COMPANY CONFIDENTIAL
RESEARCH AND DEVELOPMENT REPORT
ANNISTON PLANT

Report No. 3
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Title: 1968 Quality Report on Bayer, Prodelec and Kanegafuchi Dielectric Fluids

Personnel: S. O. Kemp - G. W. Miller

Problem: Continue Surveillance on Dielectric Fluids in Competition with Monsanto Aroclor

Justification: Protection of Domestic and Foreign Sales

Summary: At the Aroclor quality meeting in March 1967 it was proposed that a second marketing quality survey be made on materials competitive with Monsanto Aroclor. The first survey made in 1966 indicated superior quality for Bayer and Prodelec materials. This 1966 conclusion was not supported as expected by the second survey. It should be remembered that the 1966 test valves and those covered in this report are based on drum samples of the material.

Bayer Clophen A-30 resistivity tested only 800 x 10^9 ohm-cm as compared with 15,000 x 10^9 in 1966. Prodelec Pyralene 1499 which in 1966 tested 1200 remained low at 700 x 10^9. Thermal Chemical Stabilities of the two products competitive with Aroclor 1242 remained low at 0.14 and 0.16 ppm Cl respectively.

The data collected on Kaneka Kanechlor 300 is included in the report; however the samples were not in the original manufacturer's containers and are not indicative of Kaneka quality.

Bayer Clophen A-50 and Prodelec Pyralene 1476, both competitive with Aroclor 1254 show fair quality. The Bayer material showed the most significant electrical property change (1967 Resistivity 150,000 x 10^9 - 1968 Resistivity 6,500 x 10^9).

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Background

Beginning in 1966 a program designed to evaluate competitive electrical grade chlorinated biphenyl products was initiated. Since that time three reports have been issued on competitive quality. The first complete report on French, German and Japanese sources on the Aroclor 1242 and 1254 equivalents was issued in 1967. Based on that report and decisions made in the 1967 Aroclor meeting it was decided that more information was needed and consequently a second series of drum shipments were obtained. The second series of shipments were ordered in late 1967 and received at Anniston during mid 1968.

The drum quantities ordered were specified to be "standard manufacture's shipping containers". Unfortunately the Kanegafuchi material was not obtained as specified, but was drawn from a Kanegafuchi customer storage tank. Therefore, little credence should be placed on the Kanechlor results.

Discussion

Bayer

There is only one significant difference observed in competitive Aroclor quality comparing 1966 and 1968 results. The latest test results show that both Bayer Clophen A-30 and A-50 are marketed with electrical properties inferior to what the 1966 test results would indicate. This fact was originally quite disturbing and it was the author's opinion that the dielectric was contaminated during sampling of the drums for test purposes. The 800×10^9 ohm-cm resistivity reported for Clophen A-30 was the highest resistivity result obtained from three separate sampling and testing operations. In two of the test series the test cell was precleansed and tested with Aroclor 1242 having a resistivity greater than $20{,}000 \times 10^9$ ohm-cm. The electrical quality of both Bayer Clophen A-30 and A-50 was definitely much lower than the first data (1966) indicated. It must be remembered however; that the data was gathered from two spot checks two years apart.

The stability test results for Bayer products remain low and are indicative of good quality.

Prodelec and Kanegafuchi

Test results of Pyralene 1499 and 1476 agree quite well from both sets of data, 1966 and 1968. Pyralene stabilities are good and electrical properties are of average quality.

Kanechlor 300 test results, as pointed out previously, must be taken with certain reservations. The material was not received in the original manufacturer's containers, but was sampled from a Kaneka customer's storage tank. The test results do indicate good stability and fair electrical properties.

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Conclusions

The quality of competitive materials as deduced from the 1966 test results was somewhat misleading. Certainly Bayer and Prodelec have good quality dielectric on the market, as does Kanegafuchi, but it does not appear that any tremendous advantages or sales points are inherent in either of their products compared with the comparable Aroclor.

Recommendations

Quality data accumulation on competitive dielectric liquids should be continued to avert situations where the quality supplied by competition is not known. It is recommended that at least every two years a survey of competitive quality be reported.

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Table I

Comparison of Materials Competitive With Aroclor 1242
1968 Result/1966 Result

Property	Bayer Clophen A-30	Kaneka Kanechlor 300	Prodelec Pyralene 1499
Color, APHA	10/<5	10/10	10/<5
Acid No.	0.001/0.001	0.001/0.001	0.001/0.002
Ref. Ind. @ 25°C	1.6240/1.6237	1.6251/1.6248	1.6246/1.6245
Sp. Gr. @ 25°C	1.381/1.378	1.391/1.390	1.387/1.387
Moisture, ppm	62/63	94/24	51/35
Free Chlorides, ppm	0.009/0.009	0.018/0.009	0.018/0.009
HST, ppm Cl	0.07/0.11	0.11/0.11	0.11/0.16
Mon. Stab., ppm Cl	0.03/0.06	0.03/0.06	0.06/0.06
TC Stab., ppm Cl	0.14/0.07	0.16/0.08	0.16/0.12
Resist. x 10^9 ohm-cm @ 100°C	800/15,200	500/9,600	700/1200
Power Factor, %			
1 KC	0.25/0.06	0.36/0.13	0.26/0.33
60 cycles	2.01/0.22	3.81/0.55	2.40/4.60
Dielectric Constant @ 100°C	4.81/4.90	4.88/4.82	4.89/4.87
Distillation, °C			
by wt. 10%	327/327	328/331	329/330
by wt. 90%	349/348	350/352	346/352
Type Drum	Galvanized	Galvanized	Steel-lined

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Table II

Comparison of Materials Competitive With Aroclor 1254
1968 Result/1966 Result

Property	Bayer Clophen A-50	Prodelec Pyralene 1476
Color, APHA	15/7	30/10
Acid No.	0.001/0.001	0.002/0.002
Ref. Ind. @ 25°C	1.6373/1.6365	1.6378/1.6380
Sp. Gr. @ 25°C	1.496/1.490	1.499/1.503
Moisture, ppm	30/30	47/30
Free Chlorides, ppm	0.009/0.009	0.009/0.018
HST, ppm Cl	0.11/0.07	0.07/0.14
Mon. Stab., ppm Cl	0.06/0.10	0.07/0.18
TC Stab., ppm Cl	0.39/0.28	0.50/0.32
Resist. x 10^9 ohm-cm @ 100°C	6500/150,000	3200/3200
Power Factor, %		
1 KC	0.17/0.09	0.22/0.14
60 cycles	0.96/0.28	1.80/1.50
Dielectric Constant @ 100°C	4.23/4.37	4.22/4.23
Distillation, °C		
by wt. 10%	367/365	367/368
by wt. 50%	373/373	374/376
by wt. 90%	384/387	385/387
Type Drum	Galvanized	Steel-lined

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