COMPANY CONFIDENTIAL

ATTORNEY--CLIENT PRIVILEGE

Date: October 15, 1969

Subject: REPORT OF AROCLOR "AD HOC" COMMITTEE
(Second Draft)

To: Rodney Harris, Jr.
Director, Law Department

From: M. N. Farrar
P. B. Hodges, Secretary
E. V. John
W. R. Richard
E. P. Wheeler, Chairman

Copy #1--H. S. Bergen, Jr.
#2--J. E. Springate
#3--M. N. Farrar
#4--P. B. Hodges
#5--E. V. John
#6--W. R. Richard
#7--W. C. Robinson
#8--W. A. Kuhn
#9--T. K. Smith
#10-J. Mason
#11-H. L. Minckler
Original-E. P. Wheeler



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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)

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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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5. LAWS AND REGULATIONS CONTROLLING ENVIRONMENTAL CONTAMINATION

A. U.S. Department of Health, Education and Welfare - Food and Drug Administration

The most pertinent legislation governing the quality of human food is the 1958 Act amending the Food, Drug and Cosmetic Act and the regulations which have been established thereunder. Briefly, the requirements relate to food additives - direct and indirect, and control food production and processing to insure a supply free from bacterial contamination and unauthorized chemicals (or levels greater than established "tolerances"). The regulations also include animal feeds.

No acceptable or "safe" levels for PCB's in human foods or animal feeds have been established. Currently, there has been no indication that the FDA is seriously concerned about the levels of PCB's which have been reported alone or in conjunction with chlorinated pesticide residues. At the same time, the Pesticide Tolerance Branch of FDA has requested (late September) samples of Aroclors 1254 and 1260 for the expressed purpose of initiating acute toxicity studies in laboratory animals.

In the past, the FDA has not seized and destroyed food contaminated by the unintentional or unexplained presence of "adulterants" unless there has been some basis for a judgement that the adulterant was toxic or might pose a threat to health. An exception has been milk because of its primary role in the diet of children. Seizure and destruction of milk containing any "adulteration" has not been uncommon. It can be assumed that the finding of PCB's in milk in Georgia in June and in Baltimore in September has created a new interest in and emphasis on the PCB problem.

B. U.S. Department of Agriculture - Under laws and regulations governing the use of economic poisons which include insecticides, rodenticides, fungicides, this department shares with the FDA the responsibility for establishing safe levels or tolerances for these products. It does seize and destroy meats and poultry subject to inspection under regulations controlling the processing of these foods - originally those entering interstate commerce but more recently, practically all slaughtered and processed items.

As in the case of FDA, the USDA has not established any acceptable or tolerance levels for the PCB's in products subject to their control.

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5. LAWS AND REGULATIONS CONTROLLING ENVIRONMENTAL CONTAMINATION (Continued)

C. U.S. Department of Interior - Federal Water Pollution Control Administration

Under the provisions of the Clean Water Act of 1967, the FWPCA has to approve standards of water quality established by the individual state regulatory agencies. For practical purposes, this has meant that FWPCA has set not only parameters but actual numbers for dissolved oxygen, pH, temperature, solids, etc. including the broad category of "toxic" compounds. As of this date, no limits per se have been promulgated for pesticides including the chlorinated hydrocarbons. This week (October 10), a bill has been introduced in Congress requiring the FWPCA to establish "limits" for pesticides. Obviously this is associated with the furor over DDT and the persistent chlorinated hydrocarbons. Hearings on the proposed legislation are expected early in 1970 soon after the Congress reconvenes.

It is reasonable to expect that the PCB problem will be brought up at these hearings. Further, with the political and public interest in all forms of environmental contamination, it is likely that the legislation will be broadened to include all persistent chemicals.

D. State Legislation - In addition to Federal legislation, all states have regulatory programs governing the adulterations of food, the contamination of intrastate and interstate waters, and the protection of fish, wildlife and natural resources. Up to this point most of the state government agencies which have contacted Monsanto represent water pollution control, natural resources, or agriculture areas of interest.

No states have established any "tolerance" limits for PCB's but a number of states have banned or restricted the use of DDT and have expressed more than a casual interest in the PCB's. In expressing such interest, several states (and the Province of Ontario) have pointed out the actions which have been taken against DDT.

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6. LEGAL IMPLICATIONS

The committee recognizes that there may be a number of legal implications including financial liability that may be involved in the PCB problem. It believes that these should be explored thoroughly with representatives of the Law Department and discussed apart from this report.

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7. ALTERNATIVES (AND PROBABLE OUTCOME)

In the face of all of the circumstances, what can Monsanto do? What does the committee recommend?

First, the committee has considered several alternatives as follows:

1) Say and do nothing - making the governmental agencies prove their case against Monsanto and its customers. Let the government establish "tolerances" based on public and political pressures and any experimental or developed data which they generate.

2) Take action to create a smoke screen hoping to delay any restrictive action by governmental agencies.

3) Immediately discontinue manufacture and sale of Aroclors 1254 and 1260.

4) Discontinue manufacture and sale of all polychlorinated biphenyls.

5) Respond responsibly, admitting that there is growing evidence of environmental contamination by the higher chlorinated biphenyls and take action to resolve the problem. Hopefully, such a course would postpone precipitous action by governmental agencies for a few months and then limit any restrictions to Aroclors 1254 and 1260. In the interim, there would be an opportunity for a concerted effort to find and promote substitute products for these particular Aroclors and the development of data to protect the continued use of lower chlorinated biphenyls such as Aroclor 1242 and the chlorinated terphenyls.

The principal purpose of the toxicological research effort underway is to establish that "safe" or "harmless" levels can be set for mammals including man and fish. As the work progresses, it appears more and more likely that "safe" levels for birds (and thus the fish consumed by birds) and some species in the marine environment will approach zero (shrimp-less than 5 parts per billion).

In summary, the committee believes that the probable outcome of a "responsible" course of action will show that some low levels or concentrations are "harmless" to some species in the environment. This gives Monsanto some defense. At the same time, safe levels of some of the Aroclors for some species will be such that any contamination will be harmful and must be prevented.

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7. ALTERNATIVES (AND PROBABLE OUTCOME) (Continued)

Further, Aroclor degradation in the environment will be proven to be extremely slow with the higher chlorinated compounds being worse in this respect.

Finally, in view of the above, this course of action will dictate that we will have to restrict uses and begin a program of "clean-up", starting immediately.

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8. STATUS OF INDIVIDUAL PRODUCTS

A. The table below summarizes the approximate sales volume of the chlorinated biphenyls by product designation and end use:

Sales for Aroclors
In Millions, Pounds

Aroclor	Pydraul	Therminol	Miscel.	Electrical	Total FLU	Plasti-sizer	Total
1242	4.06	1.12	0.30	35.5	40.98	6.6	47.6
1248	1.16	1.01	.20	--	2.37	1.35	3.7
1254	--	0.12	.50	0.8	1.45	5.37	6.8
1260	0.58	--	--	3.15	3.73	0.42	4.2
1262						.50	
1268					1.1	.41	2.4
Others						.39	
Total	5.8	2.24	1.0	39.34	49.6	15.2	64.7

B. Functional Fluids Uses

In outline form, the possibility of functional fluids uses resulting in environmental contamination, possible courses of action and effectiveness of control action are indicated as follows:

F. Fluids	Possible Pollution by Customer Plant Operation	Possible Pollution by Customers' Produc
Product		
Hydraulic Fluids	Yes, leakage external	Possible - see Johnson Motors Castings
Air Compressor Fluids	Yes, leakage external	Leakage into produc
Heat Transfer	Yes, leakage external	Leakage into produc
Capacitor Fluids	Yes, leakage from plant - scrap materials	In product but closed for end use*
Transformer Fluids	No, Should be clean; Yes, Reworked transformers	In product but closed for end use*

* Capacitors can go to land fill dumps. Probably not burned, in Al containers.

** Need to take care of Aroclor in discarded transformers. Product could be drained and reworked.

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8. STATUS OF INDIVIDUAL PRODUCTS (Continued)

Probable Outcome

Hydraulic Leakage	Product could be caught at machines but will take a lot of clean-up work with customers. Will have to have replacement product--with less sensitive components. Work from this base on clean-up to prevent more pollution problems.
Air Compressor Fluids	Ditto
Hydraulic Fluids	Must expect "shrimp" experiments, West Florida State, to be "aired" sometime soon; next few months.
	This will lead to bad publicity and competitive action vs. all Pydrauls.
	We will have to try to confine to Aroclor 1254 and Aroclor 1260.
	We will have to take action before that time.

Gulf Coast

Action--Be able to replace Aroclor 1254 and Aroclor 1260 in Pydraul AC and 625 in two months' time before Nov. 15, 1969.

Have trial product in hands of Gulf Coast accounts and distributor before Dec. 15.

Suggest possible buy of "all phosphate" ester from Food Machinery.
Use this as one trial fluid MCS___ for insurance.

Suggest possible substitution of Aroclor 5442 for Aroclor 1254 in hydraulic and compressor blends. E. Wheeler judges lower order of toxicity and solubility for 5442 series. Have to test product in pump test for deposits.

Suggest field trials of our own all-phosphate ester.

Work with large customers to clean-up streams. Bring in Findett as manufacturing partner in the recycle business. Get money out of recycle operation.

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8. STATUS OF INDIVIDUAL PRODUCTS (Continued)

Inland-Waterways

Action--Be close enough to Great Lakes studies to judge situation. Are there animals which are being affected by the concentrations found?

Be prepared to replace Aroclor 1254 and Aroclor 1260 in four months in hydraulic fluids and in air compressor fluids.

Be prepared to replace all Aroclor 1242 or 1248 in six months in hydraulic fluids. This means replacement of Pydraul 312 series, and control of sale of Aroclor 1248 to other hydraulic accounts such as Cities Service and Mobil.

Heat Transfer

Action--Systems will have some leakage depending strongly on engineering and maintenance. Need to work with customers on clean-up.

Need to replace FR especially in food or sensitive product areas where the product is getting into water. See dishwasher compounds. See letter E. Wheeler to J. Fallon.

We have possible replacement products in Therminol 55. Therminol 66.

Try to assure adequate production of Therminol 66 in face of decreased Aroclor production. H_2 and terphenyl supply may become short.

Switch customers to Therminol 55 or Therminol 66. ahead of pollution problems in customer's plant.

Work with customers on plant and dumping practices.

Findett already set up to rework. Need to make them a manufacturing arm. We get sale of recycle-rework fluid.

Capacitor Fluids

Capacitor plants have repurification and recycle systems but up to 5% of product can be lost by poor plant producers and off-quality material.

5% of production could be 1M lbs/year. This is a big loss for the type of pollution we are trying now to guard against.

Capacitor Products

Enclosed in Al or stainless steel for 5 to 25 year period.

Will ultimately have to dispose of capacitor products.

Recommend we try to save this product for a time.

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8. STATUS OF INDIVIDUAL PRODUCTS (Continued)

Capacitor Fluids (Cont.)

Action--Monsanto must help plant clean-up of customer plants' decantation, coalescing, adsorption, disposal of adsorbent or recycle of adsorbents.

Monsanto badly needs "know-how" for clean-up.

Monsanto should seek government contract money for clean-up research (see MRC R. Binning, D. Nelson).

Capacitor Products (Cont.

Recommend replacement of future Aroclor business with other products. Have two years.

Transformers

Transformer plant can operate in a clean, efficient manner with recycle of off-grade Aroclor.

Action--Should advise disposal of filter element materials so as to minimize chance of water pollution. Incinerate or dispose.

Reworked transformers pose a threat if the Aroclor is dumped into a water stream.

Should try to minimize chance of dumping "old" fluid by reworking and by educating company shops and collecting product for rework or disposal.

Dalton is set up in England to rework electrical grade fluid.

Need rework facility here and disposal scheme.

Product transformers can remain closed and no exposure for 25 years.

Should try to retain business by clean-up; by education of customers.

Monsanto Plants

The Department of Interior and/or state authorities could monitor plant outfall and find ppm of chlorinated biphenyls at Krummrich or Anniston anytime they choose to do so. This could shut us down depending on what plants or animals they choose to find harmed.

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8. STATUS OF INDIVIDUAL PRODUCTS (Continued)

Monsanto Plants (Cont.)

Action--Take steps to see that every precaution is taken to prevent Aroclor entering water streams. Try to reduce to ppb level.

Seek a government contract on adsorption and incineration cycles--MRC.

Take samples of streams and river water and mud evidence for before and after clean-up. Samples can be stored for further analysis if we can't keep up current with analytical determinations.

