Monsanto

FROM (NAME & LOCATION): W. R. Richard - Research Center

DATE: April 14, 1969

SUBJECT: CAPACITOR AND TRANSFORMER AROCLOR

REFERENCE: PGB to WRR, 3/11/69

TO : FILE

cc:
M. Farrar — Res. 1
D. Olson — DOLSO
W. Kuhn — WKUHN
P. Benignus — PBENI
H. Bergen — HBERG
J. Bryant — JBRYA
R. Munch — Res. 2
D. Armstrong — WGK
G. Miller — ANNISTON
J. Landwehr — ANNISTON
C. Coleman — RUABON

Discussed Aroclor program and possible assignments.

Item #1. Needed purification and quality control of transformer askarel "scavengers" PPO and Unox 221:

Suggested that work proceed at Anniston under G. Miller, probably should include column refining to permit our own and customer's plants to achieve lower power factor and increase resistance in the presence of PPO or Unox 221. G. Miller also to resolve purity requirements on incoming PPO and Unox 221 with suppliers Shell and Carbide.

Item #2. Stabilizers for capacitor Aroclor:

Agreed that Research and MCL will proceed with Dr. Munch and Mr. Coleman. This program was started in Jan. We view this primarily as a defensive move vs. Prodelec and Baeyer; an offensive one if we get a good stabilizer system. We have been screening stabilizers using electrical properties of Aroclor as a guide to performance. To push the trial beyond this stage a promising stabilizer would have to be screened vs. capacitor materials and then used and tested in a capacitor. E.U.C. is the "partner" in supplying capacitors for impregnation.

Item #3. Refinement of capacitor Aroclor 1242 containing stabilizers:

Research to proceed with column refining of Aroclor containing Unox 206, DER 332 and Baeyer stabilizer so that we can advise customers on Aroclor recycle purification. Many of our customers are already ahead of us on this job. We need to help with technical service and minimize Prodelec/Baeyer/ influence. This assignment to R. Munch and V. Saeger.

EXHIBIT NO. 68
10/1/92

TRAN 005472

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Item #4. Explore possibility of modifying Aroclor 1242 to gain improvements:

Prodelec and Baeyer are manufacturing an Aroclor 1242 with -5 to -10°C lower pour point. Could they invade our markets in the U. S. and U. K. with this product at a premium, at no premium? The Prodelec product is high in dichlorobiphenyl (high 2,4' and low in 4,4') as compared with Aroclor 1242. The problem seems to be how much is this product worth in the market place? We have MCS 717 and 762 low visc. versions of Aroclor 1242. We are using this product to contact capacitor designers and discuss its merits vs. Pyralene 1500S and vs. Aroclor 1242. We have samples out at Westinghouse and G.E. Canada. C. Coleman has sample requests to fill in Europe. We need a manufacturing cost estimate; Bob Kountz and Bill Kuhn will get a better feel than "5¢/lb".

Prodelec visited our U.S. Customers offering Pyralene 1500S at a 10% premium. Would Prodelec cut us out if it were offered at a normal Aroclor 1242 price? How much would we have to drop our Aroclor 1242 price to be competitive?

We need knowledge of a process which could make this material at the lowest manufacturing cost. Our "high DK process" used fractional distillation to separate the 2,4' dichlorobiphenyl. This column fractionation cost should be reviewed. We left the meeting with the understanding that this separation might be 6-8¢/lb. Bill Kuhn will recheck with R. Kountz on costs. If fractional distillation is too expensive to concentrate the 2,4' dichlorobiphenyl, then we will need a process to get it by direct or indirect chlorination. An alternate is to minimize or separate the low DK crystalline 4,4' dichlorobiphenyl from Aroclor 1232 and blend with a higher Aroclor.

This problem will be presented to Dallas Armstrong with inputs from G. Miller and Research to see if we have some possible routes to be tried on a lab scale. Dallas has the set-up and technical capability on Aroclor chlorinations.

Can we make a Fluid which will work better in polypropylene film capacitors?

Wetting agents in Aroclor which increase rate of spreading for aluminum and polypropylene are one approach. The Unox 206 and/or PPO are supposed to aid wetting. Research (R. Munch and V. Saeger)

I think he has an old report by CEP which would be good enough. How about seeing if you can find it

TRAN 005473

have been working on other additives to promote wetting without adding electrical degradation mechanisms.

Plan is to see what the capacitor designers want in way of decreased viscosity, increased or decreased dielectric constant, decreased surface tension and improved wettability.

Base Stock	2,4' dichloro-biphenyl DK=7.9	2,2' dichloro diphenyl ether DK-10	Tolyl Xylyl Sulfone DK=20
Trichlorobenzene			
Aroclor 1221			
Aroclor 1232			
MCS 717 (1239)			
Aroclor 1242			
Chloro terphenyl?			

± Wetting Agents

We will make available in at least a tech. lab volume amounts of the base stock modifiers on the top of the above table and blend appropriate mixtures for trial as dielectrics.

R. Munch made 1 calculation which seems to indicate a DK over 20 would put maximum electrical stress on polypropylene film. This says that the xylyl-tolyl sulfone (and higher DK Aroclor blends) should be re-examined closely.

Less Refractory, More Degradable Aroclors or Aroclor Substitutes - Research Problem

Concern over pollution, persistence of chlorinated hydrocarbons, ability to detect in the ppb range, the Risebrough storm about PCB's in nature all conspire to force the synthesis of Aroclor substitutes in those applications which can reach the environment.

We assume that the lower chlorinated compounds will be more easily degraded. We know that sensitivity to radiation and sunlight will be Br > Cl > F. We know that substitution of OH, OCH_3, CH_3, COOH on the ring should speed up degradation.

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We have been examining the F and F/Cl biphenyls. Decafluorobiphenyl is more toxic than Aroclor. We want to examine the bromobiphenyls for toxicity and hν decomposition. Bromination could be made available in Monsanto via Cl_2/Br_2 generation, a process we practice inadvertently and on a small scale because of KBr content in KCl in an electrolysis cell.

In Dielectric Fluids - Partly Covered - Small Program going. Q. Thompson, R. Weiss, R. Munch

Plan is to test polypropylene film compatibility, thermal chemical stability, acute toxicity and biodegradability of

2,2' dichlorobiphenyl ether

tolyl xylyl sulfone
dibromobiphenyl
bromochlorobiphenyl

In Hydraulic Fluids - Not Organized - Need Help

Need a biologically acceptable FR component for 15¢/lb.

Is chlorinated terphenyl/TCB a potential solution?
Can we use a chlorophenol derivative?
Can we use a chlorinated phthalic anhydride deriv.?
Can we use a chlorinated alkyl benzene?
Can we use a chlorinated alkylbiphenyl?

In Plasticizers - M. Farrar

In NCR Paper - M Farrar/H. Touchette

Looking at alternate compounds probably not chlorine containing compounds; phosphates - possibly tributyl phosphate.

Aroclor Plants - Alternate Products - Not Organized

Looking at Aroclor as a chlorination facility

Trichlorobenzene
Tri-tetrachlorobenzene

Trichloro-m-xylene for Textiles
Other products

TRAN 005475

W. R. Richard

ms

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