUNDS PER MONTH TARGETED FOR 30th AUGUST — PLANNING FULL SCALE PLANT 10 $\overline{M}$ LBS. PER ANNUM ON STREAM END JANUARY 1971 — ESTIMATED NFC $1 - 1.2 $\overline{M}$.

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PLASTICIZER & MISCELLANEOUS APPLICATIONS

1) DISTRIBUTORS ALREADY ADVISED NO MORE SALES AFTER 30th AUGUST. (200 CUSTOMERS)

2) LETTERS TO 661 CUSTOMERS WILL BE SENT OUT 27th MAY ADVISING NO MORE SALES AFTER 30th AUGUST — DISPOSAL INSTRUCTIONS WILL BE GIVEN.

3) IN CONTACT WITH U.S.D.A. THROUGH AG DIVISION ON SILO PAINT PROBLEM.

4) BY 30th AUGUST ALL BUSINESS IN THIS AREA WILL BE PHASED OUT.

STR 001498

WATER_PCB-SD0000073965

PRESENT PLAN

1) TERMINATE SALES OF ALL NON-BIODEGRADABLE CHLORINATED BIPHENYLS TO NON-CONTROLLABLE END USES.

COMPLETE - AUGUST 30th, 1970.

2) DISCONTINUE SALE OF ARCOLOR 1242 TO NOR AND REPLACE WITH HB-40 IN U.K., AND MISP IN U.S.A.

COMPLETE - U.K. -- JULY 1st, 1970

COMPLETE - U.S. -- JANUARY 30th, 1971

3) CLOSE THE LOOP ON HEAT TRANSFER APPLICATIONS WHERE F/R IS VITAL AND REPLACE WITH ALTERNATES IN OTHER CASES.

COMPLETE - DECEMBER 30th, 1970.

STR 00149

4) REPLACE ALL NON-BIODEGRADABLE CHLORINATED SOLVENTS IN HYDRAULIC APPLICATIONS.

COMPLETE 20% - AUGUST 1st, 1970

" 40% - NOVEMBER 1st, 1970

" 100% - DECEMBER 30th, 1970

5) CLOSE THE LOOP ON ALL NON-BIODEGRADABLE CHLORINATED SOLVENTS IN TRANSFORMER APPLICATIONS.

COMPLETE - AUGUST 1st, 1970

6) CLOSE THE LOOP ON CAPACITORS AS FAR AS POSSIBLE AND REPLACE 1242 WITH 1242S.

COMPLETE - DECEMBER 31st, 1970

STR G015CG

WATER_PCB-SD0000073967

(18

[redacted]

[redacted]	- $ 275,000
[redacted]	- $ 250,000
[redacted]	- $ 1,000,000
[redacted]	- $ 1,200,000
[redacted]	- $ 575,000
[redacted]	- $ 285,000
[redacted]	= $ 3,585,000

STR 901501

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[redacted]

1971

[redacted]	[redacted]	[redacted]
[redacted]	$ 22.0 M	$ 26.0 M
C. S.	$ 3.5 M	$ 3.0 M
[redacted]	$ 2.9 M	$ 2.7 M
[redacted]	$ 25.4 M	$ 29.0 M
[redacted]	13.5%	9.5%

STR 001502

WATER_PCB-SD0000073969

ROUGH DRAFT - 11/10/69

OUTLINE

PCB ENVIRONMENTAL POLLUTION ABATEMENT PLAN

I. Introduction

II. Problem

III. Extensiveness

IV. Nature of the Problem

~~Research and medical input~~

V. Effect on Monsanto

VI. Effect on Customer

VII. Involvement with other producers

VIII. Sources of Contamination

~~A. Indirect Pollution~~

IX. Recent technical changes which have bearing on the contamination

X. Courses of Action

XI. Recommended Course of Action

XII. Implementation of the Recommended Course of Action

A. Immediate Action (12-1-69)

B. Interim 1-3 months

C. Short term - 3-6 months

D. Long term (1-3 years)

1. Research medical
2. Manufacturing
3. Engineering
4. Market
5. Patent
6. Environmental Control
7. Legal
8. Public Relations
9. Others

PLAINTIFF'S EXHIBIT 422

STR 021938

84144

WATER_PCB-SD0000073970

XIII. Probability of Success

XIV. Cost of Program

$220,000 and bio with max. at $20-25M

XV. Future

STR 021939

WATER_PCB-SD0000073971

PCB ENVIRONMENTAL POLLUTION ABATEMENT PLAN

Introduction

On 15 October the "AD HOC" Committee consisting of Messrs. M. Farrar, P. Hodges, E. John, W. Richard, and E. Wheeler issued a report summarizing the polychlorinated biphenyl (PCB) pollution problems from the known available information to date. Out of this report came considerable information, conclusions, and recommendations which we have attempted to tie together into a plan of action in this document. Our objective has been to take a reasonable and responsible approach to the entire problem. Before we get into the problem, we should clarify the meaning of PCB, the nature of the entire line, and how these tie into our product line of Aroclors.

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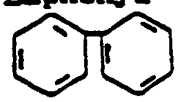
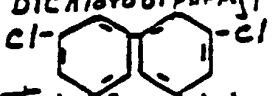
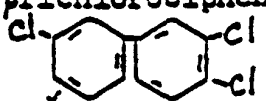
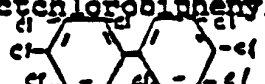
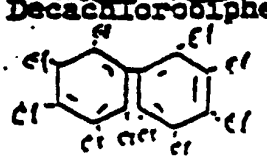
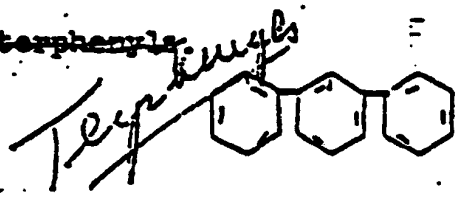
Monsanto entered the Aroclor market in 1930 by acquiring Swain Electrical Company or known today as our Anniston, Alabama plant. The first load of Aroclor which incidentally was Aroclor 1254 -- went out of Anniston, Alabama to GE in 1931. Since that time the market has grown to 170 to 200M worldwide.

Chemical	Monsanto Product Line	Nature of Material at Ambient
Biphenyl  ~~Solid at~~ ~~Sublimes at~~		Solid
Monochlorobiphenyl 	Aroclor 1221	thin liquid (oil)
Dichlorobiphenyl 	Aroclor 1232	thin flush water
Trichlorobiphenyl 	Aroclor 1242	oily type fluid material
Quaterchlorobiphenyl 	Aroclor 1248	Thicker - transmission oil
Pentachlorobiphenyl 	Aroclor 1254	Heavy-Molasses
Hexachlorobiphenyl 	Aroclor 1260	Thick - tar
Heptachlorobiphenyl 	Aroclor 1262	Very thick - liquid
Octchlorobiphenyl 	Aroclor 1268	Solid
Decachlorobiphenyl 	Aroclor 12715	Solid

STR 021941

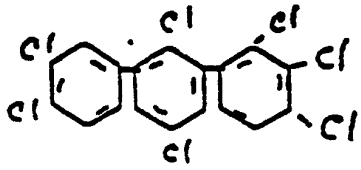
WATER_PCB-SD0000073973

Total possibility are 210 theoretically possible chlorinated biphenyls' ~~terphenyls~~ Terphenyls



Santowax or terphenyl

Solid



Aroclor 5460

Solid

II. Problem

Damage to the ecological system by contamination from polychlorinated biphenyl (PCB).

III. Extensiveness

The problem involves the entire United States, Canada, and sections of Europe especially the United Kingdom and Sweden. As the investigation broadens other areas of Europe, Asia and Latin America will surely become involved. Evidence of contamination have been shown in some of the very remote parts of the world. The involvement could and most likely will follow the DDT investigations.

IV. Nature of the Problem

Professors Widmark and Jensen of the Institute of Analytical Chemistry at Stockholm, Sweden, in November 1966, announced and confirmed finding PCB in fish, birds, and eggs. Subsequent findings were made in 1967 in Great Britain. In February 1969, Professor Risebrough of the Universit of California published an article in the San Francisco Chronicle relaying his findings of PCB in the environment of the United States. Monsanto confirmed the presence of PCB's in mid-1969 and confirmed the adequacy of work by Widmark and Jensen and others; truly, the PCB's are a worldwide ecological problem.

STR 021942

WATER_PCB-SD0000073974

Analysis indicates the environmental presence of the 5 and higher chlorinated biphenyls which take the appearance of Aroclor 1254 and Aroclor 1260. We have strong indications that Aroclor 1242 or at least part of it degrades biologically. Since the Aroclor 1242 contains arou 7 percent of the 5 chlorine biphenyl or higher we cannot rule out the possibility that the observations may be a concentration affect of the higher chlorinated biphenyls of Aroclor 1242.

To date there have been no reports of finding Aroclor 1242 present in the environment (except outside the effluent of our plants where we knc Aroclor 1242 is present).

The seriousness of the problem can best be spelled out as follows:

1. Fish - Marine or aquatic species concentrate PCB in the fatty tissue. Toxic is small quantities (down to 5 ppb) to sensitive mar life such as shrimp.

2. Birds - Predatory species feeding on the marine or aquatic life can further concentrate PCB to possible harmful effects. Specifically in birds PCB can affect the calcium metabolism leading to egg shell imperfections which prevents proper hatch of the young. In fact, Monsanto has confirmed the eggshell by feeding chickens, a high order of the species, PCB's in controlled tests.

3. Man - There is no harmful effect known to man or other mammals afte 40 years of production. Investigations are underway by various sources.

STR 021943

4. Political and Public Emotion - PCB's are falsely linked with DDT because PCB's show up in the analysis for DDT. PCB's are linked w other permanent type chlorinated hydrocarbon pesticides. This becomes particularly serious since about every article of food in country is being examined for a trace of these materials.

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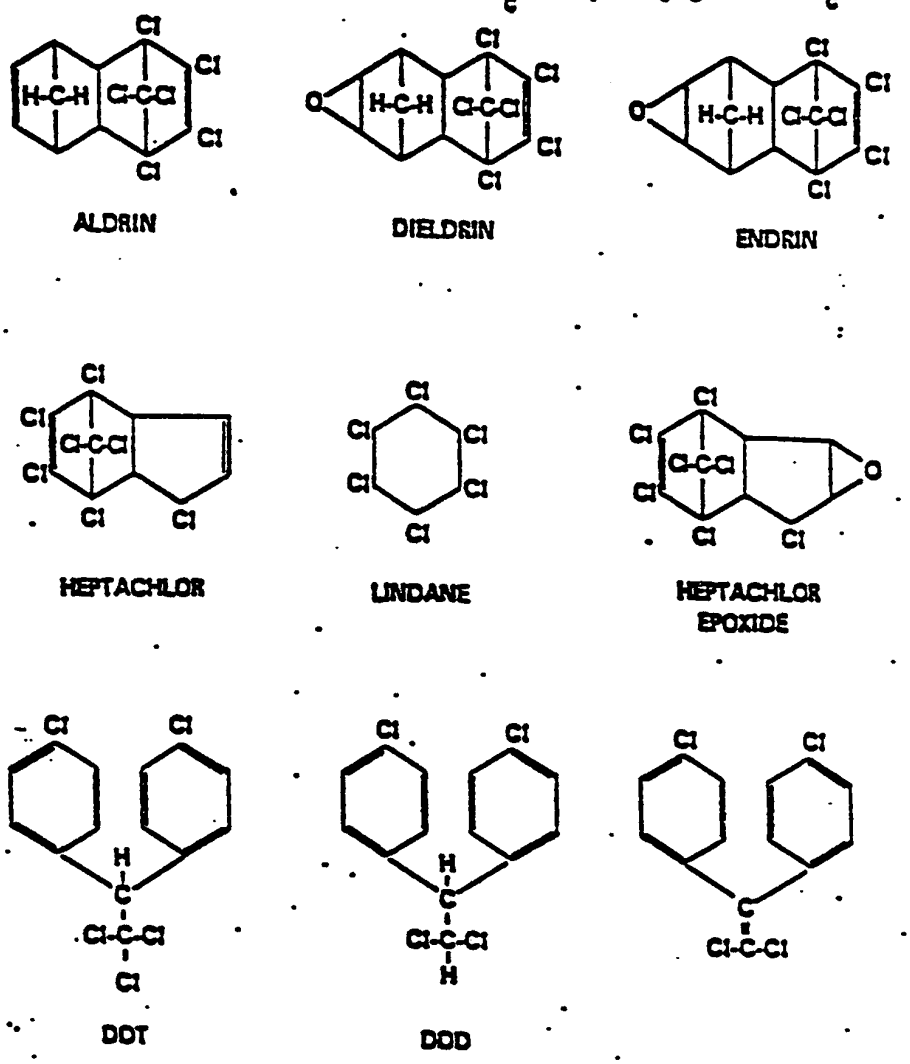

Fig 1 Structural Formulae of Nine Chlorinated-Hydrocarbon P.

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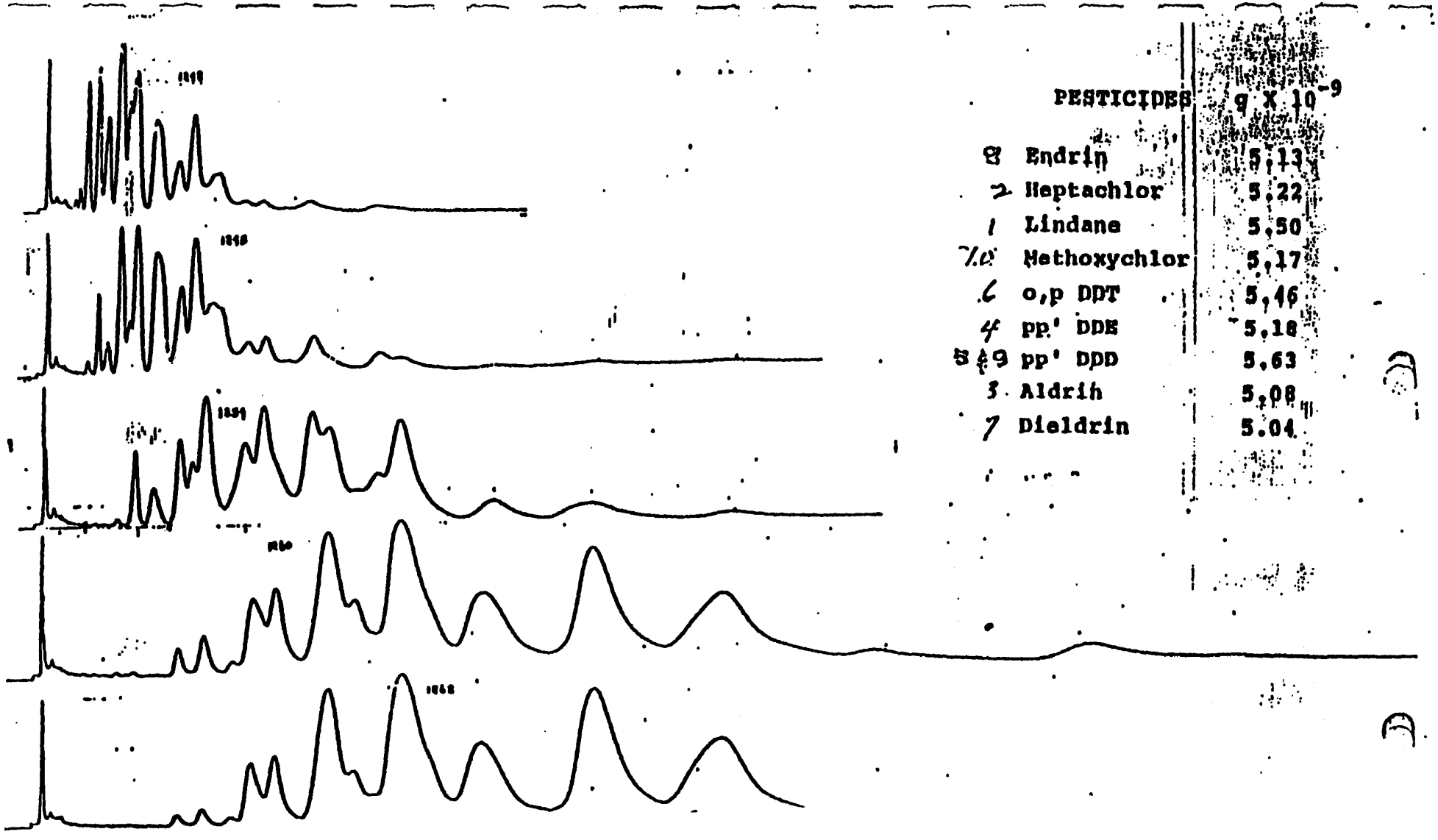

	PESTICIDES	q X 10^{-9}
8	Endrin	5.13
2	Heptachlor	5.22
1	Lindane	5.50
10	Methoxychlor	5.17
6	o,p DDT	5.46
4	pp' DDE	5.18
5 & 9	pp' DDD	5.63
3	Aldrin	5.08
7	Dieldrin	5.04

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V. Effect on Monsanto

Business potential at stake on a worldwide basis:

Fluids	Plasticizers	Total/Year
70M lbs.	34M lbs.	104M lbs.
$16M	$5M	$22M
$6-8M G.P.	$2-3M G.P.	$8-11M G.P.

Already competition is using certain data against us in competitive situations.

A. Legal Liability

Direct lawsuits are possible. The materials are already present in nature having done their "alleged damage". All customers using thes products have not been officially notified about known effects nor d our labels carry this information. These are only a few of the possible legal implications which would best be covered by the legal department.

B. Public Image

The corporate image of Monsanto as a responsible member of the business world genuinely concerned with the welfare of our environment will be adversely affected with increased publicity.

The evidence proving the persistence of these compounds and their universal presence as residues in the environment is beyond questioning. This combined with certain scare publications is cert: to give an adverse image. Guilty by association (with DDT) will prevail as the background while actual facts may be sparse.

C. Customer Relations

STR 021946

Some customers who presently use these materials will be "scared of to other competitive products. Products associated with the same name or "trademark" will be adversely affected ie., Therminol, Pydraul and Aroclor. Competitors will use the information for an

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influence on Monsanto products.

Customers will seek other "outs" rather than become involved.

VI. Effect on Customers and Ultimate Consumers

One of the unique features of PCB's is their fire resistance. Here the basic decision whether to risk lives due to fire or risk extinction of, some species of birds. In this case the PCB would probably be accepted as a necessary pollutant and tolerated under controlled conditions.

A. Electrical Industry - Capacitors and Transformers use Aroclor because it is the best inexpensive dielectric fluid available.

B. Food Processing - Bulk "deep frying" units for potato chips, fish, and doughnuts use the fire resistance fluid as an indirect heating medium.

C. Die Caster -- and other hot metal working industries fire resistance fluids to protect the workers.

Affects a wide range of plastics and adhesives because the PCB serves as the plasticizer.

A wide range of paints and coatings are affected. The "Carbonless" carbon paper used so widely would disappear.

VII. Involvement With Other Producers

Although Monsanto is most probably responsible for the U.S. contaminati and jointly responsible with MCL for the United Kingdom problem, we cannot accept responsibility for the world. There are five known producers in the free world, several possible producers behind the iron curtain and couple of additional companies making overtures about entering the business. Monsanto representatives have on one occasion discussed this problem with a couple of these producers but they expressed no great concern. In fact, it is highly possible that one of

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these manufacturers is dumping his waste into the Rhine River. Certainl any action taken by one producer will most assuredly affect the other. It is entirely possible that a joint plan of action could be developed but will most probably have to be spearheaded by Monsanto. It is also likely that producers of other chlorinated products used with PCB's will be dragged into the investigation.

VIII. Sources of Contamination

Although there may be some soil and air contamination involved, by far the most critical problem at present is water contamination. To our knowledge to date the contamination can be broken down into two general categories, open and indirect pollution.

A. Open Pollution - Our manufacturing facilities sewered a sizeable quantity of PCB's in a years time.

1. Fluids

Fluids are probably the most open source of pollution because of their mobility. They also may be the least serious because they are generally the lower chlorinated materials.

2. Electrical

Electrical customers have in the past sewered their wastes.

3. Heat Transfer

Heat transfer customers have sewered their objectionable and their spilled material.

4. Industrial

These fluids have generally been sprayed into drains, washed down sewers and generally regarded as very harmless.

All of the fluids have had the "pink" constituent dumped on dirt roads a "dedusting agent" which inadvertently found its way back to the stream.

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5. Plastics

The plastics are not as mobile as the fluids so therefore they have not found and cannot find their way back to streams in op pollution.

B. Indirect

Shipping containers and the cleaning thereof for subsequent use a source of contamination.

1. Fluids

a. Electrical - Disposal of "burned out" transformer and capacitors may find its way back to streams. Scrap units (new) are generally disposed of in land fills but could possibly get back to the stream.

b. Heat Transfer - Leaks could contaminate.

c. Industrial - Cross product contamination carried out of ar air compressor. Residual material carried on parts.

2. Plasticizers

a. Process Contamination from Washing

(1.) Environment Contamination

Swimming pool paints

Incineration of wax coatings

Traffic paints

(2.) Product Contamination

Coating for tank lining

Painting inks and paper coatings

Certain adhesives

STR 021949

IX. Recent Technical Changes Which Have Bearing on the Contamination

A. Fluids

The sources of pollution were pointed out as they have been in th past because we are dealing with that quantity of material in the

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environment today which was deposited over the past forty years. We must state that responsible people throughout the industry have taken corrective action to reduce contamination in the last two years. There have also been technical advances which have brought about the use of lower chlorinated biphenyls which may be an advantage because to date t: low chlorinated ones have not been identified present in nature.

1. Electrical - The large customers have established collect systems a: the waste is recovered. Incinerators are being investigated and built for the disposal of the materials. There has been a shift away from the higher chlorinated types products and could probably shift almost entirely away from those products.
2. Heat Transfer - System have been tightened up and redesigned to confine the contents Here, too, the trend has been to shift away from the higher chlorinated materials.
3. Industrial - Settling ponds have been built by the large manufacture to catch the material and decant off the PCB for reprocessing. The trend here as the other fluid areas has been towards the lower chlorinated materials.
4. Plants - The plants effluent has been passed through limestone whi: provides surface to catch some of the material. But high concentrations can be found in our effluent (that is relative to those findings in nature causing the problem).

B. Plasticizer

Quite opposite to fluids the trend in plasticizer Aroclor has been to higher chlorinated biphenyls. In plasticizers the lower chlorinated biphenyl will not be an acceptable solution however, the lower chlorin terphenyl could offer a possible solution.

STR 021950

WATER_PCB-SD0000073982

X. Courses of Action

A. Do Nothing

We cannot deny the findings and the acquisitions by the various agencies. If we took no action we would likely face numerous suits. We would let government tolerances be based on public and political pressure along with any experimental or developed data which they may generate. We would most likely be forced out of this business. Other product areas would be adversely affected. We would project an image as an irresponsible member of the business world. Project poor customer relations. The only advantage to this technique offers is it reduces the cost but this too must be weighed against potential loss of business.

B. Discontinue Manufacture of All Polychlorinated Biphenyls (PCB)

Although we all realize this could be an eventually unfortunately the solution is not this simple. Assuming we did stop manufacture immediately, the pollutants are present in the environment, the liability is present and possibly by the shifting to the lower chlorinated materials and the recovery techniques the contamination may already be reduced to an acceptable level. Obviously the entire business would be lost without any or very few substitutes to be offered. Other product areas would be affected. Financial loss could be considered due to raw material contracts, customer contracts and royalty -- secrecy contracts. Competition would take advantage on all fronts. We would be admitting guilt by our actions. Loss of capitol investment in the plant, associated utilities, and associated processes. We would possibly gain a little public image on this action.

STR 021951

C. Respond responsibly, admitting that there is growing evidence of environmental contamination by the higher chlorinated biphenyls and take action as new data is generated to correct the problem.

WATER_PCB-SD0000073983

This approach would enable us to phase out the higher chlorinated materials in many applications where they are no longer necessary or really desired. Wecould maximize the corporate image by publicizing this act. We would reduce a known pollutant. Additionally we could gain precious time needed to develop new products and investigate further the lower chlorinated materials. As new research data is generated our course may be altered considerably. Certain limited actions may reduce or limit the problem.

WATER_PCB-SD0000073984

XI. Recommended Course of Action

Based on the information available today the only recommendation we can honestly make is respond responsibly admitting that there is growing evidence of environmental contamination by the higher chlorinated biphenyls and take action as new data is generated to correct the problem.

XII. Implementation of the Recommended Course of Action

A. Immediate (By 12-1-69)

1. Set up a task force under a project manager or the equivalent responsible for initiating, directing and implementing all action that Monsanto decides to take. This includes sufficient budget necessary to cope with the immediate problems. This task force should include representatives from Medical, Legal, Research and the two involved Marketing Groups and Public Relations and must conduct liaison with MCL and other locations involved in the problem.

2. Decide on timing and content of any public and/or customer notification of PCB problem.

B. Interim (Within 3 months)

Fluids	Plasticizers
1. Confirm Aroclor 1254/Aroclor 1260 are found in the environment.	1. Announce differential between fluids/plasticizer uses.
2. Publicize the difficult anal. tasks.	2. Announce safety of other PCB's chlorinated terphenyl.
3. Protect other PCB/chl. terph.	3. Educate customers on control c effluent for all products.
4. Announce plans to reformulate certain Therminols and Pydraul where control of the product is difficult.	4. Initiate program to develop A/ 1254 & 1260 substitutes

STR 021953

WATER_PCB-SD0000073985

5. Emphasize better control over other Aroclor 1254 & 1260 uses.

5. Investigate with manufacturers the feasibility of alternate products.

6. Initiate customer education on need for effluent control of all products.

~~6. Analyze 1242~~

7. Determine composition of all PCB's.

Develop a comprehensive Program

C. Short Term (within the next 12 months)

1. Research - Expand program for more meaningful biodegradation studies and confirming analytical results. Expand toxicity studies. Follow developments concerning publicity and those developments covering political implications of PCB contamination.

Medical

2. Marketing - Discontinue or substitute replacement products for those applications of Aroclors 1254 and 1260 where the Aroclor remains mobile.

Work with customers to clean up plants on other Aroclors. Report the habitual violators or "do nothings" to the product group.

Reclaim or safely dispose of fluids. STR 021954

Consider renaming products that do not contain PCB. Follow and report market developments such as customer disposal systems. Follow and report any political or public feedback which may affect the contamination problems and must be coordinated with Medical, Research and Legal.

3. Production - Clean up plants and stop gross contamination.

4. Legal - Define our present position, recommend reasonable actions that will not unduely alarm the market but reduce the exposure in terms of liability. Coordinate recommendations with Marketi

WATER_PCB-SD0000073986

5. Public Relations - Publicize actions where believed advantageous. Certainly discussions should be held with other producers within same period to determine their planned course of action, if any.

D. Long Range Tentative Outline (From 1 year to 3 years)

Realizing that the comprehensive program must be outlined the "Long Range Tentative Outline" is meant to serve as a guide: All aspects of this program should be reviewed quarterly by Organic Management.

1. Research-Medical

   Continue biodegradation studies and analytical support

   Isomer distribution

   Toxicity and metabolism studies

   Water soluble removal

   Incineration analytical support

   Confirmation analytical

   Contract academic research for reference

   Develop new and improved formulations

2. Manufacturing

   a. Process Research and Development

      (1.) Identification of typical Aroclor isomers

      (2.) Develop control for effluent composition

      (3.) Test substitute formulations, etc.

      (4.) Develop new processes

   b. Clean Up Plants

   c. Modify processes to meet market needs

3. Engineering

   a. Develop and set up on plant locations incineration systems

   b. Design new processing equipment as necessary

4. Marketing

   a. Specify alternates or changes

   b. Customer-liaison

STR 021955

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c. Set reclaim or disposal of fluids

d. Work on name association problems

5. Patent

Investigate trademarks registered

Cover with patents any work felt patentable

6. Environmental Control

Develop cheap disposal systems for customers

a. Incineration or pyrolysis

b. Biodegradation unit etc.

c. Consultants in pollution control

7. Legal

Investigate and define our position on Royalty secrecy agreements.

Contracts - Raw Material and Customer

8. Public Relations

Portray to public positive actions at correcting the contamination problem. Release periodical statements covering our position.

XIII. Probability of Success

STR 021956

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XIV. Cost of Program

Neither the program nor the costs have been clearly defined at this tir
However, a cost estimate of $220,000 for toxicological work alone has
been presented. Tentative figures indicated under the worst conditions
the entire program could run as high as $2.0-2.5M. At this stage it is
very difficult if not impossible to develop a reasonable cost figure bu
one point is clear it will be larger than the normal research budget ca
handle. For this reason, assuming the approach is acceptable, we shall
be forced to ask for additional appropriations to fund the program.

XV. Future

Follow developments on the problem as they unfold.

Develop an aggressive research program to confirm or deny findings and
better understand the problem.

Develop costs for the duplementation of the Recommended course of
action.

Develop specific actions with each department involved

Submit the actions with costs for approval

Develop a timetable to solve the overall problem.

Prepare for "precipitious pullout" or drastic legislative action altho
we do not feel this is a likely possibility.

