Monsanto

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SUBJECT CEA 3023 Santosol - Dielectric Task Force Meeting

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TO

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Summary

The status from development to marketing was reviewed for each of the candidates for the capacitor and and transformer fluid markets. The capacitor fluid program is proceeding satisfactorilly with customer testing underway on the leading candidate, MCS 1238. Interim manufacture of the two compounds (TXS and MIPB) used to blend 1238 is being arranged with outside firms. The blending facilities will be provided by a plant project now being reviewed. Evaluation estimates based upon research data are being prepared to determine Monsanto manufacturing costs for TXS and MIPB. Reserach prepared lab quantities of transformer fluid for customer evaluation. Process design on the leading transformer fluid candidate, alkylated biphenyl, is underway.

Details

1. MCS - 1238

   a. The most important physical properties of MCS-1238 are dielectri constant(DK), dielectric strength and dissipation factor.

   b. Customers, according to D. Wood, require a DK of 5.0 $\pm$ 0.075 at 100°C which is equal to 23.8% $\pm$ 0.6 sulfone.

   c. Blending conductivity meter requires temperature compensator.

   d. Flash point averages 303°C but depends upon ratio of monoisoprophylbiphenyl (mono) to diisopropylbiphenyl (di). Flash point (F.P.) of mono and di are about 30-40°C apart and to increase F.P. the amount or di on the molecular weight of the side chain must be increased.

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Details (continued)

1. MCS - 1238 (con't)

   e. Mono biodegrades about 2-3 times faster than di.

   f. The oxidative stability may be a problem. Tanks must be blanketed with nitrogen and 0.01% antioxidant (tert. butyl cresol) will be added to the blending tank.

   g. Plant will heat MIPB prior to blending with TXS and will dry the blend in a molecular sieve bed after porocel bed. Sieves may remove anti-oxidant.

   h. G.E. at Hudson Falls pointed out oxidative stability problem. They have lab impregnated some test samples and, are working toward completing the lab studies in early 1976. If all goes well G.E. will begin limited production using MCS-1238 about June 1976.

   i. The three major customers will probably each require about two 55 gallon drums per day beginning June 1976. Dave Wood suggested that research have an inventory of 20 drums at this time.

   j. Metallized film may be strongest competitor for MSC-1238.

   k. Calgon units at GE(Hudson Falls) are now operating to remove PCB's from the water discharged to the river.

   l. The $250K manufacturing blending project for MCS-1238 at WGK did not include molecular sieves or antioxidant facilities Project will be re-estimated and may increase to $450K The facilities are compatible with CED design on the manufacture of MIPB and TXS. Project approval may be delayed due to the recent re-organization and the new management must be briefed on this program.

2. Monoisoprophylbiphenyl (MIPB)

   a. Research confirms that the existing carbon steel chlorinators at WGK are satisfactory for use as reactors for MIPB considering the length to diameter ratio. However, carbon steel coupons corroded in the test reactor. Water increases the amount of $AlCl_3$ catalyst required which increases the corrosion rate. Nitromethane, which could be a safety problem, reduces the corrosion rate but gives about 13 % of the less desirable ortho MIPB compared to less than 1% with no nitromethane.

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Details (continued)

2. Monoisoprophylbiphenyl (MIPB) (con't)

b. A water specification maximum may be required on propylene. Water spec on biphenyl is 100 PPM maximum. Water is added in the catalyst kill step and must be removed in the recycle biphenyl.

c. Filter cakes from the process may present environmental problems. Leaching studies will be initiated the week of Oct. 27 by Marv Gibbs. Incinerator costs of cakes outside the company is estimated to be 3¢/lb.

d. CED process design for the evaluation is complete for Delaware River and WGK. This design assumed that the existing carbon steel chlorinators are satisfactory. If the chlorinator cannot be used it will be necessary to obtain two 3000 gallon agitated glass reactors.

e. The equipment costs for MIPB at DR and WGK have been estimated.

f. Dixie will produce MIPB in a 20 tray column and is now re-evaluating process requirements due to our change in MIPB spec of 0.05% maximum biphenyl.

3. Tolylxylylsulfone (TXS)

a. An emulsion of the organic and water layers in the wash step does not gravity settle rapidly. The emulsion is produced when the recycle stream from the product distillation is returned to the reactor. Centrifuging at 3000 g's separated the phases of moderate emulsion. Marv Gibbs will develop plot settling time vs g's the week of Oct. 27.

b. JFQ has titanium POD extractor. A cream separator might also be used. The organic phase corrodes 316 ss but water phase does not.

c. Since the recycle stream may introduce trace compounds into the TXS product it is desirable to make MCS-1238 with TXS from this reactor to check the physical properties of the blend.

Details (continued)

3. Tolylxylylsulfone (TXS) (con't)

   d. Process design is complete based upon information available from research. The reaction and water wash step will utilize a 5000 gallon hastelloy vessel. Equipments costs have been developed but it may now be necessary to add a centrifuge to the process.

   e. Dixie plans to make TXS via the TSCL route. Anderson Development Co. and Deering-Millikin probably will quote. The outside manufacturing cost will probably be about $1.25/lb.

      The "OO" building may be available to manufactur TXS via the TSCL route. Manufacturing will check.

4. High Flash Hydrocarbons (HFHC)

   a. Research has no difficulty making HFHC with the necessary physical properties.

   b. Corrosion in the reaction mass has not been studied with $AlCl_3$ as catalyst. It may not be a problem if HFHC is produced in the same reactor as MIPB which also uses $AlCl_3$.

   c. Alkylated biphenyl is leading candidate for HFHC since dielectric strength is higher than alkylated naphthalene although flash point is 20-30^{o}C lower.

   d. Use of biphenyl probably will require a larger recycle stream than the use of naphthalene since the reaction products from the biphenyl alkylation contain larger quantities of partially alkylated materials.

   e. Temperatures above 320^{o}C cause significant decomposition of alkylated biphenyl and steam stripping or high vacuum (1-2MM Hg) may be necessary. Consolidated Vacuum Corporation has a production size molecular still that may be applicable. CED will investigate.

   f. Process design is on schedule for mid November completion.

5. Linear Dimer (LD)

   a. