COMPANY CONFIDENTIAL

RESEARCH AND DEVELOPMENT REPORT
ANNISTON PLANT

Report No. 3
Job No. 370-501
Date 6-24-68

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	W. B. Kuhn R. P. Stevens	

Title: Evaluation of Drum Liners for Liquid Aroclors

Personnel: W. H. Howard

Problem: Develop a drum package which will maintain high quality electrical grade Aroclor for both domestic and foreign consumers

Justification: Improve quality of product supplied to the domestic customer and deliver a product equal to or superior in quality to that of foreign competition

Summary: Electrical properties of Aroclor 1242 have held up well after transit and storage for three months in drums with clear epoxy-phenolic 70/30 and clear phenolic linings. Because of the superior impact resistance, one coat of clear epoxy-phenolic lining is recommended for use with drums for transporting liquid Aroclors. A reduction in cost of fifty cents per drum, which amounts to a reduction of $12,000 yearly, will be realized over the present double coated phenolic lined drum. Dalbon lined drums, although possessing the greatest impact resistance, cost over a dollar more per drum and do not retain the electrical properties as well as the epoxy-phenolic liner.

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Background

Studies aimed at determining the best drum liner for delivering high quality Aroclor are described in PR&D Reports 370-322, Nos. 7 and 11, and 370-501, Nos. 1 and 2. These studies, conducted with drums immediately after filling, have indicated that an epoxy-phenolic liner will retain the electrical quality of Aroclor equal to or better than the other liners tested. It also has greater impact resistance than the double coat phenolic liner now used.

As of March 1967 it was necessary to change from a single to a double coat clear phenolic liner in order to improve the electrical quality of Aroclor delivered to the customer. The single coat tended to crack excessively, leading to a loss in product quality.

A Dalbon lining, although possessing the greatest impact resistance, adds considerably to the cost of a drum and does not retain the electrical properties as well as the epoxy-phenolic lining. A pigmented epoxy-phenolic lining was also tested and found not to hold the electrical properties as well as the clear epoxy-phenolic lining.

In order to determine how well the electrical properties would hold up during transporting and storage, twenty of the drum samples described in Report 370-501, No. 2, were shipped to the warehouse in Elizabeth, N. J. in February. These drums were returned to Anniston and tested for electrical properties. The results of these tests are described in this report.

Experimental

A total of twenty-five drums, after three rinses, were filled with high quality Aroclor on January 15. These were tested for electrical properties immediately after filling and the data tabulated in Report 370-501, No. 2. Twenty of these drums, which included eight each of the Dalbon and clear epoxy-phenolic and two each of the pigmented epoxy and phenolic lined drums, were shipped in February to the warehouse in Elizabeth, N. J., returned and stored until resampled in May.

The electrical properties of these returned Aroclor samples were measured at 100°C and the data compared with that taken for these samples at the time of filling. Two samples were taken from each drum and an average of the two was determined, as was also done for the first sampling after initial drum filling. No denting or physical damage to any of the drums was found after transit.

Results and Discussion

The values for the 60 Hz power factor and resistivity are listed in Table I. The comparison between the before and after transit and storage resistivity values are listed in Table II. Although some of the samples upgraded in the drum, the electrical properties with the clear epoxy-phenolic lined drums are better than the Dalbon or pigmented epoxy-phenolic lined drum. The control drums with a clear phenolic lining have as good a retention of electrical properties as any of the other drums tested. Although the electrical properties are better with the clear epoxy-phenolic liner immediately after filling, they tend to decrease somewhat after transit while the clear phenolic tend to upgrade.

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Results and Discussion (continued)

Considering the overall characteristics the one coat of clear epoxy-phenolic lining is recommended for use as a drum liner for transporting liquid Aroclor. Its advantages are: (1) lower cost over present double coat phenolic lining ($12,000 yearly savings potential), (2) good impact resistance, and (3) good retention of electrical properties.

Conclusions

1. A one coat lining of clear epoxy-phenolic 70/30 composition is recommended as drum liner for transporting liquid Aroclor.

2. This material is recommended because of the combination of advantages of lower cost, better impact resistance, and good retention of electrical properties.

Recommendations

A single coat of clear epoxy-phenolic 70/30 liner should be specified for all future orders for drum packages for liquid Aroclor. This change will reduce the unit price from $8.30 for the double coat clear phenolic lined drum presently being used to $7.80 per drum.

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Table I

Values of 60 Hz Power Factor/Resistivity x 10^9
after Transit and Storage

Sample	1-Dal*	2-Dal	1-EP-C	2-EP-C	1-EP-P	2-EP-P	Cont.
1	.70/12,500	.60/15,000	.55/15,500	.48/16,000	.70/13,000	1.0/9,500	.42/41,500
2	.66/10,000	.60/8,000	.34/39,000	.79/9,000			.42/28,000
3	.50/16,500	.86/8,500	.54/17,000	.57/15,000			
4	.78/7,500	.50/14,000	1.0/8,500	.48/22,000			

*Code

1-Dal	1 coat Dalbon
2-Dal	2 coat Dalbon
1-EP-C	1 coat epoxy phenolic-clear
2-EP-C	2 coat epoxy phenolic-clear
1-EP-P	1 coat epoxy phenolic - pigmented
2-EP-P	2 coat epoxy phenolic - pigmented
Cont	Control (2 coat phenolic)

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Table II

Comparison of Resistivity Before and After Transit and Storage

Sample	1-Dal*	2-Dal	1-EP-C	2-EP-C	1-EP-P	2-EP-P	Cont
1	**4,000	3,000	26,000	16,000	8,500	9,000	20,000
	12,500	15,000	15,500	16,000	13,000	9,500	41,500
2	8,500	7,000	32,000	16,500			10,500
	10,000	8,000	39,000	9,000			28,000
3	16,000	6,500	21,500	31,000			
	16,500	8,500	17,000	15,000			
4	7,500	9,500	5,000	32,000			
	7,500	14,000	8,500	22,000			

**Resistivity x 10^9 ohm cm

Before
After treatment

*Code

1-Dal	1 coat Dalbon
2-Dal	2 coat Dalbon
1-EP-C	1 coat epoxy phenolic-clear
2-EP-C	2 coat epoxy phenolic-clear
1-EP-P	1 coat epoxy phenolic - pigmented
2-EP-P	2 coat epoxy phenolic - pigmented
Cont	Control (2 coat phenolic)

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