STR 021957

WATER_PCB-SD0000073989

ROFIT AND LIABILITY VS. TI

CTION

DO NOTHING

DOLLARS

70 71 72 73

Time

DISCONTINUE MANUFACTURE OF PCB

DOLLARS

70 71 72 73

Time

RESPONSIBLE APPROACH

DOLLARS

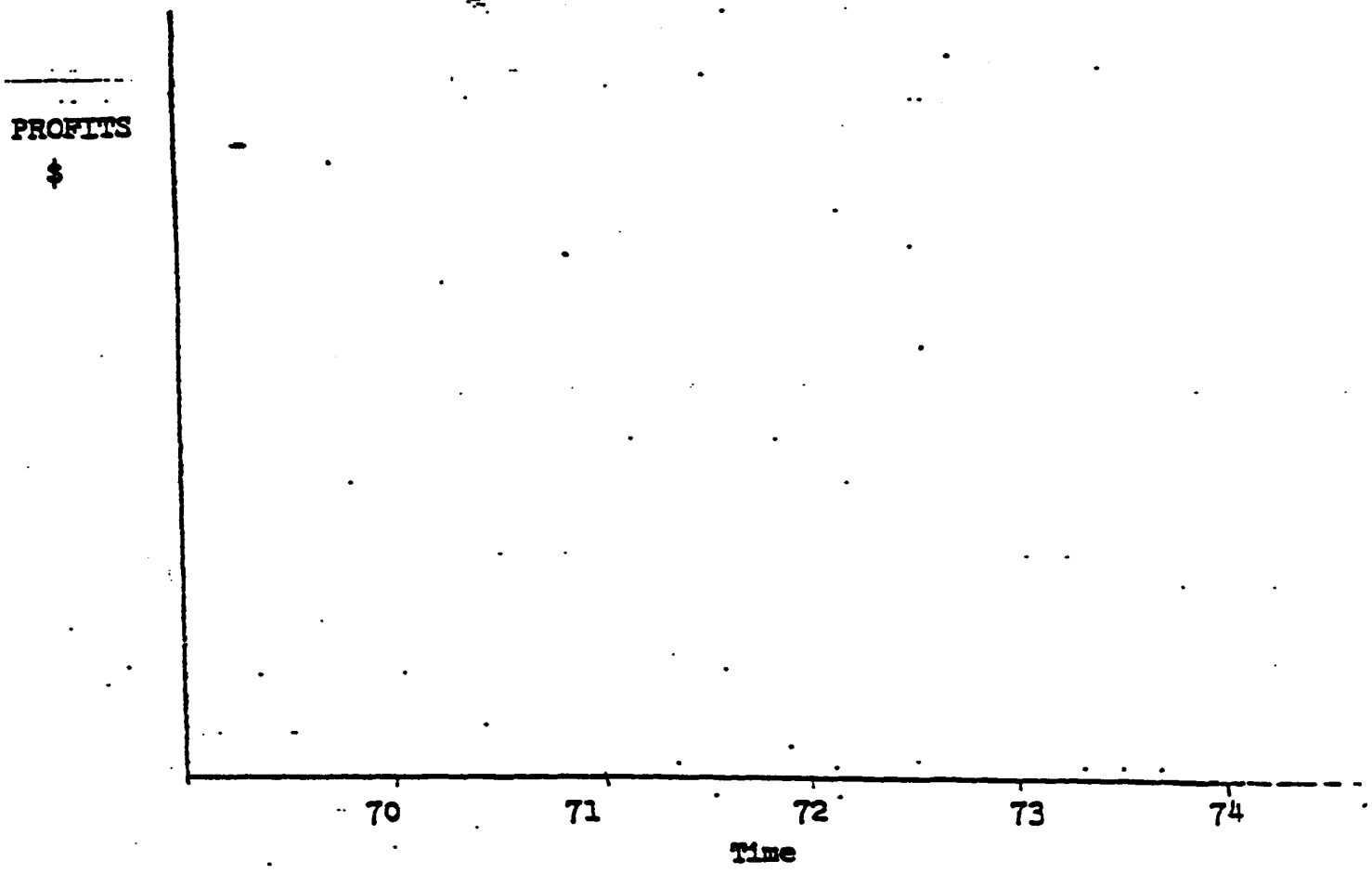
STR 021958

70 71 72 73

Time

WATER_PCB-SD0000073990

PROBABILITY OF SUCCESS



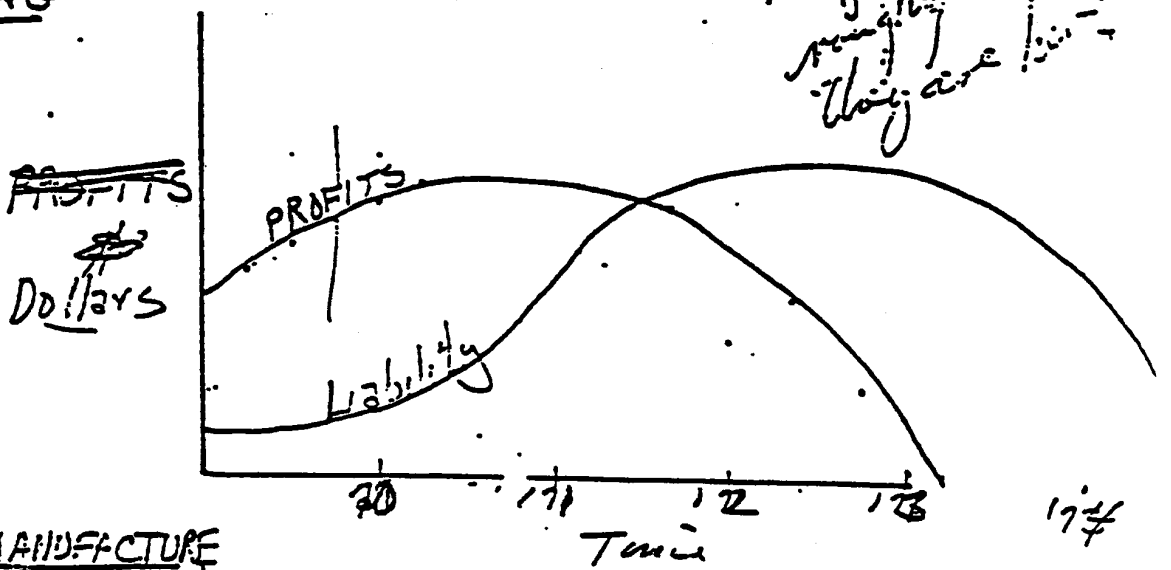
STR 021959

WATER_PCB-SD0000073991

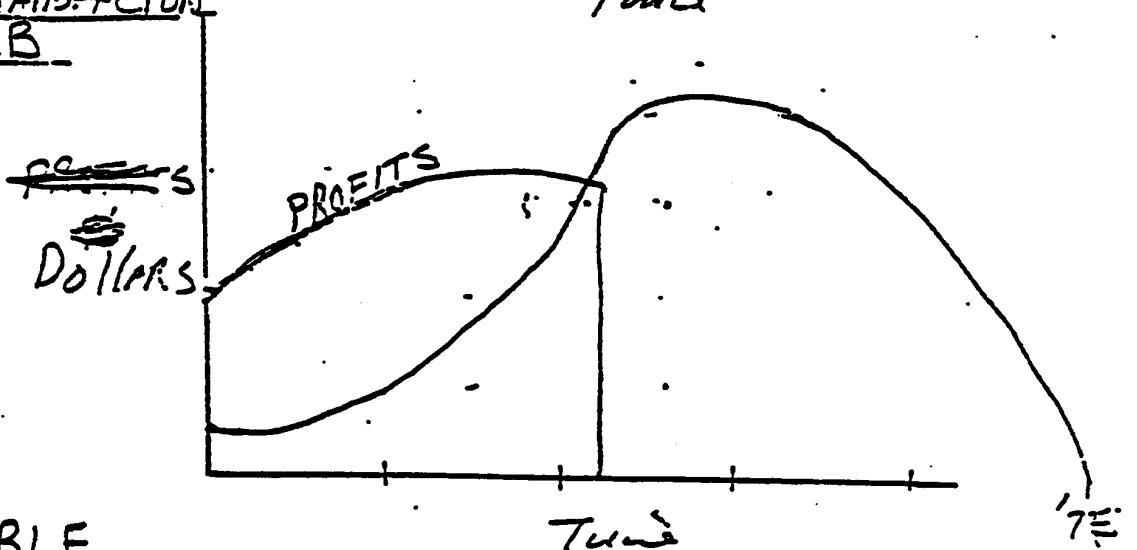
PROFIT AND LIABILITY VS TIME

ACTION

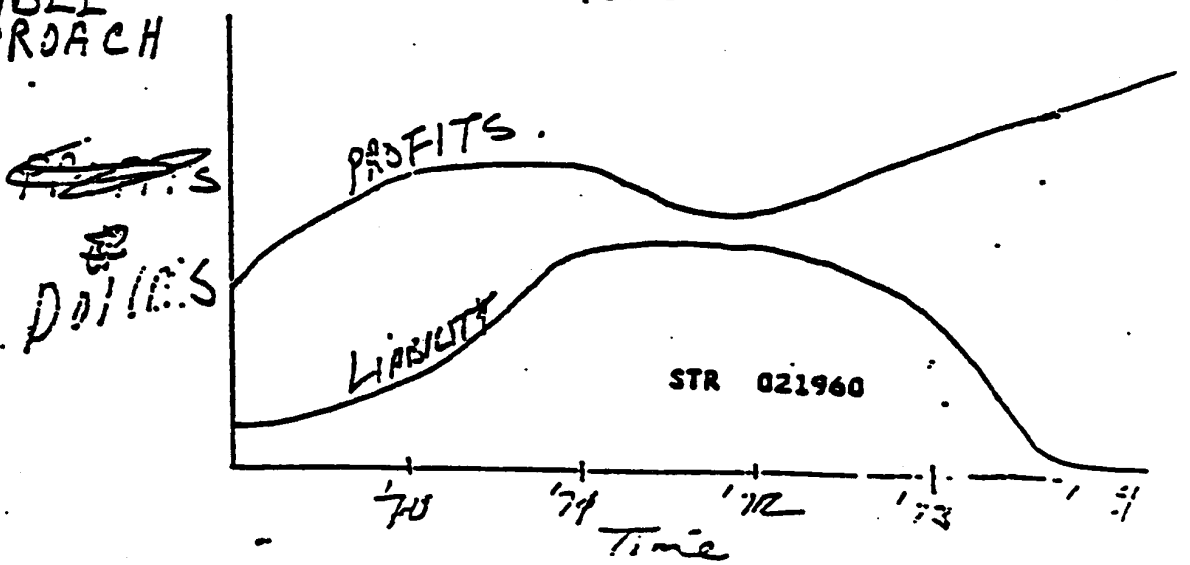
DO NOTHING



DISCONTINUE MANUFACTURE of PCB



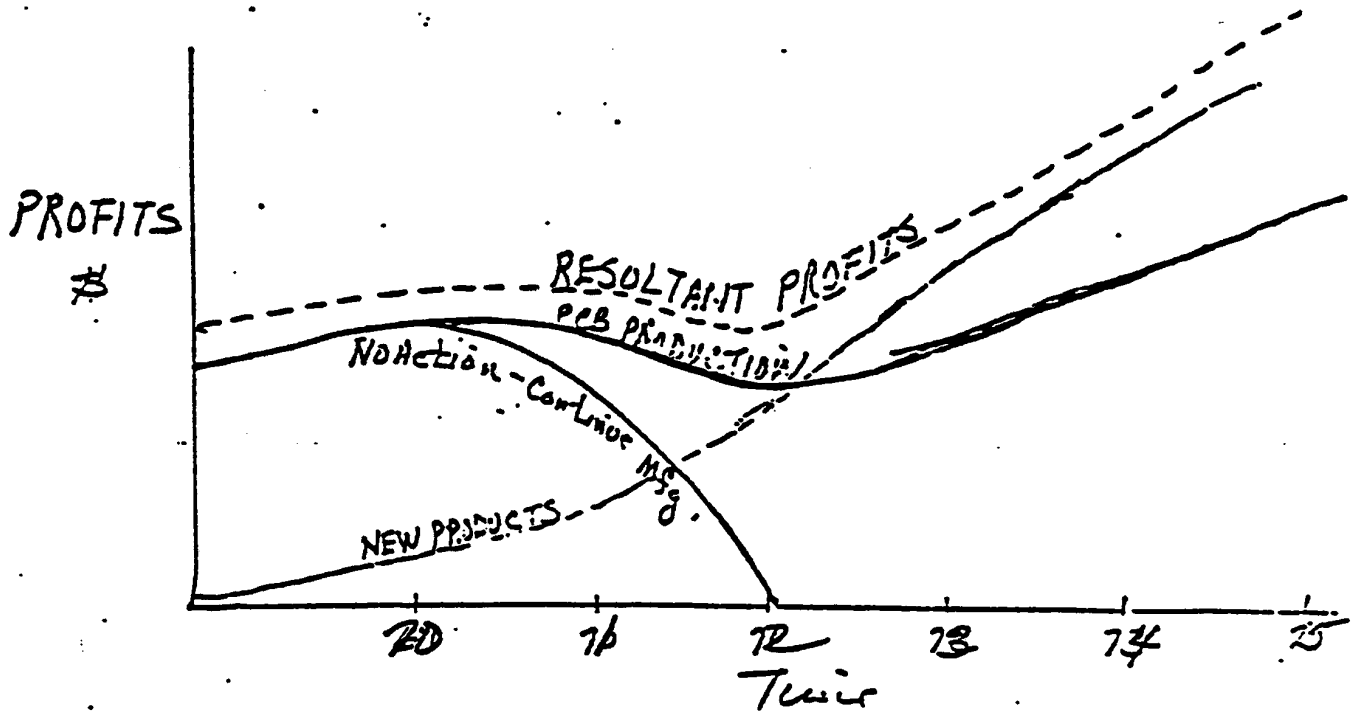
RESPONSIBLE APPROACH



STR 021960

WATER_PCB-SD0000073992

PROBABILITY OF SUCCESS



STR 021961

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PCB ENVIRONMENTAL POLLUTION ABATEMENT PLAN

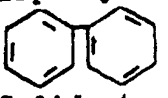
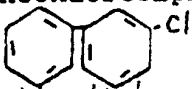
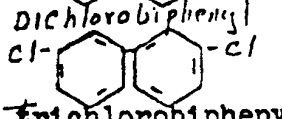
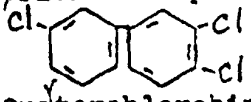
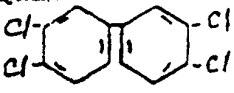
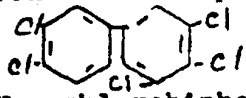
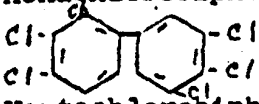
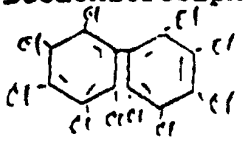
Introduction

On 15 October the "AD HOC" Committee consisting of Messrs. M. Farrar, P. Hodges, E. John, W. Richard, and E. Wheeler issued a report summarizing the polychlorinated biphenyl (PCB) pollution problems from the known available information to date. Out of this report came considerable information, conclusions, and recommendations which we have attempted to tie together into a plan of action in this document. Our objective has been to take a reasonable and responsible approach to the entire problem. Before we get into the problem, we should clarify the meaning of PCB, the nature of the entire line, and how these tie into our product line of Aroclors.



WATER_PCB-SD0000073994

Monsanto entered the Aroclor market in 1930 by acquiring Swann Chemical ~~Electrical~~ Company or known today as our Anniston, Alabama plant. The first load of Aroclor which incidentally was Aroclor 1254 -- went out of Anniston, Alabama to GE in 1931: Since that time the market has grown to 170 to 200M lbs worldwide.

Chemical	Monsanto Product Line	Nature of Material at Ambient
Biphenyl  ~~Solid at~~ ~~Sublimes at~~		Solid
Monochlorobiphenyl 	Aroclor 1221	thin liquid (oil)
Dichlorobiphenyl 	Aroclor 1232	thin flush water
Trichlorobiphenyl 	Aroclor 1242	oily type fluid material
Quaterchlorobiphenyl 	Aroclor 1248	Thicker - transmissi oil
Pentachlorobiphenyl 	Aroclor 1254	Heavy-Molasses
Hexachlorobiphenyl 	Aroclor 1260	Thick - tar
Heptachlorobiphenyl 	Aroclor 1262	Very thick - liquid
Octchlorobiphenyl 	Aroclor 1268	Solid
Decachlorobiphenyl 	Aroclor 12715	Solid

NEV 021437

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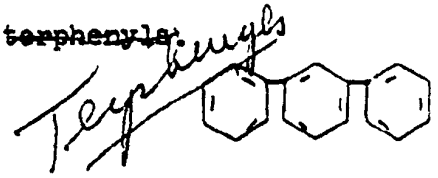
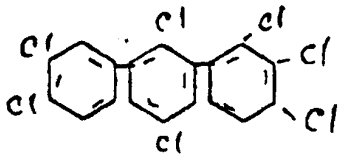
Total possibility are 210 theoretically possible chlorinated biphenyls~~terphenyls~~.



Santowax or terphenyl

Solid



Aroclor 5460

Solid

II. Problem

Damage to the ecological system by contamination from polychlorinated biphenyl (PCB).

III. Extensiveness

The problem involves the entire United States, Canada, and sections of Europe especially the United Kingdom and Sweden. As the investigation broadens other areas of Europe, Asia and Latin America will surely become involved. Evidence of contamination have been shown in some of the very remote parts of the world. The involvement could and most likely will follow the DDT investigations.

IV. Nature of the Problem

Professors Widmark and Jensen of the Institute of Analytical Chemistry at Stockholm, Sweden, in November 1966, announced and confirmed finding PCB in fish, birds, and eggs. Subsequent findings were made in 1967 in Great Britain. In February 1969, Professor Risebrough of the University of California published an article in the San Francisco Chronicle relaying his findings of PCB in the environment of the United States. Monsanto confirmed the presence of PCB's in mid-1969 and confirmed the adequacy of work by Widmark and Jensen and others; truly, the PCB's are a worldwide ecological problem.

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Analysis indicates the environmental presence of the 5 and higher chlorinated biphenyls which take the appearance of Aroclor 1254 and Aroclor 1260. We have strong indications that Aroclor 1242 or at le part of it degrades biologically. Since the Aroclor 1242 contains a 7 percent of the 5 chlorine biphenyl or higher we cannot rule out th possibility that the observations may be a concentration affect of t higher chlorinated biphenyls of Aroclor 1242.

4

To date ~~there~~ we have ~~been~~ confirmed no reports of finding Aroclor 1242 present i the environment (except ~~outside~~ in the effluent of our plants ~~where we Aroclor 1242 is present~~). streams and mud below our own plants at Anniston and Sauget

The seriousness of the problem can best be spelled out as follows:

1. Fish - Marine or aquatic species concentrate PCB in the fatty tissue. Toxic is small quantities (down to 5 ppb) to sensitive life such as shrimp.

2. Birds - Predatory species feeding on the marine or aquatic life further concentrate PCB to possible harmful effects. Specifical in birds PCB can affect the calcium metabolism leading to egg sh imperfections which prevents proper hatch of the young. In fact Monsanto has confirmed the eggshell by feeding chickens, a high order of the species, PCB's in controlled tests.

