

POSITION PAPER ON PCBS

1. Problem

- A) The EPA is using PCB as a vehicle to express the need for additional legislation to control industrial effluents.
- B) The EPA and several states, e.g., Michigan, Minnesota, Wisconsin, and New York, are concerned about the high levels of PCB found in fish. The market restrictions which we applied to Aroclor in 1972 have not resulted in the expected fall-off in PCB levels in the environment. (We believe that the dielectric usage of PCB is not the cause of the remaining high levels, but that they arise from residues of previous applications.)
- C) There is pressure, therefore, towards discontinuation of PCB usage in electrical equipment.

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2. Impact on Monsanto

Sales See Appendix D

1. If PCB sales cease and we do not replace them with one of our non-PCB candidates, potential sales dollar loss is approximately \$18M per year of which \$3M is production from Newport, U. K., plant.
2. Additional impact will be felt in the following Biphenyl-related products (\$15M in sales; \$5-6M in gross profit.
Biphenyl
HB-40/OS-84/Therminol 66/Santosol 340
WCM
HQ-40 (Pydrauls)
Therminol VP-1.
3. Successful introduction of MCS 1238 (MIPB + Sulfone) protects these other product areas because of the divisor on the polyphenyl unit at Anniston.
4. Gross Profit - Dielectrics gross profit is running at 36.6% September, 1975, YTD. As a direct loss in GP, we would expect \$6.0M minimum with additional loss in other biphenyl-related product areas.
5. Phase out costs and write offs (in 1976 or 1977) would be \$2.6M. (H. S. Bergen memo to F. J. Fitzgerald July 28, 1975, Table II) Attached in Appendix D.
6. Customer relations will be strained only if we precipitously cease production before they have proper acceptable alternatives. At such time as major equipment producers have alternates, they would probably welcome Monsanto initiative in ceasing production since this would ease their new product acceptability and legal positions (Caution - Monsanto legal position if we initiate move from PCB).

3. Impact on Major Customers

Major alternatives open to customers.

Capacitors (See Appendix B - market data)

Note: The capacitor producers have no alternatives to Aroclor ready for commercialization today to cover all markets.

- 1) Continue to use PCBs as long as
 - a) Monsanto, b) Regulatory authorities, or
 - c) Cost of controls permits.
- 2) Power Capacitors - will require a liquid in future designs.
 - a) Monsanto MCS 1238/1588
 - b) Dow candidate Chlorinated Butyl Biphenyl Oxide
 - c) Use Monsanto Dichlorobiphenyl MCS 1043.

3) Motor Run

- a) Monsanto MCS 1238/1588 - little design change.
- b) DRY metallized polypropylene attractive, but requires new investments in metallizing and winding equipment.
- c) Metallized paper-oil - requires change in paper technology.
- d) DOP/DINP - available, at 30-40¢/lb. In plant handling difficulties requires reduction in capacitor reliability.
- e) Use MCS 1043.

4) Ballast

- a) Monsanto MCS 1238/1588.
- b) Dry metallized film + new investment + considerable redesign of ballast itself.
- c) DOP/DINP
- d) Use MCS 1043.

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Note: G. E. admit that DOP use in sectors ~~2/3~~ will require major plant investment to modify their automated impregnation/treatment cycles. They do NOT know yet if MCS ¹⁵⁸⁸~~1588/1475~~ will fit the existing plant cycles eliminating the investment.

Transformers (See Appendix C - market data)

1) Industrial Load Centers

- a) Move to lower chlorinated PCB, e.g., Aroclor 1016.
- b) Derate or redesign for silicone use.
- c) Sell Dry I.e. Air cooled transformers.
- d) Use Monsanto product X.
- e) Oil filled units plus additional installation costs.

Note:

- a)- Least change for industry if environmentally acceptable.
- b)- Could be achieved in 5-6 months. Uncertainties about silicone fire resistance.
- c)- Would result in major loss of business to G. E., Westinghouse who are less set up for dry type unit production, e.g., Westinghouse, S. Boston, using 5M lbs. per year Aroclor makes no dry units.
- d)- Only becomes alternative when we define product.

Current preference of customers in above order.

2) Precipitator Transformers - Note: Air cooled transformers can Not be used in this application.

- a) Move to lower chlorinated biphenyl.
- b) Redesign for silicone.
- c) Use mineral oil and engineer precipitator around fire hazard.
- a) Least change for industry if environmentally acceptable.
- b) Could not derate, would need new design.
- c) Happening to some extent today because of 0 PCB effluent rules in force for power generation stations.

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3) Railroad/Rapid Transit

Today no acceptable alternative.

Could involve redesign transformers and rapid transit cars.

Silicone is not acceptable at present.

4) Urban Power Substations Dry-type not acceptable at high voltages used.

- a) Lower chlorinated biphenyl
- b) Oil plus additional fire protection investment.
- c) Possibly silicone - not yet tested.
- d) Monsanto product X.

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4. Alternatives Open To Monsanto

- 1) Cease production immediately.
- 2) Phase out over 9 months.
- 3) Phase out over 24 months. X
- 4) Continue sales of present PCB range until either legislation prohibits further sale or customers abandon product.
- 5) Support continued use of PCBs and move to lower chlorinated homologs e.g., MCS 1043 from Aroclor 1016 in capacitors, 1016 from Aroclor 1242/54 in transformers.

Rejected

- 1) - Alienation of major customers if we want on-going business.
 - In absence of government ban, European imports would fill gap and any fault in their handling would almost inevitably still involve Monsanto in litigation.
 - Precipitous withdrawal could in itself add to litigation burden because of added belief that product must be genuinely harmful.
- 2) Cannot get transformer fluid development completed in 9 months. Would force transformer industry to non-PCB, non-Monsanto alternative.
 - Note one advantage of this alternate in capacitor area is to pre-empt dry metallized film capacitors in motor run/ballast area.
- 4) This alternate results in total loss of sales over 2-3 years with low probability of replacement.
- 5) Qualified Rejection - This alternate has little merit unless environmental authorities make a very positive statement accepting continued long-term use of lower chlorinated homologs before end of 1975. Without such support, additional capital to switch production to 1043/1016 would be unjustified. Such support is, I believe, unlikely to be given. If support were given, this solution is the best one for both Monsanto and electrical industry.

I recommend alternate (3) as the most positive course of action and best suited to achieving minimum loss in short-term and maximum on-going business.

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5. SCD Plan (24-Month Phase Out)

Capacitors

1. Focus effort on MCS 1238 (MIPB + Sulfone) with lesser effort suspended on MCS 1588 (Santosol 100 + Sulfone) as back up.
2. Obtain performance approvals from:
 - a) G. E./Westinghouse - Power
 - b) G. E./Aerovox/EUC - Motor Run
 - c) G. E./Aerovox/Universal - Ballast.
3. Accelerate and document environmental test program 1238/1588.
4. Open up fire resistance question and clear use of flammable fluid.
5. Phased increase of PCB pricing to support development price for MCS 1238/1588.
6. Establish interim production 1238 by mid-1976 to support transition volumes.
7. Selectively introduce 1238 in Europe, Canada, Latin America, Japan.
8. Use PR to draw attention to progress towards a PCB replacement.

Transformers

1. Introduce alkylated biphenyl/TCB blend to G. E./Westinghouse.
2. Obtain their decision as to this being genuine replacement candidate.
3. If yes, initiate joint test programs with G. E./Westinghouse, start environmental test program, link into manufacturing plan as additional potential volume.

4. If not acceptable, accelerate research program on other possible candidates.
5. Work with G. E./Westinghouse/Bureau of Standards on fire test standards to further define acceptable limits.

6. Current Status SCD Actions

Capacitors

1. All key capacitor producers aware that MCS 1238 is our primary candidate. Samples are in hands of all accounts using more than 100,000 lbs. per year.
2. Key approval programs:
 - a) G. E. - testing in power motor run, ballast with results expected March/April, 1976. Simulation test to check MCS 1238 fit into automated plant timed for January, 1976. (Success in this test is very important.)
 - b) Westinghouse have funded 6-month power capacitor tests with MCS 1238 as lead candidates.
 - c) Aerovox are impregnating motor and ballast units November for 3-4 month accelerated life tests of MCS 1238 in 2 major selling designs.
 - d) EUC are selling MCS 1588 units and carrying out MCS 1238 program to transition to the preferred grade.
 - e) Universal program in ballast is behind schedule.
3. Environmental test program is laid out, but dates for test results are slipping. Need closer co-ordination.
4. Fire test program - Not started yet.
5. Increased PCB pricing October 1, 1975, - review again 1st quarter, 1976.
6. Schedule established to achieve interim production MCS 1238 by mid-1976. Need approval of approximately \$350 M expenditure.
7. MCS 1238 introduced in Canada, Europe, Mexico, Brazil.
8. PR program currently being developed.

