MONSANTO PCB ACTIONS

By

Dr. C. Paton

In this section I would like to present the voluntary changes that Monsanto has made in PCB sales with particular emphasis on the PCB product changes made in dielectrics. I also wish to show the significance of the data presented by Drs. Tucker and Munch.

Monsanto's sales actions can be divided into two categories (Slide 1: Monsanto's PCB Actions).

The first category is further described in:

Slide 2: Monsanto's PCB sales in U. S. A. and

Slide 3: Effect of phase-out policy

I respectfully submit we have achieved a significant reduction in PCB output by our actions. Turning to the second phase of our actions, viz, the product changes in PCBs for dielectric use I will first take a moment to explain the variation in biodegradability of PCBs.

Slide 4: Degree of Biodegradation of PCBs.

The product changes made dielectrics are shown on Slide 5: PCB Product Changes in Dielectrics.

Dealing first with capacitors:

Slide 6: PCBs used in Capacitors

Note: (a) Penta-chlorobiphenyl percentages include hexa- and higher homologs. Do not add both percentages together.

(b) This slide shows a substantial decrease in production of homologs of penta-chloro and higher over the years.

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Slide 7: Why Convert to Aroclor 1016?

Reasons were:

(a) 9-fold reduction in penta-chloro and higher homologs.

(b) 10-fold reduction in hexa-chloro and higher homologs.

(c) Aroclor 1016 was the PCB product that could be introduced into the capacitor industry while still meeting Underwriter's Laboratory requirement on flammability.

(d) Aroclor 1016 was selected because its electrical properties and in-plant processing performance most closely met the capacitor industry's requirements.

Note: Our choice of Aroclor 1016 has since been borne-out by industry experience which to date has shown no problems.

Slide 8: Capacitor Fluids: What is Effect of Aroclor 1016?

We have tried to show amounts of penta-chloro and higher and hexa-chloro and higher homologs which would have been produced (Not entering the environment) for each of three possible capacitor fluids in 1972. Aroclor 1016 (used at 97% level in U.S.A. in 1972) is obviously the PCB involving least penta and higher chloro biphenyl production.

Of obvious interest is the possible amount of PCBs entering the environment from capacitor failures.

Slide 9:

Using the worst case (0.2% per year failure) we see that no more than 40 pounds of hexa-chloro and higher homologs of PCB are likely to enter the environment if Aroclor 1016 is used at a rate of 20M lb./year.

Turning now to Transformers.

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Slide 11:

Note: Higher chlorinated PCBs are needed in transformers than in capacitors because the correct Hydrogen/Chlorine ratio is vital in preventing formation of flammable, explosive arc-form gases.

Slide 12:

Slide 13:

In summary, Slide 14:

We will continue our voluntary policy of no more sales world-wide except to dielectric users. This means a 45% reduction in total PCB sales in the U.S.A. We will restrict over 97% capacitor fluid sales to Aroclor 1016 only. This means penta-chloro and higher production will be no more than 1.1% or 220 M lbs. in 1972. Hexa-chloro biphenyl and higher will be even lower 0.1% or 20,000 lbs. in 1972. We will eliminate Aroclor 1260 from transformer fluids and continue incineration facilities for scrap PCBs. We will encourage the dielectric industry through ANSI C-107, which represents both capacitor and transformer manufacturers and users, to enforce strict environmental control over PCBs. This is a committee on which several of the agencies represented here today are members.

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MONSANTO PCB ACTIONS

- PHASE-OUT OF PCB SALES WORLDWIDE IN ALL APPLICATIONS EXCEPT DIELECTRICS
- CONVERSION OF DIELECTRIC FLUIDS TO MORE BIODEGRADABLE PCB'S

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MONSANTO PCB SALES IN U.S.A.

(MILLION POUNDS)

	DIELECTRICS	ALL OTHERS	TOTAL
1969	37.0	30.0	67.0
1970	40.5	33.5	74.0
1972 (EST.)	32.0	--	32.0

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EFFECT OF PHASE-OUT POLICY

PCB SALES REDUCED IN U.S.A. BY

30 TO 33 MILLION POUNDS,

OR 45%

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DEGREE OF BIODEGRADATION OF PCB'S

BASED ON DATA PRESENTED

- TRANSITION IN BIODEGRADATION OCCURS AROUND PENTA-/HEXA-CHLOROBIPHENYL
- DISAPPEARANCE OF ALL HOMOLOGS BELOW HEXA-CHLOROBIPHENYL OBSERVED
- PENTA- AND HIGHER PCB DETERMINED BY SPECIFIC GLC/MS TEST METHOD

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PCB PRODUCT
CHANGES IN DIELECTRICS

CAPACITORS

97% CONVERSION TO AROCLOR 1016

TRANSFORMERS

ELIMINATION OF AROCLOR 1260

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PCB'S USED IN CAPACITORS

PCB	MAJOR USE PERIOD	% PCB (PENTA-CHLORO- AND HIGHER	% PCB (HEXA-CHLORO- AND HIGHER
AROCLOR 1254	1930-1952	77.0	29.0
AROCLOR 1242	1952-SEPT. 1971	9.0	1.0
AROCLOR 1016	OCT. 1971	1.1	0.1

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CAPACITOR FLUIDS
WHY CONVERT TO AROCLOR 1016 ?

- 9-FOLD REDUCTION IN PCB'S OF PENTACHLORO- AND HIGHER
- 10-FOLD REDUCTION IN PCB'S OF HEXACHLORO- AND HIGHER
- MINIMUM INDUSTRY TESTING REQUIRED

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62

CAPACITOR FLUIDS
WHAT IS THE EFFECT OF AROCLOR 1016?

U.S. CAPACITOR FLUID SALES (1972):~20 M LBS.

IF AROCLOR WAS	% PENTACHLORO- AND HIGHER PCBs WOULD BE*	% HEXA CHLORO- AND HIGHER PCBs WOULD BE*
1254	15,400,000 POUNDS	5,800,000 POUNDS
1242	1,800,000	200,000
1016	220,000	20,000

*THIS DOES NOT MEAN AMOUNTS OF PCB ENTERING THE ENVIRONMENT

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WHAT IS CAPACITOR FAILURE RATE ?

INDUSTRY SOURCES CITE : 0.02-0.2% PER YEAR

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IF CAPACITOR FAILURE RATE IS 0.2% PER YEAR (WORST CASE)

PCB ESCAPE TO THE ENVIRONMENT* IS --

	AROCLOR 1242	AROCLOR 1016
ALL PCB HOMOLOGS	40,000 POUNDS	40,000 POUNDS
PENTA CHLORO- AND HIGHER	3,600	440
HEXA CHLORO- AND HIGHER	400	40

*ASSUMES U.S. FLUID SALES OF 20 M̄ LB./YEAR

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PCB CHANGES IN TRANSFORMER FLUID APPLICATIONS

- AROCLOR 1260 BEING PHASED-OUT NOW
- INCINERATION OF SCRAP PCB'S - 1971

NOTE: ASKAREL (PCB) TRANSFORMERS ARE HERMETICALLY SEALED UNITS

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WHAT IS FAILURE RATE IN LIQUID TRANSFORMERS?

INDUSTRY SOURCES CITE: UNDER 0.2% PER YEAR*

*ALL LIQUID TYPES - MINERAL OIL AND PCB.

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IF ASKAREL (PCB) TRANSFORMERS FAIL AT 0.2%/YEAR HOW MUCH PCB IS AFFECTED*?

ALL PCB HOMOLOGS 24,000 LBS.

(ESTIMATED PCB TRANSFORMER FLUID SALES IN U.S. 12 M LBS./YEAR)

*WITH INCINERATION FACILITIES AVAILABLE, NOT ALL THESE AMOUNTS WILL ENTER ENVIRONMENT.

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MONSANTO'S PRESENT PROGRAM TO PREVENT ENVIRONMENTAL POLLUTION BY PCB'S

- NO MORE SALES WORLD-WIDE EXCEPT DIELECTRIC USERS
- RESTRICT OVER 97% CAPACITOR FLUID SALES TO AROCLOR 1016 ONLY
- ELIMINATE AROCLOR 1266 FROM TRANSFORMER FLUIDS
- CONTINUE INCINERATION FACILITIES FOR SCRAP PCB'S
- ENCOURAGE DIELECTRIC INDUSTRY THROUGH ANSI C-107 TO ENFORCE STRICT ENVIRONMENTAL CONTROL OVER PCB'S

DSW 010711

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SUMMARY

By

W. B. Papageorge

In summary, our observations, admittedly limited, both from our laboratory data and from reports of other investigators lead us to believe with considerable confidence that PCBs do degrade in the environment. The complexity of the commercial mixtures has, however, hampered the determination of the varying rates of degradation of all the possible isomers.

Monsanto's sales actions have definitely reduced the amount of PCBs that could be introduced into the environment.

In those applications in which the use of PCBs is considered essential, namely transformers and capacitors, further actions will assure strict environmental control on PCBs.

In transformers the use of the lower chlorinated biphenyls along with proper handling during manufacture, use and repair and proper disposal of waste fluid by high temperature incineration should result in acceptable control.

For the capacitor application the development of Aroclor 1016, which satisfied all of the industry's requirements relating to dielectric characteristics and handling properties as well as having Underwriter Laboratory fire-resistance approval, permits the continued use of PCBs in this important hermetically sealed application but with a fluid that has a significantly lower content of the slower degrading isomers. The use of this material accompanied by proper handling and disposal of the scrap fluid by high temperature incineration represents in our considered opinion a significant step forward in our efforts to control the impact of PCBs on the environment.

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