3. Man - There is no harmful effect known to man or other mammals af 40 years of production. Investigations are underway by various sources.

4. Political and Public Emotion - PCB's are falsely linked with DDT because PCB's show up in the analysis for DDT. PCB's are linked other permanent type chlorinated hydrocarbon pesticides. This becomes particularly serious since about every article of food in country is being examined for a trace of these materials.

5

More than 50 samples and [illegible]

NEV 021439

WATER_PCB-SD0000073997

V. Effect on Monsanto

Business potential at stake on a worldwide basis:

Fluids	Plasticizers	Total/Year
70M lbs.	34M lbs.	104M lbs.
$16M	$6M	$22M
$6-8M G.P.	$2-3M G.P.	$8-11M G.P.

Already competition is using certain data against us in competitive situations.

A. Legal Liability

Direct lawsuits are possible. The materials are already present nature having done their "alleged damage". All customers using products have not been officially notified about known effects nc our labels carry this information. These are only a few of the possible legal implications which would best be covered by the legal department.

B. Public Image

The corporate image of Monsanto as a responsible member of the business world genuinely concerned with the welfare of our enviro ment will be adversely affected with increased publicity.

The evidence proving the persistence of these compounds and their universal presence as residues in the environment is beyond questioning. This combined with certain scare publications is ce to give an adverse image. Guilty by association (with DDT) will prevail as the background while actual facts may be sparse.

C. Customer Relations

NEV 021440

Some customers who presently use these materials will be "scared c to other competitive products. Products associated with the same name or "trademark" will be adversely affected ie., Therminol, Pydraul and Arcolor. Competitors will use the information for an

WATER_PCB-SD0000073998

influence on Monsanto products.

Customers will seek other "outs" rather than become involved.

VI. Effect on Customers and Ultimate Consumers

One of the unique features of PCB's is their fire resistance. Here t basic decision whether to risk lives due to fire or risk extinction o some species of birds. In this case the PCB would probably be accept as a necessary pollutant and tolerated under controlled conditions.

A. Electrical Industry - Capacitors and Transformers use Aroclor because it is the best inexpensive dielectric fluid available.

B. Food Processing - Bulk "deep frying" units for potato chips, fish, and doughnuts use the fire resistance fluid as an indirect heatin medium.

C. Die Caster -- and other hot metal working industries fire resista fluids to protect the workers.

Affects a wide range of plastics and adhesives because the PCB serves as the plasticizer.

A wide range of paints and coatings are affected. The "Carbonles carbon paper used so widely would disappear.

VII. Involvement With Other Producers

Although Monsanto is most probably responsible for the U.S. contamina and jointly responsible with MCL for the United Kingdom problem, we cannot accept responsibility for the world. There are five known producers in the free world, several possible producers behind the ir curtain and couple of additional companies making overtures about entering the business. Monsanto representatives have on one occasion discussed this problem with a couple of these producers but they expressed no great concern. In fact, it is highly possible that one

WATER_PCB-SD0000073999

these manufacturers is dumping his waste into the Rhine River. Certa any action taken by one producer will most assuredly affect the other It is entirely possible that a joint plan of action could be develope but will most probably have to be spearheaded by Monsanto. It is als likely that producers of other chlorinated products used with PCB's will be dragged into the investigation.

VIII. Sources of Contamination

Although there may be some soil and air contamination involved, by fa the most critical problem at present is water contamination. To our knowledge to date the contamination can be broken down into two gener categories, open and indirect pollution.

A. Open Pollution - Our manufacturing facilities sewered a sizeable quantity of PCB's in a years time.

1. Fluids

Fluids are probably the most open source of pollution because their mobility. They also may be the least serious because t are generally the lower chlorinated materials.

2. Electrical

Electrical customers have in the past sewered their wastes.

3. Heat Transfer

Heat transfer customers have sewered their objectionable and their spilled material.

4. Industrial

These fluids have generally been sprayed into drains, washed down sewers and generally regarded as very harmless.

All of the fluids have had the "pink" constituent dumped on dirt roads a "dedusting agent" which inadvertently found its way back to the stream.

NEV 021442

WATER_PCB-SD0000074000

5. Plastics

The plastics are not as mobile as the fluids so therefore th have not found and cannot find their way back to streams in pollution.

B. Indirect

Shipping containers and the cleaning thereof for subsequent use source of contamination.

1. Fluids

a. Electrical - Disposal of "burned out" transformer and capacitors may find its way back to streams. Scrap unit: (new) are generally disposed of in land fills but could possibly get back to the stream.

b. Heat Transfer - Leaks could contaminate.

c. Industrial - Cross product contamination carried out of a air compressor. Residual material carried on parts.

2. Plasticizers

a. Process Contamination from Washing

(1.) Environment Contamination

Swimming pool paints

Incineration of wax coatings

Traffic paints

(2.) Product Contamination

Coating for tank lining

Printing inks and paper coatings NEV 021443

Certain adhesives

IX. Recent Technical Changes Which Have Bearing on the Contamination

A. Fluids

The sources of pollution were pointed out as they have been in the past because we are dealing with that quantity of material in the

WATER_PCB-SD0000074001

environment today which was deposited over the past forty years. We mustmust state that responsible people throughout the industry have taker corrective action to reduce contamination in the last two years. Ther have also been technical advances which have brought about the use of lower chlorinated biphenyls which may be an advantage because to date low chlorinated ones have not been identified present in nature.

1. Electrical - The large customers have established collect systems the waste is recovered. Incinerators are being investigated and built for the disposal of the materials. There has been a shift away from the higher chlorinated types products and could probabl shift almost entirely away from those products.
2. Heat Transfer - System have been tightened up and redesigned to confine the contents Here, too, the trend has been to shift away from the higher chlorinated materials.
3. Industrial - Settling ponds have been built by the large manufactu to catch the material and decant off the PCB for reprocessing. T trend here as the other fluid areas has been towards the lower chlorinated materials.
4. Plants - The plants effluent has been passed through limestone wh provides surface to catch some of the material. But high concentrations can be found in our effluent (that is relative to those findings in nature causing the problem).

B. Plasticizer

Quite opposite to fluids the trend in plasticizer Aroclor has been to higher chlorinated biphenyls. In plasticizers the lower chlorinated biphenyl will not be an acceptable solution however, the lower chlori terphenyls could offer a possible solution.

WATER_PCB-SD0000074002

X. Courses of Action

A. Do Nothing

We cannot deny the findings and the acquisitions by the various agencies. If we took no action we would likely face numerous su: We would let government tolerances be based on public and political pressure along with any experimental or developed data which they may generate. We would most likely be forced out of this business. Other product areas would be adversely affected. We would project an image as an irresponsible member of the busir world. Project poor customer relations. The only advantage to t technique offers is it reduces the cost but this too must be weighed against potential loss of business.

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Although we all realize this could be an eventually unfortunately the solution is not this simple. Assuming we did stop manufactur immediately, the pollutants are present in the environment, the liability is present and possibly by the shifting to the lower chlorinated materials and the recovery techniques the contaminati may already be reduced to an acceptable level. Obviously the enti: business would be lost without any or very few substitutes to be offered. Other product areas would be affected. Financial loss could be considered due to raw material contracts, customer contra and royalty -- secrecy contracts. Competition would take advantag on all fronts. We would be admitting guilt by our actions. Loss of capitol investment in the plant, associated utilities, and asse ciated processes. We would possibly gain a little public image on this action.

NEV 021445

C. Respond responsibly, admitting that there is growing evidence of environmental contamination by the higher chlorinated biphenyls anc take action as new data is generated to correct the problem.

WATER_PCB-SD0000074003

This approach would enable us to phase out the higher chlorinate materials in many applications where they are no longer necessar or really desired. Wecould maximize the corporate image by publicizing this act. We would reduce a known pollutant. Additionally we could gain precious time needed to develop new products and investigate further the lower chlorinated materials As new research data is generated our course may be altered considerably. Certain limited actions may reduce or limit the problem.

WATER_PCB-SD0000074004

XI. Recommended Course of Action

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XII. Implementation of the Recommended Course of Action

A. Immediate (By 12-1-69)

1. Set up a task force under a project manager or the equivalent responsible for initiating, directing and implementing all act that Monsanto decides to take. This includes sufficient budge necessary to cope with the immediate problems. This task forc should include representatives from Medical, Legal, Research and the two involved Marketing Groups and Public Relations and must conduct liaison with MCL and other locations involved in the problem.

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2. Publicize the difficult anal. tasks.	2. Announce safety of other PCE chlorinated terphenyl.
3. Protect other PCB/chl. terph.	3. Educate customers on control effluent for all products.
4. Announce plans to reformulate certain Therminols and Pydraul where control of the product is difficult.	4. Initiate program to develop 1254 & 1260 substitutes

NEV 021447

WATER_PCB-SD0000074005

5. Emphasize better control over other Aroclor 1254 & 1260 uses.

5. Investigate with manufact the feasibility of altern products.

6. Initiate customer education or need for effluent control of all products.

~~6. Analyze 1242~~

7. Determine composition of all PCB's.

Develop a comprehensive Program

C. Short Term (within the next 12 months)

1. Research - Expand program for more meaningful biodegradation studies and confirming analytical results. Expand toxicity studies. Follow developments concerning publicity and those developments covering politica implications of PCB contamination.

Medical

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Work with customers to clean up plants on other Aroclors. Report the habitual violators or "do nothings" to the product group.

NEV 021448

Reclaim or safely dispose of fluids.

Consider renaming products that do not contain PCB. Follow ar report market developments such as customer disposal systems. Follow and report any political or public feedback which may affect the contamination problems and must be coordinated with Medical, Research and Legal.

3. Production - Clean up plants and stop gross contamination.

4. Legal - Define our present position, recommend reasonable acti that will not unduely alarm the market but reduce the exposure in terms of liabilit

WATER_PCB-SD0000074006

5. Public Relations - Publicize actions where believed advantage Certainly discussions should be held with other producers wit same period to determine their planned course of action, if a

D. Long Range Tentative Outline (From 1 year to 3 years)

Realizing that the comprehensive program must be outlined the "Lo Range Tentative Outline" is meant to serve as a guide: All aspec of this program should be reviewed quarterly by Organic Management.

1. Research-Medical

Continue biodegradation studies and analytical support

Isomer distribution

Toxicity and metabolism studies

Water soluble removal

Incineration analytical support

Confirmation analytical

Contract academic research for reference

Develop new and improved formulations

2. Manufacturing

a. Process Research and Development

(1.) Identification of typical Aroclor isomers

(2.) Develop control for effluent composition

(3.) Test substitute formulations, etc.

(4.) Develop new processes

b. Clean Up Plants

c. Modify processes to meet market needs

3. Engineering

a. Develop and set up on plant locations incineration syste

b. Design new processing equipment as necessary

4. Marketing

a. Specify alternates or changes

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c. Set reclaim or disposal of fluids

d. Work on name association problems

5. Patent

Investigate trademarks registered

Cover with patents any work felt patentable

6. Environmental Control

Develop cheap disposal systems for customers

a. Incineration or pyrolysis

b. Biodegradation unit etc.

c. Consultants in pollution control

7. Legal

Investigate and define our position on Royalty secrecy agreements.

Contracts - Raw Material and Customer

8. Public Relations

Portray to public positive actions at correcting the contamination problem. Release periodical statements covering our position.

XIII. Probability of Success

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XIV. Cost of Program

Neither the program nor the costs have been clearly defined at this
However, a cost estimate of $220,000 for toxicological work alone ha
been presented. Tentative figures indicated under the worst conditi
the entire program could run as high as $2.0-2.5M. At this stage it
very difficult if not impossible to develop a reasonable cost figure
one point is clear it will be larger than the normal research budget
handle. For this reason, assuming the approach is acceptable, we sh
be forced to ask for additional appropriations to fund the program.

XV. Future

Follow developments on the problem as they unfold.

Develop an aggressive research program to confirm or deny findings a:
better understand the problem.

Develop costs for the duplementation of the Recommended course of
action.

Develop specific actions with each department involved

Submit the actions with costs for approval

Develop a timetable to solve the overall problem.

Prepare for "precipitious pullout" or drastic legislative action alth
we do not feel this is a likely possibility.

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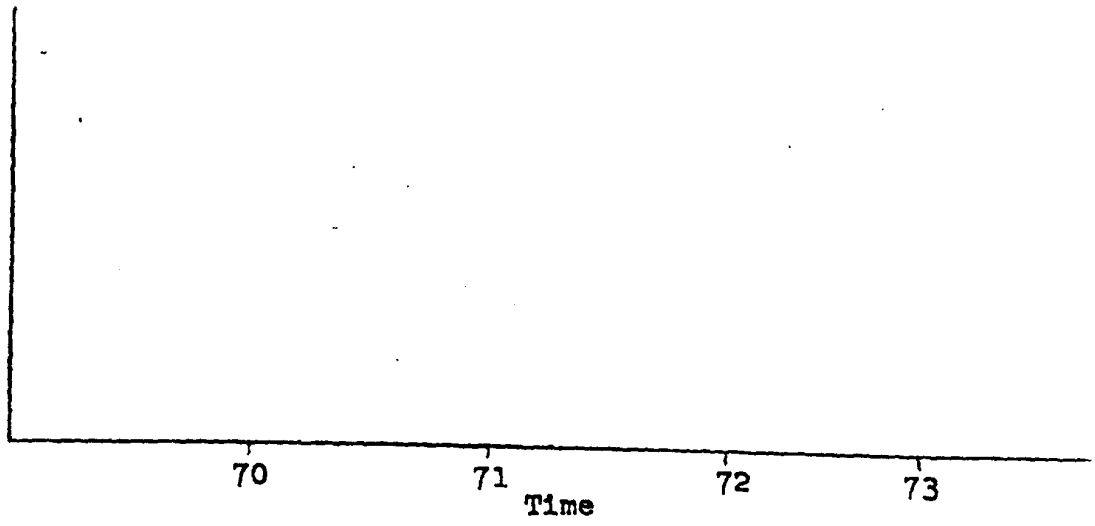
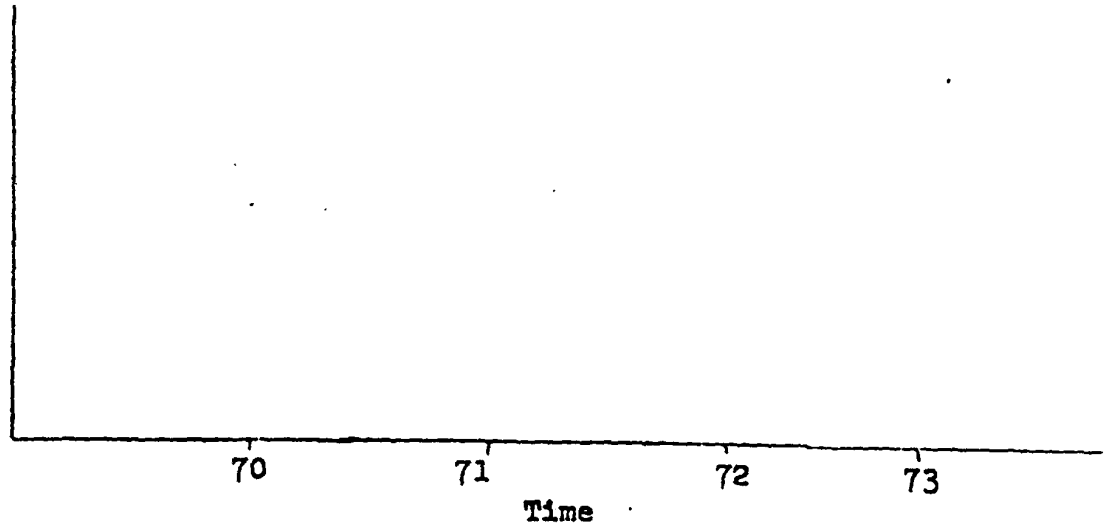
PROFIT AND LIABILITY VS. TIME