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Transformers

We will present preliminary data on:

- a) Alkyl Biphenyl/TCB
- b) Alkyl Naphthalene/TCB
- c) Trichlorobiphenyl methane

to G. E./Westinghouse on November 12 and week of November 23 respectively.

7. Recommendations

1. We should not precipitously and unilaterally cease PCB production.
2. We should put in place interim production facilities for non-PCB capacitor fluids (e.g. MCS 1238).
3. We should staff our marketing department to effect a transition from PCB to non-PCB dielectric fluids with minimum loss of M/I by 12/31/77.
4. Research activity should be focused on dielectrics market served by PCB today, and on process and application research on a limited number of non-PCB candidates.
5. Research activity on lower PCB homologs or other PCB developments should be discontinued 12/31/75 unless "lower chlorinated homolog" concept receives active support of EPA.
6. An environmental test program on the primary non-PCB candidates should be more closely defined and accelerated. All work on PCB or non-PCBs with low potential for commercial success should be restricted or discontinued.

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APPENDIX A

Problem

Additional contributing factors in the problem are:

- 1) New York State has taken legal action against G. E. capacitor business and seeks zero discharge by September 30, 1976, into the Hudson River. G. E., while able to make significant reduction in PCB, do not believe that they can achieve zero discharge.
- 2) G. E. Transformer Division has just lost a \$250 M lawsuit as a result of a spillage of transformer liquid in Tennessee. Additionally, clean-up of this spill cost in excess of \$300 M. Since part of the damages assessed against G. E. related to physical injury to a passing motorist who claimed bronchial problems resulting from the PCB exposure, G. E. are concerned that loss of this suit could lead to further costly litigation and worker compensation suits.
- 3) The EPA use of PCB as an example to support the Toxic Substances Act has resulted in wide spread publicity concerning chlorinated biphenyls reflecting on the public-mindedness of a number of large corporations including ourselves, G. E., and Westinghouse.

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APPENDIX B

Capacitor Market

- 1) Of our total PCB dielectric sales of 40M lbs., \$18M capacitor fluids represents approximately 2/3 in both lbs. and dollars.
- 2) There are three major applicational areas for Aroclor in capacitors:
 - Power Capacitors, used by utilities to improve efficiency of electrical distribution-approximately 1/4 of lbs. used.
 - Motor Run, e.g. air conditioners, industrial motors, fans, microwave ovens, etc.- 1/2 of lbs. used.
 - Ballast Capacitors - used in the starting and efficient operating of fluorescent lights and sodium and mercury street lighting - approximately 1/4 of lbs. used.
- 3) There are three influential companies supplying capacitors:
 - a) General Electric - active in all three markets - have close to 50% market share in each market - technical leader in all three markets - Aroclor used at two locations, Fort Edwards/Hudson Falls, both on Hudson River, New York. - Aroclor capacitors represents approximately 80% of the value of production at these locations - two plants employ approximately 1200 workers - within G. E. Electronic Components Division, capacitor business group represents approximately 20% of sales and a lower percentage of profit. Business viewed by divisional management as low growth area (e.g., dropped in 1973 as a separate strategic center)- separate from transformer division up to mainboard level. Capacitor sales total approximately \$70M. Aroclor purchases \$2-3M per year.

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- b) Westinghouse-factor only in power capacitor market - do not manufacture in the other two sectors - within same division as transformers, capacitor sales \$10-15M per year (versus askarel transformer sales \$18-20M per year) - sales of Aroclor capacitor represent a small proportion of Corporate sales - capacitor sales have additional significance in filling out Westinghouse's line of equipment supplied to utilities - All production centered in Bloomington, Indiana, where little environmental pressure has been felt up to the present time.
- c) Aerovox - factor only in motor run and ballast market sectors - Do not manufacture power capacitors - Smaller dynamic company - actively pursuing increased market share. Currently, Aroclor units represent approximately 50% of annual sales - Actively seeking design innovation as means to increase market share - Support Aroclor until they can find a satisfactory non-PCB design which would permit increased market share.

