Purpose

Westinghouse and Crocker, Burbank agreed to a program, whereby Crocker, Burbank would make capacitors to evaluate various grades of paper treated with a Polyl Dibyl Sulfone and 1242 Aroclor mixture. The Sulfone, which is under a Westinghouse patent, was furnished by Westinghouse for these tests.

Included, in this report, for comparison, is some data on the same grades of paper run in a standard 100% Aroclor treat.

Paper Tested

Lot No.	Roel/Roll	Grade	Thickness
K03A	--	CK 70	.00065
K003	24/47	CK 80	"
K013	2/3	CK 90	"(not treated with (100% Aroclor)
K016	8/15	CK 90	.0005' (Not treated wi (16.7% Sulfone)
K003	15/44	CK 75	.00065

K 013 was not run in a 100% Aroclor treat. K 016, which had been treated with 100% Aroclor, was chosen for comparison; because it is representative of a CK 90 paper.

Capacitor Assembly

Capacitors were wound as follows:

Two sheets of paper between foils, 1-7/8" wide-0.25 mil x 1-3/8" wd. foil. 1-7/16" dia. mandrel.

	K016	All Others
Turns of paper only at start	240	149
Tabs inserted at	260	179
Foil out at	279	205
extra turns of paper	4	4
Total turns	283	210

This winding is designed to give 0.55 uf when treated with 100% Aroclor. The active capacity is at the outside of the roll, allowing good heat transfer from the winding, and a low temperature rise above the ambient.

The containers were 1⅛" oval cans, 2-3/4" high with glass insulated terminals.

Treat

A mixture of 2.6 lbs. of Sulfone and 13 lbs. of 1242 Aroclor (16.7% Sulfone) was refined with fullers earth to a resistivity of 43×10^9 ohm-cm. ($1000\text{-}3000 \times 10^9$ ohm-cm. is normally obtained with 100% Aroclor).

DSW 436016

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The capacitors were dried according to the standard C.D. drying cycle:

14 hrs. at 150°C of broken vacuum
1/2 hr. vac., 1/2 hr. air - - - -
2 hrs. of fine vacuum
1/2 hr. for vacuum filling @ 100° C
1-1/2 hr. of vacuum soak @ 100°C

The final vacuum attained for this run was 30 microns.

Impregnants

Capacity and power factor were measured at 300 volts/mil, and 11 volts at 100°C; both at 60 cycles.

I R was measured at 500 volts after an electrification time of 1 min.

The life tests were run at 125°C in a forced draft oven at 550 volts (526 v/mil), 60 cycles for the Dulfene units; and 770 volts (583 v/mil) for the 100% Aroclor units. The capacitors made from lot 3016, which is .0005 thick, were stressed at 770 v/mil.

Results

The results of the tests are tabulated on the attached sheet, and a graph is attached showing power factor versus temperature for the papers treated with 16.7% Dulfene.

Conclusions

The power factors at both 300 v/mil and 11 volts indicate a possible presence of some contamination in the CK 60 capacitors. This is more pronounced in the 16.7% Dulfene capacitors than in the 100% Aroclor capacitors.

In the 16.7% Dulfene treated capacitors the CK 70 units show the best power factor results, but the KI 75 units show the best life. The choice, for a capacitor, would seem to depend on the capacitor design and application.

The "per cent of expected life" shown on the results sheet was determined by applying the 7th power law to several previous life tests for a given paper grade treated with Aroclor. Also the 3016 lot would be expected to have a life of 1410 hours if tested at 583 v/mil, based on its performance at 770 v/mil.

The life of the 16.7% Dulfene capacitors, made with CK papers, is in the inverse order as their densities. The life of the 100% Aroclor capacitors, made with the CK papers, would be in the same order as their densities, if it were not for the low value of the CK 60 lot.

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	Life, hrs.	
	16.7% Sulfone	100% Aroclor
CK 70	200.0	180.7
CK 80	126.8	159.9
CK 90	116.8	1410 (expected at >83

Comparisons of the measured capacitors of the two treats give the following increase in capacity due to the 16.7% Sulfone:

CK 70	25%
CK 80	25%
CK 90	31% (not based on the same winding)
MK 75	23%

L. W. Stiles

LWS/a

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TEST RESULTS

Average values for (5) units of each lot

Lot	Grade	300 volts/mil Cap, uf 125°C	Power Factor, % 40°C	60°C	85°C	100°C	125°C	11v P.F., % 100°C	IR, megohm-uf 85°C	125°C	Life Actual hrs, % of expected	
16.7% Sulfone												
Run # 78A											416 v/mil Life test	
M021A	CK 70	.738	.293	.268	.270	.308	.453	3.54	182	11.3	200.0	unknown
M003	CK 80	.735	.302	.281	.298	.366	.702	4.20	120	6.3	126.8	unknown
M013	CK 90	.756	.325	.300	.306	.355	.594	2.96	135	7.9	116.8	unknown
M003	MK 75	.729	.246	.234	.262	.312	.527	2.87	133	7.6	318.2	unknown
100% Aroclor												
Run #81A											583 v/mil Life test	
M021A	CK 70	.589	.233	.205	.194	.206	.259	1.05	489	47.1	180.7	insufficient data
M003	CK 80	.581	.293	.217	.210	.231	.332	1.42	304	28.8	159.5	" "
Run # 65A											770 v/mil Life test	
M016	CK 90	.576	.283	.256	.245	.255	.332	.879	322	22.2	353.2	125
Run # 73A											583 v/mil Life test	
M003	MK 75	.590	.207	.202	.208	.228	.314	1.84	354	32.0	358.4	100

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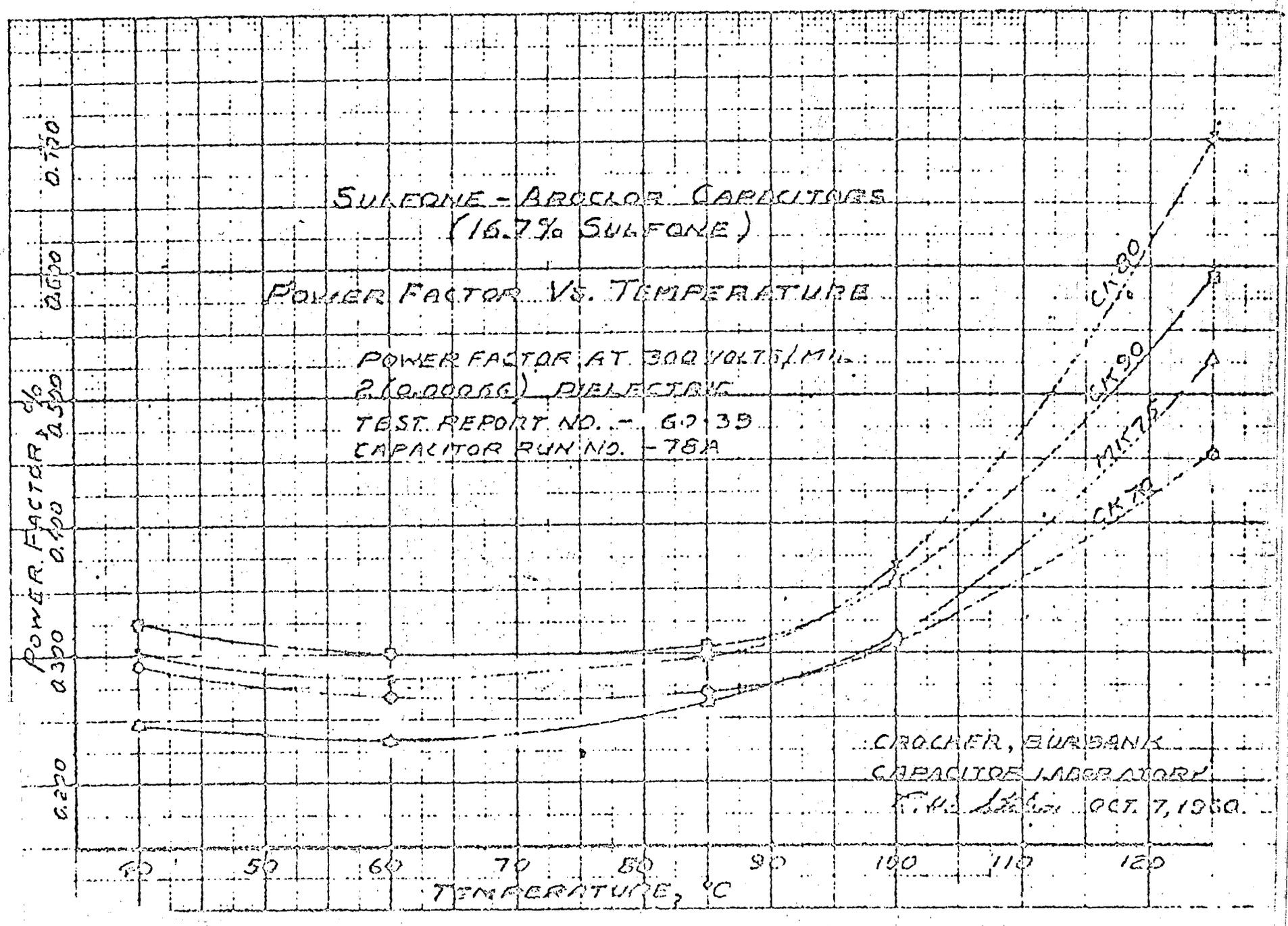

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