Monsanto

FROM (NAME & LOCATION): H. S. Bergen - B2SL

DATE : August 6, 1975 CC:

SUBJECT : PCB CONTINGENCY PLAN

REFERENCE : Your Memo 8/4/75

TO : F. J. Fitzgerald - B3SA

PERSONAL & CONFIDENTIAL

You requested two additional pieces of information as follows:

1. The use of the material broken down by major categories; for example, transformers, capacitors, etc.

   Traditionally, the market demand for capacitor fluids has been about 60% of the demand and transformers have taken 40%. 1975 was somewhat unusual because of the huge capital programs which required more transformer fluid and with the consumer recession on air conditioners and appliances, capacitor fluid demand fell off so that the ratio in 1975 for the first six months was approximately 50/50. Table I, attached, illustrates these statistics. Our 1976 budget for domestic and U.S. export reflects a return to a 58% capacitor/42% transformer fluid situation.

2. The applicability and availability of Monsanto replacement products for these same categories:

   A. Comments on any competitive substitute product.

   B. Why future profitability for Monsanto is less on substitute products than on PCBs, judging from the summary economics in your case studies.

   Let us respond to this question by first discussing the market needs for capacitor fluids and transformer fluids and then analyzing future technology and product replacement requirements.

   (1) Capacitor fluids are used in three major market areas: (a) power capacitors (utilities); (b) ballast capacitors (lighting); (c) permanent split motor capacitors (air conditioners and other appliance motors).

   Domestically, the power market uses 3-5 $\overline{M}$ pounds of fluid; the ballast market 4-5 $\overline{M}$ pounds and the permanent split capacitor market 5-10 $\overline{M}$ pounds.

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Capacitors for each of these different market areas are technically designed to meet different technical needs. Aroclor, for the past 40 years, has met all of these needs for all requirements in the most satisfactory manner. With the advent, in the last 5-7 years, of plastic polypropylene film, the capacitor market design has been undergoing change from paper and combinations of paper and plastic with the long range potential towards all plastic film. As this trend develops and if it succeeds, the technical demands on the fluid change.

With the long range plan of replacing Aroclors which we have had for the last three years, we have long recognized that this area is the most technically and commercially difficult to accomplish. Nevertheless, we have made good progress in getting several candidates that might be suitable. At the moment, dioctyl phthalate, a commodity plasticizer, is being used by G.E. for a very small segment of the capacitor market for computer equipment, primarily because of the export demands to Japan that IBM and such companies must have non-PCBs in this equipment. G.E. makes only limited guarantees on capacitor life and reliability. This is a market of some 500-700M pounds per year.

G.E. and others like our MCS 1588 and 1238 because of their greater stability and high dielectric constant properties. Dioctyl phthalate will definitely not work in power capacitors. If there was a complete government ban today, MCS 1588 or 1238 would be high on industry's consideration and should capture the volumes indicated in the two contingency cases. Again, the industry has not done enough life testing to date to be able to make a decision or a quick conversion. None of these products get around the fire resistance problem, however, and the industry would have to design further safeguards into their equipment to accomplish this. They are not set up to do this today.

MCS 1588 and 1238 may not be satisfactory in all film capacitors and most likely another product must be developed for these future capacitor designs. Dow has a candidate product in limited evaluation. We have candidates not yet under evaluation.

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(2) In the transformer market, there are three types of transformers used: (a) air type transformers, (b) liquid transformers, both oil and Aroclor type, and (c) gas transformers. Technically, all three types of transformers are needed and used for specific technical end-use reasons. The technical job of finding an Aroclor replacement for transformers is even more difficult than capacitors because fire resistance and explosive characteristics of the fluid are much more stringent. Aroclor type transformers are used in those applications where this is one of the prime requisites. If an oil fluid is used which burns or explodes, the transformer must be enclosed in concrete vaults and many other precautions taken. Space limitations preclude this in many applications. Air transformers do not have the reliability and have a higher noise factor which often prohibits their use.

Dow-Corning is touting one of their silicone fluids as a replacement for PCBs and RTE Corporation is promoting a high napthenic type oil transformer fluid. None of these products, to date, have been thoroughly tested by the industry; however, they must be viewed as potential competitors. These products are questionable on explosivity and fire safety although they show improvements over regular oil transformers.

Monsanto's program on a replacement for transformer fluids to date has not been successful and we have no candidates. We do have initial laboratory results on some silicate esters and some other chlorinated compounds which need considerable R&D work, followed by customer evaluation and life testing.

You asked why the future profitability is less on substitute products than on PCBs. In the first place, we accept the fact that there will never be a one product replacement for both transformers and capacitors and we are now faced with having to replace essentially one product line, Aroclors, with at least two and possibly three different chemical families. The capital required and the manufacturing costs, at this stage of the game, and with our present knowledge do not lead us to believe that we will ever have a family tree as profitable as Aroclor. Our feelings on this may change as we get more into our product introduction program with the customers. Obviously, we will be striving to achieve the same level of profitability as Aroclor but at this time we don't see it that way. The market place has technology designs and other fluid considerations which don't give us a blank check on pricing.

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Regarding your final summary comment, I think it's evident that we have had in our Long Range Plan and in our research program for the last three years the plan to obsolete PCBs. We have done this successfully in encapsulant solvents for carbonless copy paper, in our entire Pydraul line, and in our Therminol transformer heat line. The dielectric market area is the last and technically and commercially the most difficult to achieve. It's also the heart of profitability for the "fluids" part of the Business Group so it must be done carefully. Therminols and Santosols will also be affected.

We have budgeted for 1976 sales of non-PCB capacitor dielectric fluids. These plans and actions already have indicated our plan to phase out PCBs so it will not be unusual to set a goal for 1976 and 1977 to accomplish the results desired. We understand your desire for prompt action and we will strongly "reason with" the industry to a greater sense of urgency and action.

You may have more questions after reading this and I need some time with you to discuss this and other things. Please give me a call and let's set a date.

H. S. Bergen

HSB/tl

Attachment

DSW 231799

DSW 231800

AROCLOR SALES FOR DIELECTRICS

($\overline{M}$ lbs./or $)

	1974				1975 (Actual 1st 6 mos.)				1976 B	
	Transformer		Capacitor		Transformer		Capacitor		Trans.	Capac.
	lb.	$	lb.	$	lb.	$	lb.	$	lb.	$
Domestic	13.9	4.52	22.1	6.7	8.22	3.4	6.65	2.45	10.8	17.5
U.S. Export	4.1	1.34	2.48	0.75	2.7	1.1	0.88	0.33	4.15	3.15
Sub-Total	18.0	5.86	24.58	7.45	10.92	4.5	7.53	2.78	14.95	20.65
Ex-U.S.A.	3.42	1.0	7.86	2.38	1.25	0.49	4.156	1.74	?	?
TOTAL W.W.	21.42	6.86	32.44	9.83	12.17	4.99	11.686	4.52		
%	39.77		60.22		51		49		42	58
Ratios: Capacitor/ Transformer		1.5				0.96				

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