The rest of the industry will follow the lead of these three companies if Aroclor usage is discontinued. Some of the smaller producers may well go out of the capacitor business; however, the total demand for capacitors will remain much the same.

A wild card is McGraw-Edison (operated only at the power capacitor sector) who are seeking to establish a reputation for technical leadership by introduction of improved designs and who are actively working with Dow.

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APPENDIX C

Transformer Market

- 1) G. E. and Westinghouse represent 75% of Aroclor usage.
- 2) Total usage 14-15 M lbs. per year.
- 3) Transformers fall into 3 major categories and one minor but highly profitable G. E. specialty.
 - a) Industrial Load Centers i.e., secondary power distribution in large manufacturing plants, hospitals, schools, etc. The total installed cost is the key to Aroclor use in this sector. The higher cost of an Aroclor unit is more than offset by the additional engineering in fire walls, sumps, sprinklers and extra low voltage cable expense if an oil unit is used. Represents approximately 50% of our sales.
 - b) Precipitator Transformers - Electrostatic precipitator use is becoming mandatory in many plants emitting particulate matter in stack gases, e.g. power utilities, steel mills, cement plants. To provide high voltage, DC transformer rectifiers must be placed CLOSE to the precipitator, normally in a penthouse above the unit. Fire hazard is high. Represents 20% of business and growing.
 - c) Urban Substations - Utilities in urban areas have many high voltage underground substation vaults. Space requirements make askarel preferable to oil units with cumbersome fire walls etc. Represents 15-20% of lbs. sold.
 - d) Special Railroad Transformers (G.E.)
Special designs under railroad cars, 3-4 inch clearance from track. Very rugged treatment creates leakage risk. In event of fire, passenger risk high. Price of fluid almost insignificant in these units. Safety all important. 10-15% of business.

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APPENDIX DAROCLOR SALES FOR DIELECTRICS

(M lbs./or \$)

	1974				1975 September				1976 B			
	<u>Transformer</u>		<u>Capacitor</u>		<u>Transformer</u>		<u>Capacitor</u>		<u>Transformer</u>		<u>Capacitor</u>	
	<u>lb.</u>	<u>\$</u>	<u>lb.</u>	<u>\$</u>	<u>lb.</u>	<u>\$</u>	<u>lb.</u>	<u>\$</u>	<u>lb.</u>	<u>\$</u>	<u>lb.</u>	<u>\$</u>
Domestic	13.9	4.52	22.1	6.7	11.2	4.6	9.5	3.5	10.8	4.5	16.0	6.3
J. S. Export	<u>4.1</u>	<u>1.34</u>	<u>2.48</u>	<u>0.75</u>	<u>3.7</u>	<u>1.5</u>	<u>1.65</u>	<u>.6</u>	<u>4.1</u>	<u>1.6</u>	<u>2.8</u>	<u>1.2</u>
Sub-Total	18.0	5.86	24.58	7.45	14.9	6.1	11.15	4.1	14.9	6.1	18.8	7.5
Ex-U.S.A.	<u>3.42</u>	<u>1.0</u>	<u>7.86</u>	<u>2.38</u>	<u>1.7</u>	<u>.66</u>	<u>4.4</u>	<u>1.8</u>	<u>2.2</u>	<u>1.0</u>	<u>5.9</u>	<u>2.6</u>
Total W. W.	21.42	6.86	32.44	9.83	16.6	6.76	15.55	5.9	17.1	7.1	24.7	10.1

TABLE 11

SPECIALTY PRODUCTS

PHASE-OUT COSTS & WRITEOFFS - TAKE IN 1977

I. Fixed Investment Write-off and Dismantling

	<u>\$M</u>	<u>\$M</u>
Krummrich Plant	850	
Newport Plant	<u>600</u>	1450

II. Decontamination and Phase-out Dom. Tank Cars 360

III. Decontamination - Newport 150

Total 1960

IV. Plant FIE Redistributed to Rest of Plant

Krummrich	330	
Newport	<u>125</u>	455

V. Task Force to Phase-out PCB Dielectrics

Domestic and Export	150	
Ex. USA	<u>75</u>	225

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