ACTION

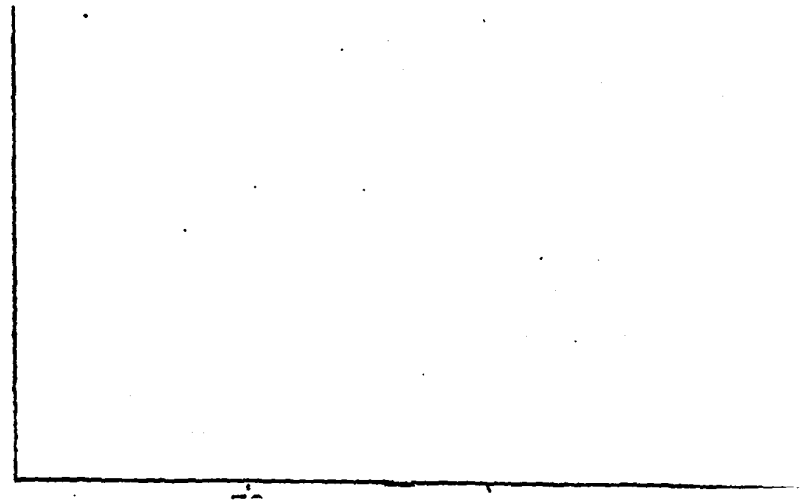
DO NOTHING



DISCONTINUE MANUFACTURE OF PCB



RESPONSIBLE APPROACH



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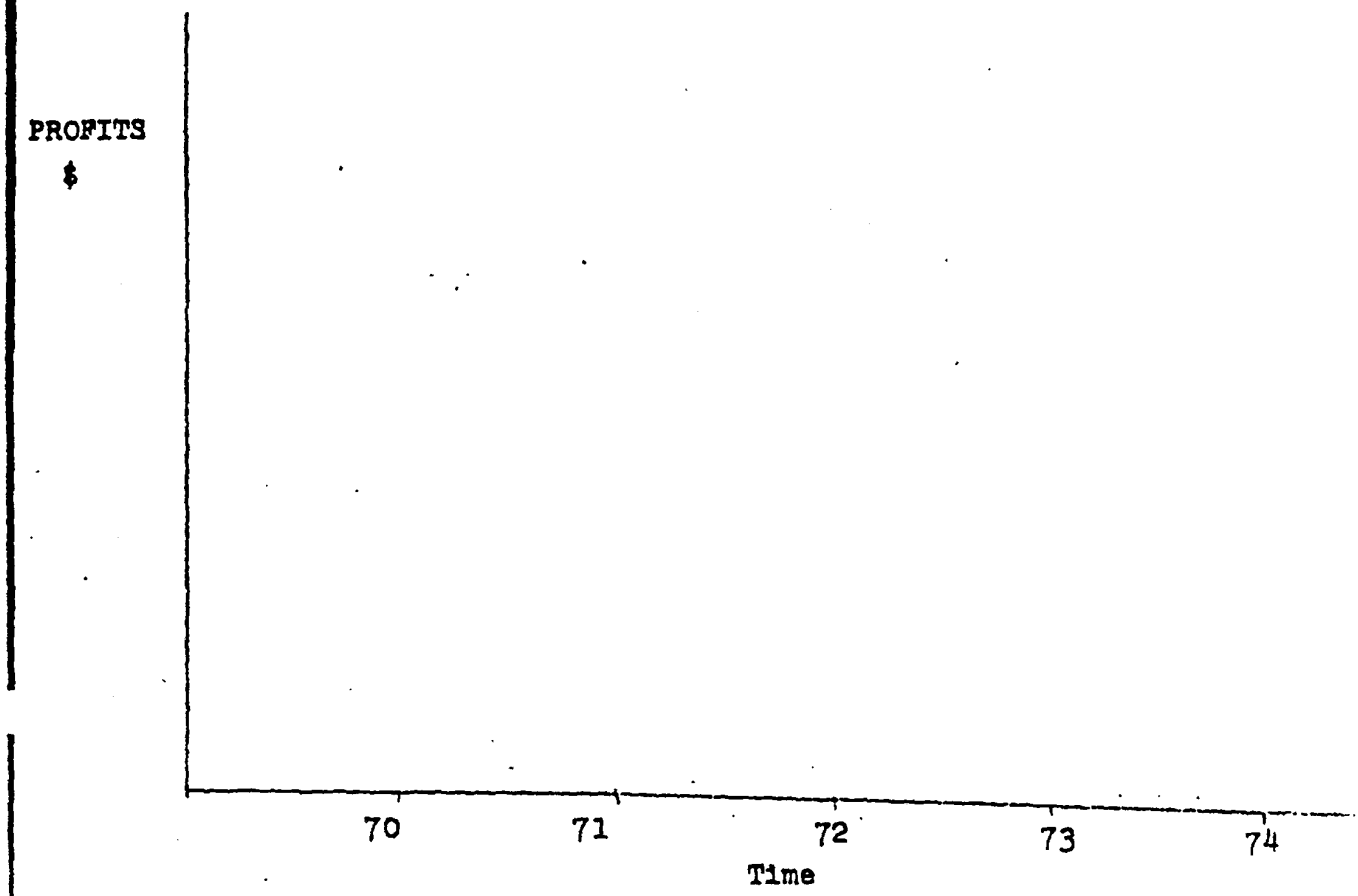
PROBABILITY OF SUCCESS



NEV 02145:

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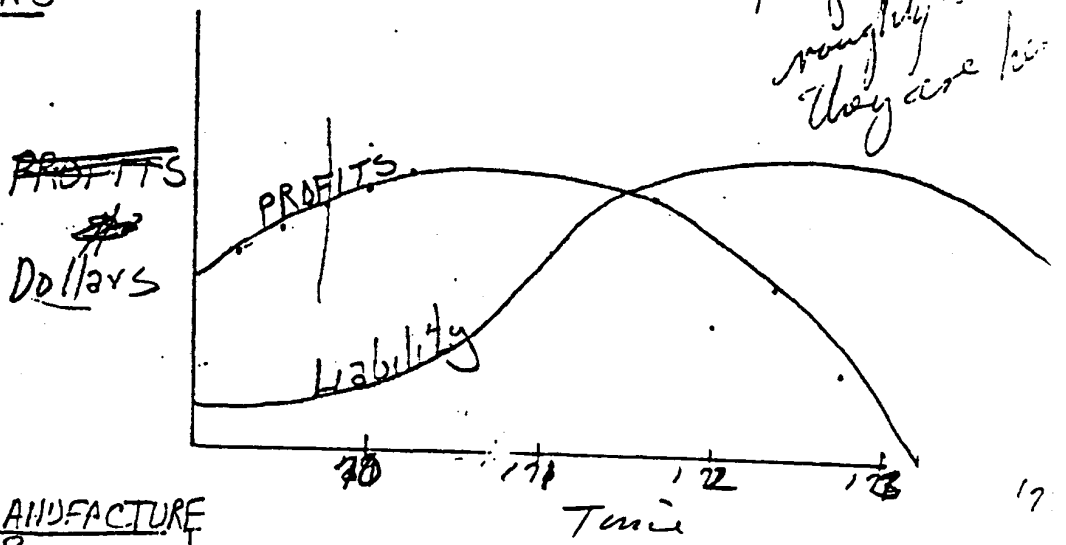
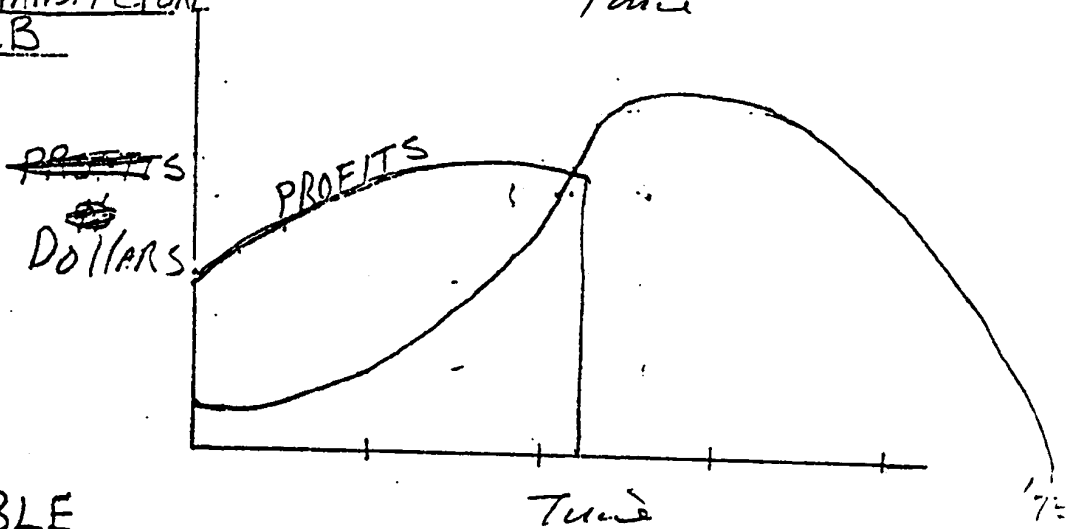
PROFIT AND LIABILITY VS TIME

ACTION

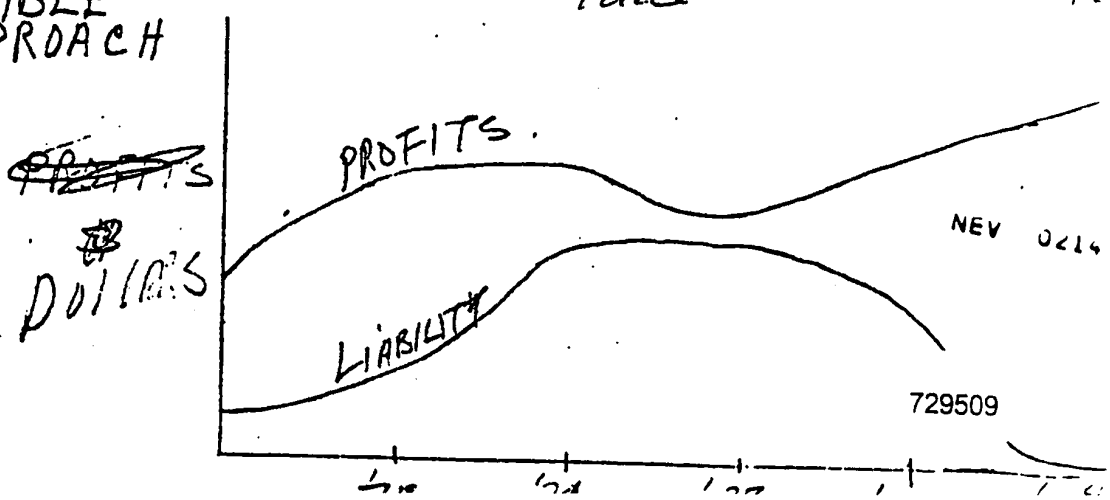
DO NOTHING



DISCONTINUE MANUFACTURE of PCB



RESPONSIBLE APPROACH



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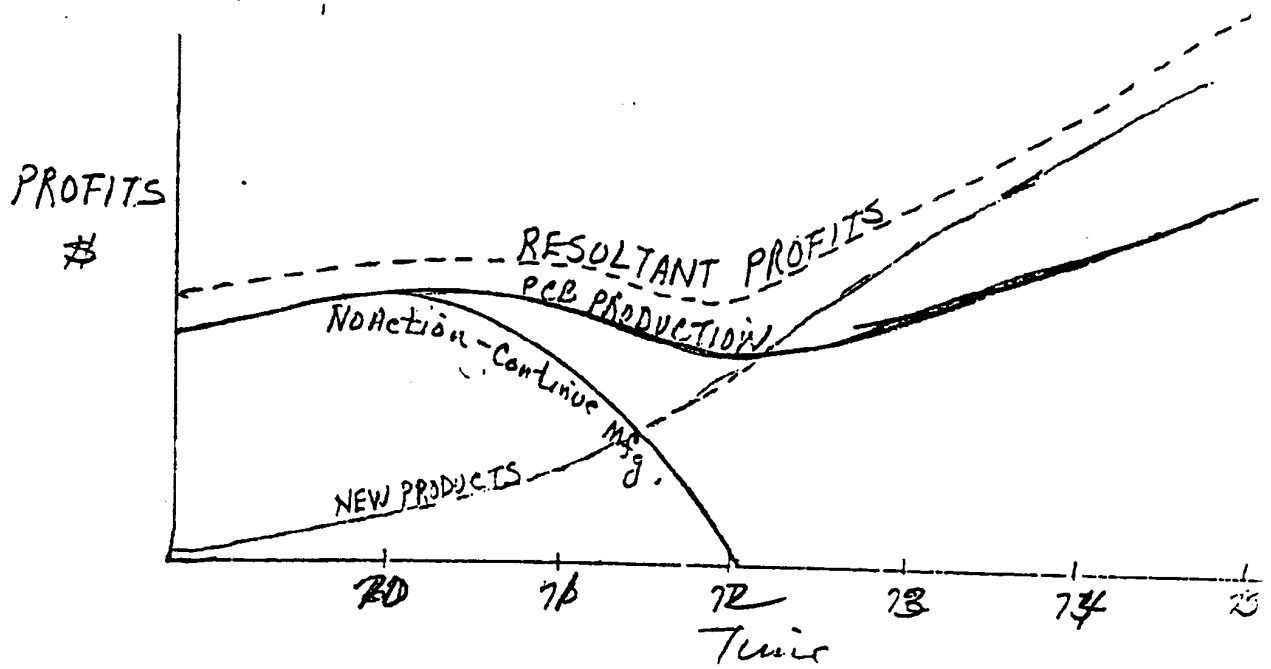
PROBABILITY OF SUCCESS



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XIII. Probability of Success

XIV. Cost of Program

$220,000 and bio with max. at $20-25M

XV. Future

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Springdale - X

PCB PRESENTATION

Nov 17, 1969

TO

CORPORATE DEVELOPMENT COMMITTEE

I. INTRODUCTION:

We are here today to acquaint you with the PCB (Aroclor) pollution problem and to secure your guidance and approval on a recommended plan of action.

Certain PCB's have recently been identified by various scientists along with DDT in fish, birds, and other wildlife.

From the standpoint of reproduction, the PCB's are highly toxic to birds. In a few moments, Elmer Wheeler will describe the problem in detail.

Our objective is to describe for you the basic problems, the issues involved, review alternative courses of action, and suggest an action plan program for your approval.

This is a serious matter, not only from the pollution viewpoint, but also because of the $22 M worldwide customer business involved with resultant gross profits of $10 M and a net investment of approximately $9 M. In addition, there could be possible adverse legal and public relations problems leveled against Monsanto.

Our Agenda will be as follows:



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PCB AGENDA REVIEW

I. INTRODUCTION

II. THE PROBLEM

- DEVELOPMENTS INCRIMINATING PCB's
- COMPLEXITY OF IDENTIFICATION
- NATURE OF
- SERIOUSNESS

III. LAW DEPARTMENT VIEWPOINT AND RECOMMENDATIONS

IV. EFFECT ON MONSANTO AND ALTERNATIVES

V. FUNCTIONAL FLUID BUSINESS GROUP DISCUSSION

- MARKETS, USES
- SOURCES OF POLLUTION
- CUSTOMER EFFECT

VI. PLASTICIZER BUSINESS GROUP DISCUSSION

- MARKETS, USES
- SOURCES OF POLLUTION

VII. RECOMMENDED ACTION PLAN

VIII. SUMMARY

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By way of introduction, the Organic Division and the Medical Department has been actively engaged for the last 18 months in developing facts and knowledge on this subject by personal visits to Universities and Industrial test laboratories, other worldwide producers, and other industrial collaborators, as well as keeping abreast of all literature and news sources on the subject as well as funding a toxicological and analytical test program in excess of $100 M. We established an Ad Hoc Committee of both Business Groups and Medical which recently issued a report - much of which will be discussed today. We have learned a lot, but there is much yet to learn as you will hear.

What are PCB's? They are polychlorinated biphenyls - better known to us as Aroclors. The next slide will quickly re-familiarize you with our Aroclor business.