Apply Monsanto clean-up methods to customer plant clean-up equipment and procedures.

Evaluate liquid incinerators vs. solids handling incinerators for disposing of Aroclor and pentachlorophenol wastes. Estimated Aroclor disposal at 1-4M lbs/year, exclusive of cleaning up river bottoms or outfall bottoms.

Hydraulics	20% of 4M lbs.	800,000 lbs.
Heat Transfer	10% of 2M lbs.	200,000 lbs.
Capacitors	5% of 20M	1,000,000 lbs.
Transformers	5% of 15M	750,000 lbs.
		2,750,000 lbs.

Set up an incinerator to handle Aroclor disposal--preferably one which will handle solids such as muds--slurries as well as liquids. Have in operation within 12 months. Ideally have incinerators available different sections for disposal.

Chronic Toxicity Studies--Industrial Bio-Test

Action--Continue studies to establish FDA type limits of toxicity on Aroclor 1242, Aroclor 1254 and Aroclor 1260.

Rework with R. Keller-S. Tucker the number of samples which are to be analyzed for Aroclor in tissue. Try to see if Aroclors are changed metabolically. Does concentration level off, decline if feeding is stopped?

Institute studies against the most limiting biological parameters. If shrimp are the most limited species for Aroclor levels of toxicity, then we will have to have biological studies on these species to confirm or deny adverse findings.

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8. STATUS OF INDIVIDUAL PRODUCTS (Continued)

Biodegradation Studies

Action--Set up rate of biodegradation studies with Inorganic Division on Aroclor 1242 vs. Aroclor 1254
Aroclor 5442 vs. Aroclor 5460
Chlorinated diphenyl ether
Chlorinated paraffin vs. chlorinated naphthalene
Chlorobromo Aroclors 1242 and 1248

Contact Baxter and Lidgett at MCL regularly for results on Aroclor degradation. They are reported to be moving on laboratory experiments.

Establish contact with chlorophenol degradation studies of Cellu-Chem Group.

C. Plasticizer Uses

Analysis of chlorinated biphenyl uses as plasticizers (1968 figures) is as follows (provided by C. Paton, 3/25/69).

1. No carbon required paper

NCR: 6.0M pounds Aroclor 1242

Until mid-1968, only NCR plant was at Dayton, Ohio. There is now a plant at Portage, Wisconsin on stream.

2. Distributors

Our distributors resold 4.5M pounds chlorinated biphenyls in 1968. It is impossible to pinpoint all uses. I estimate surface coatings is the biggest market.

3. Hot Melt Adhesives

DuPont at Parlin, New Jersey uses 460 M pounds (mainly Aroclor 1248) in a hot melt adhesive for bookbinding.

4. Sealants

Aroclors are used in polysulfide sealants (automotive windscreen sealant and light construction, e.g., window sealants). 1968 sales were 1.4M pounds (Aroclor 1248/Aroclor 1254). Our largest customers are Products Research at Burbank, California and Gloucester City, Pennsylvania (680 M pounds) and Sonneborn in New Jersey (225 M pounds).

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8. STATUS OF INDIVIDUAL PRODUCTS (Continued)

5. Adhesives

Rubber adhesives, etc. accounted for 0.8 M pounds in 1968 of which 400 M pounds went to 3-M.

6. Coatings

In 1968, we sold 1.3 M pounds on a direct basis to this market. Our biggest direct customers in this market is Sherwin-Williams (Cleveland) at 140 M pounds and Koppers (Pittsburgh/Newark) at 250 M pounds.

7. Miscellaneous

Approximately 0.7 M pounds chlorinated biphenyls are used in miscellaneous applications as fire retardant additives, wax compounds, etc.

