RESEARCH ACCOMPLISHMENTS 1972

Capacitor Fluids

MCS 1043 (a biodegradable chlorinated biphenyl) process has been established and product has been shown to be a satisfactory capacitor dielectric impregnant with improved biodegradability but less fire resistance than Aroclor 1016.

Our program on the synthesis of new dielectric compounds, the formulation of fluids and testing of capacitors has provided the following products:

MCS 1238, a non-haolgen capacitor impregnant, had life test results equivalent to Aroclor 1016. Product is an aromatic sulfone/MIPB blend.

A capacitor dielectric impregnant containing only C, H and O gave capacitor life test results equivalent to Aroclor 1016. The product is a dimethylbenzophenone/hydrocarbon blend.

A new high 10-12 DK capacitor fluid was developed for specialty capacitors. Products are tolyl xylyl sulfone blends.

A new type of shipping drum which causes less contamination and deterioration of electrical fluid properties has been defined and tested for Aroclor 1016.

Cable Fluids

Demonstrated that H-230L could be upgraded to give the necessary electrical properties and that with a suitable inhibitor it can be kept from degrading due to oxidation.

Transformer Fluids

Initiated work to see if a high impulse strength synthetic transformer fluid could be developed. Found reason to hope that this can be done. Synthetic hydrocarbon impulses were 15 to 50% above the standard transformer oils.

DIELECTRIC FLUIDS
BUSINESS PARAMETERS
(World Wide)

Product	1972 Actual Sales M lbs.	M $	Gross Profit %
Transformer Fluids	19.5	4.04	32.6
Capacitor Fluids	31.2	5.66	43.4
Total	50.7	9.70	37.8

	1973 Budget	
Total	10.2	35%

1972 Research Expense - Actual*

$.37M

1972 Direct Research Expense - Budget*

$.36M

* Includes all Aroclor environmental defense and development of replacement products for heat transfer and hydraulics.

DIELECTRIC FLUIDS CUSTOMERS

Capacitor Fluids

G.E.	8 M lbs.
Universal	1.9
Westinghouse	1.7
Cornel Dubillier	1.5
Arovox	1.6
Sprague	1.3
Mallory	1.1
Electric Utilities	.8
Sangamo	.8
McGraw Edison	.6
Jard	.6

Transformer Fluids

Westinghouse	4.3 M lbs.
G.E.	3.0
ITE	1.6
Research Cottrell	1.0
Buell Engineering	.6

RESEARCH TEAM

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CAPACITOR FLUIDS

MCS 1043 (A mono, di, trichlorobiphenyl blend)

Advantages:

Life test results in capacitors at G.E. are superior to even Aroclor 1016

Biodegradability	MCS 1043	56% ± 16%
	Aroclor 1016	33% ± 14%
	Aroclor 1242	26% ± 15%

Uses biphenyl as a raw material.

Could be produced in present plant with only minor modifications.

Disadvantages:

Less fire resistant than Aroclor 1016.

Still a chlorinated biphenyl.

Assessment:

Would have been considered a real advance before PCB's became suspect. Probably not attractive under present conditions but it should not be forgotten.

MCS 1238 (Aromatic sulfone - MIPB blend)

Advantages:

Shows good life test results in paper capacitors at G.E. and at Electric Utilities, and in both paper and polypropylene film capacitors here.

Contains no halogen

Biodegradation 70%

Made from TSCl available at Queeny.

Disadvantages:

Not fire resistant.

Cannot be made in present plant.

Does not use biphenyl as raw material.

Cost - MIPB is more expensive than expected when work was begun since it is no longer being made as a dye encapsulant. Cheaper replacement diluents are under test with promising results.

Assessment:

With optimum diluent will become best all round non-PCB substitute for Aroclor 1016.

There is a market demand now for use in capacitors for export to Japan. Fluid might be sold in Japan in quantity.

Might sell 100M lbs. in a year in U.S. Could snowball rapidly.

MCS 1342 (dimethyl benzophenone blend)

Advantages:

Shows excellent life test results in capacitors.

Excellent biodegradability - 85%

Readily compatible with low cost diluents.

Contains only C, H, O.

Disadvantages:

Not fire resistant.

Does not use biphenyl as a raw material.

Relatively expensive.

Lower dielectric constant requires a larger concentration to give required dielectric constant in blend.

Assessment:

If process for manufacture from benzyl chloride residue is efficient, this might be a very good product.

The best choice if a C, H, O only fluid must be used.

HIGH DK CAPACITOR FLUIDS

Specialty capacitor manufacturers put great pressure on us to supply 2,2'-dichlorodiphenyl ether (DK = 10) but we could not sell it because of extreme environmental stability. Special sulfone blends have been developed which have the desired electrical properties and acceptable biodegradability too.

Assessment:

This kind of fluid offers the possibility of more compact capacitors for special uses such as portable equipment and space vehicles which appear willing to pay a premium price.

Cable Fluids

Adsorbent treated H-230L with antioxidant added gives the possibility of a low cost, low viscosity cable fluid.

Assessment:

Market probably too small and served adequately at present by oil companies.

Transformer Fluids

The need to transmit more power longer distances requires higher voltages for transmission lines and associated transformers. Usual present voltage is 135 KV. Voltages up to 1M are under consideration. This requires higher dielectric strength and especially higher impulse strength.

Preliminary results indicate significant improvement (15-50%) might be achieved.

Assessment:

This could represent an important new market for a synthetic transformer fluid. Size and profitability are difficult to evaluate at present.

NEW SHIPPING DRUMS

Electrical fluids have been shipped in lined drums to minimize contamination and degradation of electrical properties. A new unlined drum using a non-contaminating seam sealant and other selected materials has been developed which gives less fluid contamination than the lined drums.

Assessment:

One of our perennial problems has been degradation of electrical properties of electrical fluids during shipment. These new drums should solve this problem resulting in greater customer satisfaction and better competitive position especially outside the U.S.A.