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MONSANTO WORLDWIDE AROCLOR BUSINESS

POUNDS/YEAR	104 M	(70 M in Functional Fluids 34 M in Plasticizers)
SALES/YEAR	$22 M	($16 M in Functional Fluids $ 6 M in Plasticizers)
GROSS PROFIT/YEAR	$10.0 M	($7.5 M in Functional Fluids $2.5 M in Plasticizers)
GROSS INVESTMENT	$13 M	($8.8 M net investment)
ROI	10.5%	
WORLDWIDE M/I	62%	
MONSANTO PRODUCTION LOCATIONS:	USA (2 plants, Anniston, Alabama Sauget, Illinois)	
	UK (Newport)	
	JAPAN (Yokkaichi)	
OTHER PRODUCERS:	Bayer, Prodelec, Caffaro, Flick, Kanegahuchi, and several Eastern European producers (all ex-USA)	

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THE AROCLOR PRODUCT LINE

CHEMICAL NAME	TRADE NAME	NATURE OF MATERIAL
MONOCHLOROBIPHENYL	AROCLOR 1221	THIN LIQUID
DICHLOROBIPHENYL	AROCLOR 1232	
TRICHLOROBIPHENYL	AROCLOR 1242	OILY LIQUID
TETRACHLOROBIPHENYL	AROCLOR 1248	
PENTACHLOROBIPHENYL	AROCLOR 1254	HEAVY MOLASSES
HEXACHLOROBIPHENYL	AROCLOR 1260	THICK TAR
HEPTACHLOROBIPHENYL	AROCLOR 1262	
OCTACHLOROBIPHENYL	AROCLOR 1268	
DECACHLOROBIPHENYL	AROCLOR 1270	SOLID
TERPHENYLS	SANTOWAX	
CHLORINATED TERPHENYL	AROCLOR 5460	SOLID

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There are theoretically 210 different isomers of chlorinated biphenyls.

Monsanto entered the Aroclor market in 1930 by acquiring Swan Chemical Company. The first load of Aroclor went out of Anniston, Alabama to General Electric in 1931. Since then, the market has grown to one of Monsanto's most profitable franchises. This franchise is now being threatened by [illegible] recently found pollution problems which Elmer Wheeler will now discuss.

II. The Problem (Wheeler) - see attached Appendix A

III. Law Department Viewpoint and Recommendations (French)

IV. Effect on Monsanto and Our Alternative Courses of Action

As discussed, Aroclors 1254 and 1260 -- the 5 and 6 Cl ringed biphenyls are the ones most seriously involved in the pollution problem. Both Plasticizers and Fluids Groups are involved as shown:

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AROCLOR SALES

(M POUNDS)

	FLUIDS	PLASTICIZERS	TOTAL
AROCLOR 1254	1.45	5.4	6.85
AROCLOR 1260 & ABOVE	3.7	1.7	5.4
	5.15	7.1	12.25

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We considered 4 alternative courses of action:

(Slide)

Alternative 1: Do nothing was considered unacceptable from a legal, moral, and customer, public relations & company policy viewpoint. This is also the quickest route to being forced out of business.

Alternative 2: Go out of total Aroclor business was considered unacceptable from a Divisional viewpoint, but from a Corporate viewpoint may be necessary. ~~Only you can make that decision.~~ All Aroclor products are not serious pollutants - many degrade; there is too much customer/market need and selfishly too much Monsanto profit to go out. To go out would require a write off of Aroclor net investment of $7 M (10¢/share) or if biphenyl included $8.8 M (12¢/share). In addition, inventory disposition, continuing cost of utilities, and back-up capital and serious manpower & resources reallocation at Anniston.

Alternative 3: Go out of Aroclor 1254 and 1260. This was seriously considered and may eventually occur by our actions and customer actions, nevertheless, we feel that segments of this business are defensible or are so "confined" in use that specific plans of action are called for this portion. Our reasons for eliminating this alternative will become clearer as we outline our action plans.

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ALTERNATIVE COURSES OF ACTION

1. DO NOTHING - JUST REACT TO LEGISLATION AND EMOTION.

2. GO OUT OF TOTAL AROCLOR BUSINESS.

3. GO OUT OF AROCLOR 1254 AND 1260 PRODUCTION

4. DEVELOP SPECIFIC ACTION PLANS "TAILORED" TO EACH BUSINESS GROUP AND EACH CUSTOMER/MARKET SITUATION TO "CLEAN UP" THE MESS.

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Alternative 4: Develop specific action plans tailored to each Business Group and each customer/market situation, - was the alternative selected at this point of time and based on our knowledge from a Divisional viewpoint as making Monsanto act in the most positive, responsible way to society and our customers, as well as our interests.

However, because of the magnitude and seriousness of this problem and its total implications for Corporate Monsanto, the final decision on this matter must be made by the CDC.

V. Functional Fluids Business Group Discussion:

Aroclors are used widely in 3 of our 4 market areas in the Fluids Group:

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FLUIDS USE OF AROCLORS BY MARKET AREA

AROCLOR PRODUCT	DOMESTIC MARKET AREA			TOTAL
	INDUSTRIAL	HEAT TRANSFER	ELECTRICAL	
1242	4.1	1.1	36	41.2
1248	1.2	1.0	-	2.2
1254	-	0.1	0.8	0.9
1260 & Above	0.6	-	3.5	4.1
	5.9	2.2	40.3	48.4

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SOURCES OF FLUIDS POLLUTION

APPLICATION	INTENSITY OF POLLUTION	
INDUSTRIAL FLUIDS	GREATEST	(DIRECT)
DIELECTRICS	↓	(INDIRECT CONTAINED)
HEAT TRANSFER	↓	(INDIRECT CONTAINED)
PRODUCING PLANTS	LEAST	(DIRECT)

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FLUIDS CUSTOMER ALTERNATIVES

AREA OF APPLICATION	PRODUCT OF CHOICE	CUSTOMER OPTIONS
Industrial Fluids	Pydraul 312/F-9/ A-200/Phosphate Esters/ Water Glycol	Customer could get along without us, but Pydraul 312 favored. H_2O Glycol has some pollution problem: Phosphate ester route ok at present.
Transformer	Air/Oil/Aroclor/Gas	Could drop Aroclor at sacrifice of safety, cost or size of equipment or noise level.
Capacitors	Aroclors	No immediate replacement available. Longer term - oil at expense of size and cost of efficiency and redesign of equipment.
Heat Transfer	Therminol	No option for FR liquid market. Other system possibility.
	Oil/Dowtherm/T66 T55 T77 T88	Liquid systems favored. T66 and T55 increasing rapidly in use. Oil also a pollution problem.

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Customer Choices & Alternatives & Penalties:

Summarizing, some of our customers have no immediate alternative, some could change only at sacrifices of safety, or cost or various technical factors. Only in the Industrial field could the customer make an immediate conversion.

PCB Threat to Functional Fluids Business and Profit:

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FLUIDS BUSINESS THREATENED

(1970 BUDGET)

PROBLEM	SALES	GROSS PROFIT
1. Confined to A-1254/ 1260 only.	$ 3.0 M	$1.36 M
2. Spreads to A-1242 and 1248		
First to: a) Industrial Fluids	$ 4.0 M	$1.6 M
Then to: b) Dielectric Fluids	$ 8.0 M	$3.8 M
Then to: c) Heat Transfer	$ 1.0 M	$ .6 M
	$16.0 M	$7.36 M

— Turn over to Jim Springgate

741959

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VI

PLASTICIZERS
(WORLD-WIDE)

	ALL AROCLORS	AROCLOR 1254/1260 TYPE
1969 SALES, DOLLARS	$ 6.0 M	$1.7 M (28%)
POUNDS	34.0 M	9.5 M (28%)
1969 GROSS PROFIT	$ 2.5 M	$0.8 M (32%)

741960

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COMMENTS: DISTINCTIONS FROM F.F.

1. Large number of direct U.S. customers - 570.
2. Customers are small: 23 direct customers - 47% A-1254/1260 sales.
3. 50% domestic A-1254/1260 sales through distributors - difficult to police.

741961

NEV 028707

WATER_PCB-SD0000074031

MARKETS	1968 SALES	MAJOR AROCLOR USED
Carbonless Carbon Paper	8.8 M lb.	Aroclor 1242
Hot Melt Adhesives	5.7 M lb.	Aroclor 5460
Swimming Pool Paints	1.7 M lb.	Aroclor 1254 ✓ Aroclor 5460)
Protective Coatings	5.3 M lb.	Aroclor 1254 ✓ Aroclor 5460)
Emulsion Adhesives	1.5 M lb.	Aroclor 1254) Aroclor 1260) ✓
Sealants	3.0 M lb.	Aroclor 1254) Aroclor 1262)
Wax Modification	2.0 M lb.	Aroclor 1254 ✓ Aroclor 5460)
Miscellaneous	5.0 M lb.	Aroclor 1248) ✓ Aroclor 1254)

COMMENTS: 1. [illegible] major customer (85% of Aroclor 1242 sold).

2. 55% of domestic Aroclors sold through distributors.

741962

NEV 028708

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POSSIBLE CONTAMINATION SOURCES

(PLASTICIZERS)

DEGREE OF CONTAMINATION	MARKET	APPLICATION	SOURCE	IS A-1254 /1260 USED?
Most	Coatings	Marine Paints Water tank linings	Leaching	Yes
	Coatings	Swimming Pool Paints	Leaching	Yes
	Carbonless Carbon Paper	-	Vaporization	No
	Wax Modification	-	Vaporization	Yes
	Emulsion Adhesives	-	Contact with product via packaging. Incineration.	Yes
	Hot Melt Adhesives	-	Contact with product via packaging. Incineration.	No
Least	Sealants	Automotive Construction joint sealants	Long-term leaching	Yes

[illegible]: 1. Unlike fluids, Aroclor plasticizers are combined into plastics to produce the final product - therefore, far less mobile.

2. Problems such as wastes from our manufacturing plants, customers plants and and leasing of drums common to both groups.

3. [illegible] or protective coatings are not considered a high [illegible] [illegible].

4. [illegible] of Aroclors during plant processing or [illegible] [illegible]

741963

NEV 028709

PLASTICIZER BUSINESS THREATENED

PROBLEM	SALES RETAINED*	$ G.P. RETAINED (LOST)
1. Confined to A-1254/1260 type only.	$4.3 M	$1.7 M (-$0.8 M)
2. Spreads to all chlorinated biphenyls.	$2.0	$0.6 M (-$1.9 M)
3. Spreads to all PCB's and all chlorinated terphenyls	0.0	0.0 (-$2.5 M)

*Based on 1969 prospects.

Notes: Plasticizers sell Aroclor 1262/4465 which are very close to A-1254/1260 and these have been included as A-1254/1260.

741964

NEV 028710

WATER_PCB-SD0000074034

RECOMMENDED ACTION PLAN

THE JOINT ACTION PLAN DEVELOPED BY THE FUNCTIONAL FLUIDS AND PLASTICIZER BUSINESS GROUPS, AND THE MEDICAL AND LAW DEPARTMENTS IS AS FOLLOWS:

1. Appoint a Project Manager - responsible for the overall management of the Aroclor pollution problem. He would be assisted by a Task Force from members of each Business Group plus Medical, Law, Engineering and Manufacturing.

2. Notify all Aroclor customers of PCB problem and relabel containers - within 60 days.

3. Clean up Monsanto plants' effluents within 12 months.

4. Develop and implement new packaging systems for Aroclor 1254/1260 - within 6 months.

5. Educate customers on need for clean-up at their plants - within 4 months.

6. Introduct to market, replacement products for Aroclor 1254/1260 - beginning 1/1/70 (Fluids), 4/1/70 (Plasticizers).

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RECOMMENDED ACTION PLAN

7. Continue and expand biodegratation test program with Aroclor series, particularly 1242, 1248 and 1254.

8. Continue toxicological test program.

9. Accelerate present analytical test program.

10. Determine feasibility and cost of eliminating 5/6 Cl_2 in Aroclors 1242 and 1248. (3/70)

11. Study incineration products. (3/70)

12. Develop business plan to offer:

    Monsanto Fluid Reclamation and Recovery with Enviro Chem (4/70). (Reclamation already underway at Findett.)

741966

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WHAT COULD WE EXPECT FROM THIS PROGRAM?

Through this action program, Monsanto would expect to:

1. Retain or convert a good portion of our business and profits:

PROBLEMS	CONVERT OR RETAIN	$\overline{M}$ SALES OUT OF PRESENT	ODDS OF SUCCESS
a. Confined to A-1254/ 1260.	$20.3 $\overline{M}$	$22 $\overline{M}$	70%
b. Spreads to A-1248 and 1242.	$10 $\overline{M}$	$22 $\overline{M}$	60%

2. Gain further valuable knowledge and time to:
   a. Learn more facts.
   b. Protect our position.
   c. Make further decisions regarding our program.
   d. Contribute to overall pollution knowledge.

3. Clean up the major contributing PCB pollution factors.

4. Minimize customer complaints and hardships.

741967

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The Program Would:

1. Cost some money.

   Est. SARE - $400-500 M

   Est. Capital - $700 M

   $1.1 M - 1.2 M

2. Expose us to continued adverse publicity and possible law suits.

3. Cause some customer discontent - but much less than an abrupt termination of production.

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SUMMARY

In summary, the PCB pollution problem is a very serious one. It is a worldwide ecological problem. At present the most serious offenders are the 5 and 6 chlorine containing products (Aroclors 1254 and 1260). There are some indications other members are biodegradable to varying degrees. Currently, much scientific testing is underway and more information will be forthcoming. Monsanto must act in a positive cooperative fashion. A plan of action has been discussed which we feel indicates responsible action. Our stakes are large and because of the many possible effects on the Corporation -- your guidance and approval of the suggested action program is requested.

Thank you for your consideration. May we answer any questions?

741969

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1. EVIDENCE OF PROBLEM

For the last fifteen years there has been growing world-wide concern regarding the persistence of chlorinated pesticides (particularly DDT) and their universal presence in man, food, animals, fish, birds, air, water, and soil. DDT and its metabolites have been found in virtually every living organism and matter around the globe--including penguins in the Antarctic and the polar ice cap.

As analytical techniques for measuring the residues have improved, interfering substances have become apparent and raised doubts as to the quantitative validity of reported concentrations. Gas chromatograph techniques, making possible determination in the parts per billion and parts per trillion range are particularly sensitive not only to DDT but also to its metabolites DDE, the insecticides Dieldrin and Aldrin, and polychlorinated biphenyls (PCB's), isomers of which have similar retention times ("peak locations") in the gas chromatogram.

Identification of some of the major interfering substances as PCB's was announced by Professors Widmark and Jensen of the Institute of Analytical Chemistry at Stockholm in November, 1966. With the identification (confirmed by mass spectroscopy) Widmark and Jensen announced finding PCB's in fish, birds, eggs, pine needles and childrens' hair. Samples analyzed were all from Sweden and the Swedish coastal areas.

Subsequently, PCB's were identified in fish and wildlife in Great Britain (1967), the Rhine River and Netherlands estuaries (March, 1969).

In August of 1968, Professor Risebrough of the University of California at Berkeley presented a paper at a private meeting of toxicologists indicating he had found PCB's in fish and wildlife along the coast of California. The first reference in the American public press followed the publication of Risebrough's paper in Nature, February, 1969. At that time the San Francisco Chronicle carried a "scare" story concerning PCB's after an interview with the author.

In the last six months, PCB's have been reported in:

a. Milk in Georgia
b. Waters of Lake Michigan
c. Fish in Connecticut
d. Sea food along the Gulf Coast (toxic--fatal to shrimp at Pensacola)

PLAINTIFF'S EXHIBIT 1253

WATER_PCB-SD0000074040

1. EVIDENCE OF PROBLEM (Continued)

e. Electric dishwashing compounds
f. Milk in Maryland
g. Bald eagles from the mid-west and
h. Mother's milk (rumor--not confirmed) in Denver.

After investigation--not complete in all cases--the committee has concluded:

1. That the identification of the PCB's as contaminants of the environment is certain;

2. There is no question as to the non or low biogradability of the PCB's--particularly the higher chlorinated members of the series including Aroclors 1254 and 1260 and probably 1248;

3. The possibility of natural origin of the PCB's (such as biological or chemical degradation of other chlorinated hydrocarbons by natural processes or metabolism in the eco-system) is so remote that it is not a satisfactory explanation of their presence;

4. As discussed in the following section, these may be significant toxicological effects in some species of living organisms; and,

5. Aroclors 1254 and 1260 are the compounds which are found and reported in the literature by the Aroclor trade-names or as the "biphenyls with predominantly 5 to 8 chlorine atoms". We believe that references to Aroclors 1242 and 1268 (and chlorinated terphenyls) in several letters received reflect early non-definitive efforts of the analysts.