1968 sales of chlorinated biphenyls were:

NCR	:	6.0 M pounds
Distributors	:	4.5
Eight Major Customers	:	2.5
All Others	:	2.2
		15.2 M pounds

By market, 1968 sales were:

NCR	:	6.0 M pounds
Distributors	:	4.5
Sealants	:	1.4
Coatings	:	1.3
Adhesives	:	0.8
Hot Melt Adhesives	:	0.5
Miscellaneous	:	0.7
		15.2 M pounds

D. Possibility of Contamination from Plasticizer Uses

With the exception of the use of the higher chlorinated biphenyls in rubber based paints for swimming pools and water storage tanks, it is more difficult to pinpoint end uses that would permit "direct" contamination of the aquatic environment than is the case with functional fluid uses. "Indirect" contamination could occur from the eventual leaching of the Aroclors from the final disposal or ultimate end point of any product containing them. For example, highway marking paints obviously have a short life. It may be presumed that such paints containing Aroclors eventually end up in the drainage areas for the highways and provide a continuing source of PCB's to the limit of their solubilities. Similarly, any Aroclor containing products which end

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8. STATUS OF INDIVIDUAL PRODUCTS (Continued)

up ultimately in refuse dumps or land fill operations are possible sources.

Several scientists alarmed about the marine environment contamination have theorized that any PCB's which get into the atmosphere from processes involving plasticizer uses or the incomplete incineration of waste products containing PCB's eventually end up in the sea because of "rain-out". This then could involve nearly all of the plasticizer uses other than coatings.

E. The Chlorinated Terphenyls

Up to this point there have been only scattered reports that these compounds are present in the environment and/or are interfering with the analysis of chlorinated pesticide residues. There are at least two possible explanations:

1. Due to extremely low solubility, they are not being dispersed as are the chlorinated biphenyls; and

2. The retention times in the GC analytical techniques are so great that their peaks don't interfere with the identification of DDT, its metabolites and the other chlorinated hydrocarbon pesticides. This explanation implies that they may be present but are not being identified.

Hopefully, if they are eventually identified and their presence confirmed, we will be able to provide data that they are sufficiently biologically "inert" for man, animals and all species in the ecosystem that they present no problem.

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9. RECOMMENDATIONS

From the specific recommendations indicated in Section 8, pages 13 to 20 as they relate to individual Aroclors and their uses, the following general recommendations have been developed:

A. Immediately assign full time at least three individuals for a period of at least three months to an "emergency" task force to implement the action indicated by the specific recommendations referred to above and those which follow.

B. In view of legal and moral considerations, notify all Aroclor 1254 and 1260 customers of environmental contamination problem and their possible involvement.

C. Reduce losses of Aroclors in liquid wastes from Monsanto plants to minimum. Goals for Aroclors 1254 and 1260 - 0 to 10 parts per billion.

D. Consult with appropriate federal agencies' headquarters in Washington to determine current status of concern and to inform appropriate individuals therein of Monsanto's research and control efforts.

E. Personally contact all governmental and university laboratories which have requested Aroclor samples and indicated interest in the environmental contamination problem.

F. Determine extent of atmospheric losses from Aroclors from Anniston and WGK Plants and develop plans for and install control.

G. Analyze in Organic Division laboratories (or by contract) selected appropriate samples from:

(1) Environment of Anniston and WGK Plants.

(2) Monsanto products where contamination is possible.

(3) Agencies and/or laboratories attempting to pinpoint specific sources of contamination.

(4) Customer plants' environments.

(5) Research efforts involved in biological studies--i.e. animal, bird and fish toxicity studies and biodegradation studies.

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9. RECOMMENDATIONS (Continued)

H. Establish a special budgetary account to allow implementation of these recommendations and the continuation of the toxicological research effort now underway and continuing until June, 1971. The problem involves not only Research whose budget has born the major costs to date. It is a joint problem involving also sales, and production or manufacturing.

The budget for the remainder of 1969 and 1970 should include:

(1)	Costs of 3-man task force for six months - including travel	$40,000
(2)	A continuing 3-man effort in the analytical area. (At present there is the equivalent of one and a half men).	$55,000
(3)	* Toxicological research and biological degradation studies.	$125,000
	Sub Total	$220,000
(4)	Development of substitute products	

* In connection with the toxicity research, developments during the next 3 to 6 months may dictate that some studies be discontinued in mid-1970 because the results may be meaningless in terms of preventing loss of business.

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10. SUMMARY

1. The committee has concluded that the identification of PCB's as an environmental contaminant is certain.

2. Toxicity to some biological species at extremely low levels (a few parts per billion) is significant.

3. The PCB's are persistent once they become a part of the environment and the rate of degradation is extremely low.

4. There is little likelihood that the PCB's appear in the environment as a result of "natural" origin on the metabolism or degradation of other chlorinated hydrocarbons.

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