

Monsanto

FROM (NAME & LOCATION) J. G. Bryant - St. Louis

DATE : September 30, 1970 CC:

SUBJECT : New Dielectric for Transformers,
Circuit Breakers, and Liquid Filled Cables

REFERENCE : Letter 9-8-70 PGB to RHM

TO : P. G. BENIGNUS
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Introduction:

Six hydrocarbon streams within Monsanto have been viewed as possible candidates for a new dielectric. Two of these streams show promise as a possible dielectric fluid. Presently these two streams are blended together for lack of separate storage facilities. The combined streams, presently used in Therminol 55, were evaluated electrically and yielded very good results. The physical properties of the separate streams appear promising. Initial investigation indicates a material cost of \$0.08-\$0.15/gallon with a possible resale price of \$0.35 or higher. However, the economics must be firmed. There is a total of 32M lbs/yr. available. A third stream appears attractive on physical properties although an electrical evaluation must be made.

Fluid Characteristics:

Although the two primary streams of interest are presently combined for their use in Therminol 55, they leave the cracking unit in heavy and light fractions. The major difference in the streams is the average molecular weight and the pour point. The pour point is extremely important in the electrical application and the heavy fraction shows a -65°F while even the light shows -40°F which is the value sought. The only disadvantage shown is the 0°C viscosity of 7000 SUS whereas we seek 300-320 SUS. Although the light shows a lower viscosity at 37.8°C than the heavy fraction, there is not expected to be a great difference and the lower pour point of the heavy may be a more saleable feature. Too, by a slight blending of Alkalate 228, the viscosity can probably be lowered within acceptable limits.

Also, for the use in Therminol 55 they seek to separate the streams and blend into the desired proportions. Since storage facilities could not be justified on Therminol 55 sales alone, the two streams are blended together. However, with electrical application there may be justification to install storage facilities.

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The aromatic oil No. 1 from the cracking unit appears cheap enough but the low Flash Point would probably prevent its acceptance as a dielectric. The Resin Oil is expected to contain too much vinyl unsaturates for its acceptance. True, these materials could be hydrogenated but there are technical and economic problems to overcome. Also, the supply is expected to vanish after two years. Three ethyl benzene streams were considered. The diethyl benzene has an extremely low flash point and probably would not be acceptable. The polyethyl (5D4OH) was considered but felt the flash point may prevent acceptance of this material. The Bottoms (5D4), although they contain 50% aromatics and 50% nonaromatics, may be applicable. Although the economics of Bottoms (5D4) appears quite favorable, we are presently short on hydrogenation capacity and if the material must be hydrogenated as speculated it may be difficult to justify. For a more complete comparison see the attached table.

Availability:

The total stream available is 32M lbs/yr which is split, 24M heavy and 8M light. Presently both streams are blended together and about 16M lbs are committed at about \$0.03/lbs. to outside sources. However, if Monsanto could realize a greater profit from within, these sales could be discontinued. Therminol 55 consumes a small amount. To separate the two streams as would be sought for electrical application, storage facilities must be provided. This, too, as previously mentioned is sought for Therminol 55 - heat transfer medium. Additionally, initial results with the combined streams indicate the streams must be earth refined. This would add approximately \$0.005/lb. to the cost. It has been reported that on occasion this material runs wet and would require drying. If true, this would not be expensive or difficult but would add some expense to the processing costs, probably less than the \$0.005/lb. All indications are that the cost can be held to about \$0.025/lb.

Plans to establish a market:

Action/Accomplished by

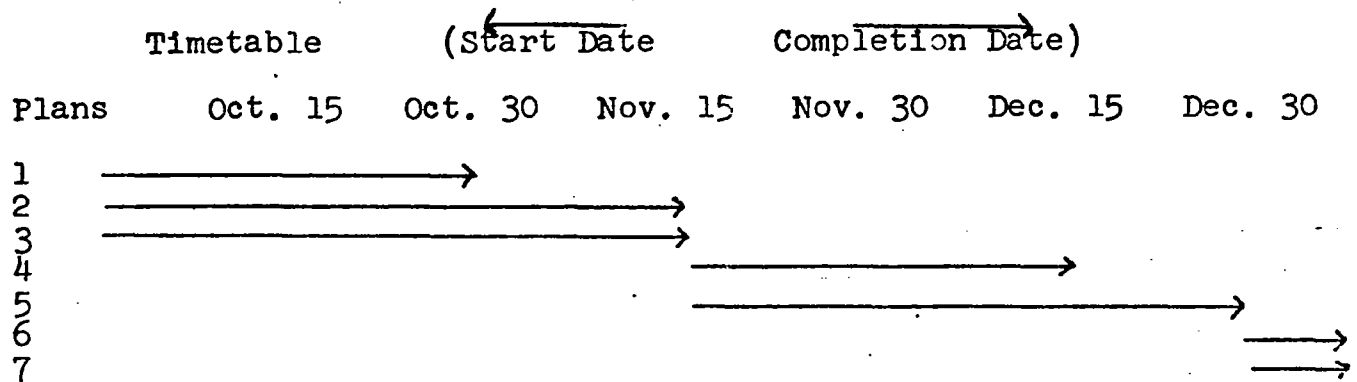
1. Check out process at Chocolate Bayou and Texas City to confirm actual costs, and necessary equipment expenditures to do the job./Marketing
2. Complete laboratory-electrical and physical properties -- analysis of both the heavy and light fractions/Research
3. Complete laboratory evaluation of Ethyl Benzene Bottoms 5D4/Research

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4. Obtain a certified analysis by an independent laboratory (namely Doble Engineering) to evaluate the full potential of the fluid in properties which Monsanto does not have facilities to measure/Marketing & Research
5. Providing the laboratory results are satisfactory, we shall then proceed with the market evaluation/Marketing
6. Issue a project to install the necessary processing equipment/Marketing
7. Continue with program to market this material on a wide-spread basis/Marketing



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Table II

light at

	<u>Therminol 55</u>	<u>Therminol 55 Earth Treated</u>
Dielectric Constant*	2.22	2.22
Dissipation Factor*	.00096	.00005
Resistivity**	$239 \times 10^{12} \Omega \text{cm}$	$318 \times 10^{12} \Omega \text{cm}$
Dielectric Strength***	31 KV	46 KV

* At 100°C, 60 Hz

** At 100°C

*** At room temperature - ASTM, D1816-60T

The material was placed in a cold box at -20°C for 51 hours. When removed it appeared only slightly more viscous than at room temperature.

These properties would indicate that if there is a dependable, uniform supply of this material at the price that has been suggested, it is a worthwhile candidate for transformer use.

R. H. Munch

9-2-70

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Condition	FLUID
Uninhibited Transformer Oil (Spec.) Therminol 55 Heavy Light	Aromatic Oils Resin Oil Ethyl Benzene Diethyl Polyethyl Bottoms
Comments General Guide for a Spec.	Streams are presently mixed. Storage facilities must be provided to isolate the streams. Stream is hydrogenated. From the ethylene cracking unit. Flash point too low. Stream contains considerable vinyl unsaturates. 15% vinyl toluene 13% indene 16% others toluene divinyl benzene
Other General Properties Refractive Index N _D ²⁵ Ave. Mol. Wt. Dist. Range @ atm (^o C) 20%	Contains 50% aromatics 50% non-aromatics. Must be hydrogenated to use as a dielectric Drying Application and stream may not be available after 2 yr. Would have to use hydrogenate to use flex. 270°C. 50-2300°C

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