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2. TOXICOLOGICAL ASPECTS

A. Man--Data available at present indicate that PCB's may be "moderately toxic" to man. Safe industrial usage has been based on a recognition of possible toxic effects and control of exposures to minimize the hazard. There have been a limited number of cases of occupational disease where workmen have been exposed to excessive vapor inhalation or repeated and prolonged skin contact with subsequent development of skin manifestations ("chloracne") or more serious involvement of the liver and kidneys.

B. Animals--Chronic toxicity data for animals (which would allow a better extrapolation of "safety" levels for humans) has been meager. In May, 1969 chronic (two year) feeding studies in rats and dogs were initiated at our consultant's Industrial Bio-Test Laboratories in Chicago. A three generation rat reproduction study is also underway. The purpose of the research is to make available to the U. S. Food and Drug Administration and other federal and state agencies data which will confirm that the levels of PCB's being found in nature--and particularly in human food--do not constitute a serious threat to the public health.

C. Fish--The proven presence of pesticides (and PCB's) in fish is beginning to cause concern for two reasons. In Sweden and other Scandinavian countries where fish make up a large portion of the daily diet, the use of DDT has been temporarily or permanently banned. Similiar action has been taken in several states in the United States and bills have been presented in Congress to outlaw the sale and use of DDT. This summer the U. S. Food and Drug Administration seized and destroyed Coho Salmon caught in Lake Michigan because of DDT content.

This highlights the particular problem with fish which can concentrate/accumulate persistent chlorinated hydrocarbons in their tissues. For example, trout raised in water containing 1 part per billion will contain 1 part per million in their tissues in six weeks. Other marine species exhibit a similar "concentrating" propensity. Although no scientist has maintained that these accumulated levels in fish are toxic per se, the question of the desirability of having such fish in the human diet has caused concern--and in some minds, alarm.

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2. TOXICOLOGICAL ASPECTS (Continued)

A second consequence of the chlorinated pesticide presence in fish, is the alleged effect on species of coastal and other fish-eating birds. There is evidence interpreted by a number of scientists (and seized upon by the conservationist-pseudo-scientists) that several species of birds face elimination or absolute extinction because of persistent chlorinated hydrocarbons in fish which make up the major portion if not all of their diet. Included in the United States are the Peregrine Falcon and the brown pelican. (At a meeting in October, 1969, of the Association of Official Analytical Chemists, will be a paper presented entitled, "The Determination of PCB's in Two Bald Eagles". This is based on work done by the Fish and Wildlife Laboratories of the U. S. Department of the Interior at Patuxent, Maryland. Now the emblem of the heritage of the United States is threatened!)

D. Birds--The effect in birds appears to be due to an upset of enzyme metabolism in the liver leading to the laying of eggs with thin or no shells at all. On Anacapa Island, near Oxnard, California, only three of one thousand brown pelican eggs were found this year with shells and only one bird was born. This was due allegedly to anchovies--the main diet of the pelican--containing "DDT and hundreds of parts per million of PCB's".

Preliminary results from studies at Industrial Bio-Test Laboratories indicate that 100 ppm of Aroclors 1242, 1254 and 1260 in the diet of white leghorns causes a reduction in egg shell thickness and an effect in chick embryos which prevents hatching.

E. Shrimp--In August, 1969, West Florida State University at Pensacola reported to our Pensacola Plant that PCB's (Aroclor 1254) had been found in the Escambia River below our outfall. The amount was reported as 40-45 parts per billion one quarter mile below the plant and 1 ppb at the bridge over the river as it enters Pensacola Bay.

The Gulf Breeze Laboratories of the Bureau of Commercial Fisheries (U. S. Department of Interior) at Pensacola next reported that 40 ppb killed baby shrimp in 96 hours. Further study indicated that 5 ppb killed 18 of 25 baby shrimp in 18 days.

Plant investigation revealed that one to three gallons per day of Aroclor 1254 was being lost to the river from the use of Pydraul AC in air compressors.

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2. TOXICOLOGICAL ASPECTS (Continued)

F. Summary of Toxicity Considerations

a. The PCB's are "moderately" toxic to man. A probable safe level for Aroclor 1254 and 1260 in the diet will be something less than one part per million.

b. Although only "moderately" or "slightly" toxic to adult birds and fish on the basis of acute exposure, the "safe long term" or "chronic dose" is less than 100 ppm insofar as reproduction is concerned.

c. In the case of shrimp, the "safe" or no effect" level for Aroclor 1254 is less than 5 parts per billion.

It thus appears that, while we may be able to show some kind of reasonable numbers for "safe levels" of Aroclors 1254 and 1260 (and other lower chlorinated biphenyls)in some species, there are other species of life in the ecosystem where a zero to 5 parts per billion limit for Aroclor 1254 and 1260 (and possibly other more highly chlorinated biphenyls) will be the tolerance level.

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3. PERSISTENCE OR LACK OF BIODEGRADATION

Evidence for the persistence of Aroclors 1254 and 1260 in the environment includes:

a. The chemical stability of most of the chlorinated aromatic hydrocarbons.

b. The identification of Aroclors 1254 and 1260 in the environment as itemized in Section 1.

c. Reports from Sweden indicating the presence of Aroclors 1254 and/or 1260 or competitive equivalent products in the sludge from municipal waste treatment plants.

d. The lack of data up to now indicating that lower chlorinated PCB's are interfering in the pesticide residue analysis in spite of the equivalent usage of some of them (e.g. Aroclor 1242) and undoubted losses to the environment depending on use applications and ultimate disposal. (Comfort in this conclusion is tempered by some evidence that the preparation of samples for GC analysis--destroying the DDT and metabolites--may be causing destruction of Aroclor 1242).

e. Literature evidence that other lower chlorinated hydrocarbons in a series of compounds (e.g. mono and di-chlorophenols) are subject to biodegradation whereas increase in chlorination makes them more refractory (pentachlorphenol).

f. Early reports of research in Monsanto's Ruabon Laboratories that indicate that Aroclor 1242 is indeed subject to biodegradation in biological waste treatment plants (research scale).

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4. PRESSURES WHICH WILL AFFECT SALES AND USE OF AROCLORS 1254 AND 1260

As of this date (October, 1969), there are no restrictions which control the current uses of our Aroclors or PCB's. We are faced instead with pressures being applied relative to persistent chlorinated hydrocarbon pesticides in general and specifically DDT. The evidence proving the persistence of these compounds and their universal presence as residues in the environment is beyond question. Although the significance of these residues is subject to wide difference of opinion among reasonable scientists, the development of "lunatic fringe" post-Rachel Carson has led to a domination of the media by scare publications in the public and scientific press. Only the most myopic individual in the business world could be unaware of the overwhelming interest and influences being directed at preventing contamination of the environment. The principal groups with an apparent avowed mission of providing a world of pristine pure food, water and air include many in academic and political fields who recognize the headline value of statements supporting these ideals.

In the case of the PCB's as environmental contaminants, the committee believes that Monsanto is faced with a barrage of adverse publicity in all elements of the news media--including those with national coverage. Factual basis will be sparse or non-existent but guilt by association (with DDT) will provide background and prevail.

As indicated in the earlier sections of this report, it will be impossible to deny the presence and persistence of Aroclors 1254 and 1260 at least. The public and legal pressures then to eliminate or prevent global contamination are inevitable and probably cannot be contained successfully.

In defense of the chlorinated pesticides, their manufacturers will not be loath to incriminate the PCB's as being culprits in the development of misleading data relative to their concentrations as residues. Secondly, the manufacturers of competitive products will seize any opportunity to point out to our customers their potential problems if they continue to use products containing Aroclors. This has already occurred in the case of our Pydrauls.

There are pertinent federal laws and regulations relating to environmental control as discussed in the following section.

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On Nov 17, 1969 we discussed with you the PCB problem and outlined a program for coping with it. At that time the decision was made to develop a plan to phase out ~~discontinue~~ the manufacture of Aroclor 1254 and 1260

Since then, as you well know, the pollution hysteria continues to grow and specifically in the area of PCB's the number of laboratories, governmental and university involved continues to increase as we predicted

At this meeting I wish to bring you up to date on the latest developments, the progress we have made and the need for modifying our [illegible]

Since November, the press has been relatively quite except for the recent flurry [illegible] Congressman Ryan press [illegible]. Two publications have appeared which implicate PCB. The January-February, 1970 issue of Environment carried an article by Robert Risebrough and Virginia Brodine. The presence of PCB in samples of human milk is first

NEV 021459

PLAINTIFF'S EXHIBIT 1454

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publicly reported in this article. An article by Dr. David Peakall of Cornell University appeared in the April issue of Scientific American. In this article the effect of DDT and PCB on reproduction and emphasizes that problem has been apparent since the introduction of these to the environment and reproduction is described. Three news articles were noted, one in the Miami Herald, another in the Tampa Tribune and the third in the Ann Arbor News, all describing these effects of DDT and PCB on the environment.

In March, we held discussions with Dr. Risebrough and Olcutt at Berkeley, Calif. They are personally convinced PCB's are harmful and were pleased that EPA was concerned and cooperative

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Also in March we conducted with about 50 technical representatives representing State, Federal and Canadian

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regulatory agencies in an objective [illegible] in Duluth, Minn. Analytical techniques, monitoring and toxicity of PCB were discussed. Absolute identification of [illegible] and its effect on the environment were identified as requiring considerable research. Concern was expressed by [illegible] present that some agency such as [illegible] [illegible] precipitous action before [illegible] could be [illegible] which was believed to require at least one year. [illegible] presence & offer to cooperate was [illegible].

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About two weeks ago we receive word from a Dr. Hill, Ohio [illegible] Health Dept, that his laboratory [illegible] PCB's in milk from an area [illegible] Columbus Ohio. They believed they [illegible] the source of PCB to deteriorating [illegible] applied to silos in 1967. This [illegible]

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was formulated using Aroclor 1254 and [illegible] 5460. We requested samples which [illegible] laboratory could analyze and [illegible] our analytical work has shown chlorinated compounds similar to our Aroclor 1254 in the extract samples. The milk samples were contaminated during shipping and we have requested additional samples.

During our discussions with Dr Hill we were told that the FDA was considering establishing a PCB [illegible] of 0.2 ppm in food. Subsequent discussions with FDA personnel [illegible] that the FDA will in [illegible] their [illegible] that PCB [illegible] 0.5 ppm in milk and 5 ppm [illegible] subject the milk or food to [illegible].

In the U.K. we are also experiencing considerable concern. [illegible] Ministry of Agriculture, Fisheries and Fu[illegible] has repeatedly requested Monsanto to divulge our customers. From the U.S. point of view

NEV 021462

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we were reluctant to divulge this info because of adverse consequences worldwide. From the U.K. point of view divulging the customer's name with assurances that it would be kept in confidence and any information to be released would be cleared with both Monsanto and the customer is considered the wiser approach. We are receiving permission from NCR to divulge their name and will approach the Ministry on a basis.

In Europe we have assumed worldwide
1. and contacted the representatives of the European producers. Initially their response was indifferent. Subsequently Bayer, Germany and Prodelec, France become more concerned and are cooperative with information exchange. The Italian producer does not believe he has a pro-

NEV 021463

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During our meeting with General Electric representatives in late January we discussed our decision to discontinue the manufacture of Aroclor 1254 and 1260. G.E. immediately challenged the decision on the basis that information available was not adequate to incriminate these Aroclors and that the adverse consequences of fire and explosion far exceed the potential threat to the environment. They also indicated that at the proper time they would be willing to have an officer of their company go on record as stating that the unavailability of these materials would result in serious power blackouts.

As you can see we are still very much on the defensive however considerable progress has been made.

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PCB CONTENT

PLANT EFFLUENT

Anniston

June, 1969	50 pounds per day	(5,000 ppb)
Present	5 pounds per day	(500 ppb)
October, 1970	2 pounds per day	(200 ppb)
Jan, 1971	.5 pounds per day	(50 ppb)
Sept, 1971	.05 pounds per day	(5 ppb)

Sawyer

April, 1969	700 pounds per day	(3500 ppb)
March, 1970	200 pounds per day	(1000 ppb)
Current	65 pounds per day	(325 ppb)
Sept, 1970	55 pounds per day	(275 ppb)
Oct, 1970	10 pounds per day	(50 ppb)
Sept, 1971	1 pound per day	(5 ppb)

Newport

Current	30 pounds per day	(3000 ppb)

NEV 021465

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In our plants control of emmissions is progressing well. After initial audits all plants instituted programs for control of spillage, leaks and disposal. Our Newport plant installed and placed in service an interceptor pit to hold major spills. Emission has approval and is proceeding with a similar installation. This should be in service by the end of the third quarter. Reduction in PCB contents of our plant streams below the solubility level (50-200 ppb) will be achieved only after research work now underway is completed and plant units are designed and installed. Completion of this work is expected to occur in late 1971.

A' We have worked closely with our customers and have offered our technical assistance on their disposal and effluent problems. Arrangements have been made for

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the return and recovery of some of these fluids. Successful control is possible for those uses which utilize Aroclors in closed, sealed systems. In those instances where control is virtually impossible e.g. coatings, adhesives, pesticide uses (cutting oils), we must discontinue sales or offer, preferably, an acceptable substitute product. These substitutes must be thoroughly evaluated to determine long term effect on the environment to avoid problems in the future.

In developing product substitutes we are very hopeful that the NCR applications in the U.S and U.K can be met with biodegradable hydrogenated terphenyls or alkylated biphenyls. Testing is active in NCR laboratories and plants. If successful complete conversion from Aroclor 1242 should be possible within a year to eighteen months.

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The use of Aroclors to extend pesticide persistence is not one we are recommending at present but we still have some extremely minor sales through distributors which we are discontinuing. We have recommended to the U.S Department of Agriculture to reject Aroclors as an approved inert material when pesticide reregistrations occur this year.

We have developed or are making rapid progress in developing acceptable substitutes for sealants, coatings and industrial fluid use. By year end we should have replaced Aroclors in sealants and coatings or have discontinued sales. Also by year end about 50% of our Pydraul will have been reformulated with the remainder targeted for early 1971.

Toxicity studies are now in the last month. Data to date

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indicate that Aroclors are mildly toxic to mammals however it is highly unlikely that this will be a significant factor in any decision regarding the banning or restricting of the use of Aroclors.

A major development has been achieved by our research department in refining our analytical procedures to the level that we now possess capabilities far exceeding many laboratories and unsurpassed by any. We are actively communicating our methodology to other laboratories to improve the type of information being generated. Our objective is to be considered experts with reliable results.

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Biodegradation studies have, thus far, confirmed our initial

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beliefs that the lower chlorinated biphenyls would degrade easily. We were disappointed in the resistance to degradation of some of the isomers in Aroclor 1242. This would tend to confirm the belief that some of the 5 and 6 chlorinated biphenyls being found in the environment could be residue from degraded Aroclor 1242. We are actively pursuing the possible use of distilled Aroclor 1242 with degradable components as a possible substitute with minimum loss of other favorable characteristics e.g. fire resistance.

In summary I recommend that we proceed with the plan as presented and I particularly refer to the change in our strategy regarding the discontinuing the manufacture of Aroclors 1254 and 1260

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On November 17, 1969 we discussed with you the PCB problem and outlined a program for coping with it. At that time the decision was made to develop a plan to phase out the manufacture of Aroclor 1254 and 1260. Since then, as you well know, the pollution hysteria continues to grow and specifically in the area of PCB's, the number of laboratories, both governmental and university involved continues to increase as we predicted.

At this meeting, I wish to bring you up-to-date on the latest developments, the progress we have made, and the need for modifying our strategy.

Since November, the press has been relatively quiet except for the recent flurry following Congressman Ryan's Press Conference. Two publications have appeared which implicate PCB. The January-February, 1970 issue of Environment carried an article by Robert Risebrough and Virginia Brodine. The presence of PCB in samples of human milk is first publicly reported in this article. An article by Dr. David Peakall of Cornell University appeared in the April issue of Scientific American. In this article, the effect of DDT and PCB on egg shell formation and reproduction is described, and emphasizes that the problem has been apparent since the introduction of DDT to the environment. Three newspaper articles were noted, one in the Miami Herald, another in the Tampa Tribune, and the third in the Ann Arbor News, again describing the effects of DDT and PCB on the environment. The Florida paper referred to the Pensacola incident

In March, we held discussions with Dr's. Risebrough and Olcutt at Berkeley, California. They are personally convinced PCB's are harmful and were pleased that Monsanto was concerned and cooperative.

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Also in March, we participated with about 50 technical representatives representing State, Federal and Canadian regulatory agencies in an objective discussion in Duluth, Minnesota. Analytical techniques, monitoring and toxicity of PCB were discussed. Absolute identification of PCB and its effect on the environment were identified as requiring considerable research. Concern was expressed by many present that some agency such as the FDA would take precipitous action before adequate information could be gathered which was believed to require at least one year. Monsanto's presence and offer to cooperate was appreciated.

About two weeks ago, we received word from a Dr. Hill, Ohio State Health Department, that his laboratory had found PCB's in milk from an area around Columbus, Ohio. They believed they traced the source of PCB to deteriorating coating applied to silos in 1967. This coating was formulated using Aroclor 1254 and Aroclor 5460. We requested samples which our laboratory could analyze and so far our analytical work has shown chlorinated compounds similar to our Aroclor 1254 in the extract samples. The milk samples were contaminated during shipping and we have requested additional samples.

During our discussions with Dr. Hill, we were told that the FDA was considering establishing a PCB limit of 0.2 ppm in food. Subsequent discussions with FDA personnel indicated that the FDA will in a few weeks advise their offices that PCB contents exceeding 0.5 ppm in milk and 5 ppm in food would subject the milk or food to confiscation.

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In the U.K. we are, of course, also experiencing considerable concern. The Ministry of Agriculture, Fisheries and Food has repeatedly requested Monsanto to divulge our customers. From the U.S. point of view we were reluctant to divulge this information because of adverse consequences worldwide. From the U.K. point of view, divulging the customers' name with assurances that it would be kept in confidence and any information to be released would be cleared with both Monsanto and the customer is considered the wiser approach. We are receiving permission from NCR to divulge their name and will approach the Ministry on a confidential basis.

In Europe, we have assumed worldwide leadership and contacted the respresentatives of the European producers. Initially, their response was indifferent. Subsequently, Bayer, Germany, and Prodelac, France have become more concerned and are cooperating with information exchange. The Italian producer does not believe he has a problem.

During our meeting with General Electric representatives in late January, we discussed our decision to discontinue the manufacture of Aroclor 1254 and 1260. GE immediately challenged the decision on the basis that information available was not adequate to incriminate these Aroclors and that the adverse consequences of fires and explosions far exceed the potential threat to the environment. They also indicated that at the proper time they would be willing to have an officer of their company go on record as stating that the unavailability of these materials would result in serious power blackouts.

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As you can see, we are still very much on the defensive, however, considerable progress has been made. In our plants, control of emissions is progressing well. After initial audits, all plants instituted programs for control of spillage, leaks and disposal. Our Newport plant installed and placed in service an interceptor pit to hold major spills. Anniston has approval and and the Krummrich plant ~~is~~ one proceeding with a similar installation. This should be in service by the end of the third quarter. Reduction in PCB contents of our plant streams below the solubility level (50-200 ppb) will be achieved only after research work now underway is completed and plant units are designed and installed. Completion of this work is expected to occur in late 1971.

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PCB CONTENT

PLANT EFFLUENT

Anniston

June, 1969	50 pounds per day	(5,000 ppb)
Present	5 pounds per day	(500 ppb)
October, 1970	2 pounds per day	(200 ppb)
January, 1971	.5 pounds per day	(50 ppb)
September, 1971	.1 pounds per day	(10 ppb)

Sauget

April, 1969	700 pounds per day	(3,500 ppb)
March, 1970	200 pounds per day	(1,000 ppb)
Present	65 pounds per day	(325 ppb)
September, 1970	55 pounds per day	(275 ppb)
October, 1970	10 pounds per day	(50 ppb)
September, 1971	2 pounds per day	(10 ppb)

Newport

Present	30 pounds per day	(3,000 ppb)

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We have worked closely with our customers and have offered our technical assistance on their disposal and effluent problems. Arrangements have been made for the return and recovery of some of these fluids. Successful control is possible for those uses which utilize Aroclors in closed, sealed systems. In those instances where control is virtually impossible; e.g. coatings, adhesives, pesticide uses, cutting oils, we must discontinue sales or offer, preferably, an acceptable substitute product. These substitutes must be thoroughly evaluated to determine long term effect on the environment to avoid problems in the future.

In developing product substitutes, we are very hopeful that the NCR applications in the U.S. and U.K. can be met with biodegradable hydrogenated terphenyls or alkylated biphenyls. Testing is active in NCR laboratories and plants. If successful, complete conversion from Aroclor 1242 should be possible within a year to eighteen months. The use of Aroclors to extend pesticide persistence is not one we are recommending of present, but we still have some extremely minor sales through distributors which we are discontinuing. We have recommended to the U. S. Department of Agriculture to reject Aroclors as an approved inert material when pesticide reregistrations occur this year.

We have developed or are making rapid progress in developing acceptable substitutes for sealants, coatings and industrial fluid use. By year end we should have replaced Aroclors in sealants and coatings or have discontinued sales. Also, by year end about 50% of our Pydrauls will have been reformulated with the remainder targeted for early 1971.

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SCHEDULE FOR DISCONTINUING

AROCLOR APPLICATIONS

Application	Sales M Dollars/Year	Target Date
Pesticide Extender	$ 10	Completed
Cutting Oils	50	June, 1970
Coatings	1,000	December, 1970
Sealants	1,000	December, 1970
Hydraulic Fluids		
Pydraul AC	290	September, 1970
Pydraul AC-WG	3	September, 1970
Pydraul 625	250	September, 1970
Pydraul F-9	600	December, 1970
Pydraul A-200	740	December, 1970
Pydraul 540	35	December, 1970
Pydraul 280	130	December, 1970
NCR Paper	2,000	July, 1971
	$6,108	

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Toxicity studies are now in the tenth month. Data to date indicate that Aroclors are mildly toxic to mammals, however, it is highly unlikely that this will be a significant factor in any decision regarding the banning or restricting of the use of Aroclors.

A major development has been achieved by our research department in refining our analytical procedures to the level that we now possess capabilities far exceeding many laboratories and unsurpassed by any. We are actively communicating our methodology to other laboratories to improve the type of information being generated. Our objective is to be considered experts with reliable results.

Biodegradation studies have, thus far, confirmed our initial beliefs that the lower chlorinated biphenyls would degrade easily. We were disappointed in the resistance to degradation of some of the isomers in Aroclor 1242. This would tend to confirm the belief that some of the 5 and 6 chlorinated biphenyls being found in the environment could be residue from degraded Aroclor 1242. We are actively pursuing the possible use of distilled Aroclor 1242 with degradable components as a possible substitute with minimum loss of other favorable characteristics; e.g. fire resistance.

In summary, we are making progress in our plants and with our customers in controlling discharge to the environment, we are learning more about PCB and its effect on the environment and we are agressively phasing out of uses which cannot be controlled. In summary, I recommend that we proceed with the plan as presented and I particularly refer to the change in our strategy regarding the discontinuing the manufacture of Aroclors 1254 and 1260.

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PRESENTATION OF THE PCB MANAGEMENT PLAN

On November 17, 1969 we discussed with you the PCB problem and outlined a program for coping with it.

* (Show transparency on pounds-dollars-return)

Our concern is great because of the $21 M worldwide business involved with gross profits of $10 M on a net investment of approximately $9 M.

On this chart we have summarized the total worldwide business.

* (Show transparency on non-degradable Aroclors)

The next chart summarizes the business which now depends on the non-degradable (persistent) Aroclors. Solid Aroclors, which are not an environmental problem and Aroclor 1221 which has been demonstrated in our laboratories to respond to degradation, have been excluded.

In November, the decision was made to develop a plan to phase out the manufacture of Aroclor 1254 and 1260. Since then, as you well know, the pollution hysteria continues to grow and specifically in the area of PCB's the number of laboratories,

NEV 021479

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both governmental and university, involved continues to increase as we predicted.

At this meeting, I wish to bring you up-to-date on the latest developments, the progress we have made, the need for modifying our strategy, and our new strategy.

Since November, the press has been relatively quite except for the recent flurry following Congressman Ryan's Press Conference. Two publications have appeared which implicate PCB. The January-February, 1970 issue of Environment, published in St. Louis carried an article by Dr. Robert Risebrough and Virginia Brodine. The presence of PCB in samples of human milk is first publicly reported in this article. An article by Dr. David Peakall of Cornell University appeared in the April issue of Scientific American. In this article, the effect of DDT and PCB on egg shell formation and reproduction is described, and emphasizes that the problem has been apparent since the introduction of DDT to the environment. Three newspaper

NEV 021480

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articles were noted, one in the Miami Herald, another in the Tampa Tribune, and the third in the Ann Arbor News, again describing the effects of DDT and PCB on the environment. The Florida papers referred to the effect on shrimp of hydraulic fluid which was traced to our Pensacola plant.

In March, we held discussions with Dr's. Risebrough and Olcutt at Berkeley, California. They are personally convinced PCB's are harmful and were pleased that Monsanto was concerned and cooperative.

Also in March, we participated with about 50 technical representatives representing State, Federal and Canadian Water, fish, wildlife regulatory agencies in a very objective discussion in Duluth, Minnesota. Analytical techniques, monitoring of the environment and toxicity of PCB were discussed. Absolute identification of PCB and its effect on the environment were identified as requiring considerable research. Concern was expressed by many present that some agency such as

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the FDA would take precipitous action before adequate information could be gathered; which was believed by many to require at least one year. Monsanto's presence and offer to cooperate was appreciated.

About two weeks ago, we received word from a Dr. Hill, Ohio State Health Department, that his laboratory had found PCB's in milk from an area around Columbus, Ohio. They believed they traced the source of PCB to deteriorating coating applied to silos in 1967. This coating was formulated using Aroclor 1254 ~~and Aroclor 5460.~~ We requested samples which our laboratory could analyze and our analytical work has confirmed that chlorinated compounds similar to our Aroclor 1254 are present.

NEV 021482

During our discussions with Dr. Hill, we were told that the FDA was considering establishing a PCB limit of 0.2 ppm in food. In pursuing this further Dr. Kelly was subsequently told by the FDA personnel that the FDA will, in a few weeks, advise their offices that PCB contents exceeding 0.5 ppm in milk and 5 ppm in food would subject the milk or food to confiscation.

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In the U.K. we are, of course, also experiencing considerable concern. The Ministry of Agriculture, Fisheries and Food has repeatedly requested Monsanto to divulge the names of our major customers. From the U.S. point of view, we were reluctant to divulge this information because of possible adverse consequences worldwide. From the U.K. point of view, divulging the customer's name with assurances that it would be kept in confidence is considered the wiser approach in the long run. We are receiving permission from NCR to divulge their name and will approach the Ministry on a confidential basis.

In Europe, we have assumed worldwide leadership and contacted the representatives of the European producers. Initially, their response was indifferent. Subsequently, Bayer, Germany and Prodelac, France have become more concerned, have initiated programs of their own, and are cooperating with information exchange. The Italian producer does not believe he has a problem. MMK, Japan, has been fully informed of our program

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During our meeting with General Electric representatives in late January, we discussed our decision to discontinue the manufacture of Aroclor 1254 and 1260. GE immediately challenged the decision on the basis that information available was not adequate to incriminate these Aroclors for electrical use since other nondegradable ingredients used in dielectric fluids have and that the adverse consequences of fires and explosions far exceed the potential threat to the environment. They also indicated that at the proper time they would be willing to have an officer of their company go on record as stating that the unavailability of these materials would result in serious power blackouts. Without Aroclors the maintenance of existing equipment would be impossible. Replacement of this equipment would be extremely costly, primarily because of the increased space required by the replacement. The power companies could not provide the uninterrupted service expected.

not been identified in the environment.

As you can see, we are still very much on the defensive, however, considerable progress has been made. In our plants, control of emissions is progressing extremely well. After initial

NEV 021484

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audits, all plants instituted programs for control of spillage, leaks and disposal. Our Newport plant installed and placed in service this month an interceptor pit to hold major spills. Anniston and the Krummrich plant are proceeding with similar installations. These should be in service by the end of the third quarter. Reduction in PCB contents of our plant streams below the solubility level in water (50-200 ppb) will be achieved only after research work now underway is completed and plant units are designed and installed. Completion of this work is expected to occur in late 1971.

* (Show transparency on plant effluent)

A major development has been achieved by our research department in refining our analytical procedures to the level that we now possess capabilities far exceeding many laboratories and unsurpassed by any. We are actively communicating our methodology to other laboratories to improve the type of information being generated and published. Our objective is to be considered experts with reliable results.

NEV 021485

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Toxicity studies are now in the tenth month. Data to date indicate that Aroclors are mildly toxic to mammals, however, it is highly unlikely that this will be a significant factor in any decision regarding the banning or restricting of the use of Aroclors.

Biodegradation studies have, thus far, confirmed our initial beliefs that the lower chlorinated biphenyls would degrade easily. We were disappointed in the resistance to degradation of some of the isomers in Aroclor 1242. This would tend to confirm the belief that some of the 5 and 6 chlorinated biphenyls being found in the environment could be residue from degraded Aroclor 1242. We are actively pursuing the possible use of distilled Aroclor 1242 with degradable components as a possible substitute with minimum loss of other favorable characteristics; e.g. fire resistance.

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We have recommended to the U.S. Department of Agriculture to reject Aroclors as an approved inert material when pesticide reregistrations occur this year.

We don't know when our distributors are selling Aroclors.
To obtain better control of the end uses of Aroclors we will immediately take steps to terminate distributor selling arrangements as soon as possible.
~~with a final completion targeted for October 1.~~

We are taking immediate steps to terminate the use of Aroclors for mitking oil medicinal, dental and cosmetic applications. ~~We have developed or are making rapid progress in developing acceptable substitutes for sealants, coatings and industrial fluid use. By year end we should have replaced Aroclors in sealants and coatings or have discontinued sales. Also, by year end about 40% of our Pydrauls will have been reformulated with the remainder targeted for early 1971.~~

* (~~Show documentation~~)

NEV 021487

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(Show transparency on Aroclor Applications)

This chart is a summary of the major uses of the Aroclors which have shown resistance to degradation. Solid Aroclors are not included.

A critical review of these uses was completed. We have classified these uses into three categories. Business we discontinue, business we retain and business we retain with product substitution.

Uses in which control to prevent environmental contamination is virtually impossible are being immediately discontinued as shown on this chart.

(show transparency)

NEV 021488

The use of Aroclors to extend pesticide persistence, a use developed by the U.S Department of Agriculture, is one we have been recommending, however we still have some extremely minor use through distributors which we are discontinuing.

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or propose to manufacture. At present HB-40 appears promising in the U.K after one month of plant trials Alkylated biphenyl appears promising for the U.S applications. We can at present satisfy the HB-40 needs for U.K by sacrificing some low profit piedmont business however capital funding will be required to expand our production capabilities. We do not at present manufacture alkylated biphenyls but we have the technology. Facilities must be designed and installed to provide for this application.

NEV 021489

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There are many applications which ~~for which control to prevent contamination~~ are extremely difficult to control which we will discontinue but we will retain the business with acceptable product substitutes.

(Show transparency)

This chart is a summary of those applications for which we either have or will have substitutes. The formulations for sealants, coatings, and Industrial Fluids consist of biodegradable Aroclors, chlorinated terphenyls (Aroclor 5000 Series) or phosphate esters ~~or purchased ingredients such as glycol~~.

NEV 021490

In the NCR paper application we are applying considerable pressure on NCR to accelerate the conversion to products we manufacture

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In Summary we have assumed world-wide leadership in facing the PCB problem. We have educated and pressured our customers and coproducers to fully appreciate the problem. We are leaders in analytical methodology. Our plants are effectively reducing the PCB content of their effluent. We have without waiting for any orders from an agency selectively and voluntarily discontinued the sale of Aroclors for some uses. We are agressively developing and introducing product substitutes for uses difficult to control. Where control is possible we are working hard at making it effective and keeping the business.

NEV 021491

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Successful control to prevent contamination is possible in systems in which Aroclors are sealed. We are working very closely with our customers to educate and motivate them and have offered technical assistance on their disposal and effluent problems

Aroclor business which we will retain is shown on this list

(Show transparency)

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We are doing this and at the same time maintaining the image of Monsanto as a responsible member of the business world genuinely concerned with the welfare of our environment.

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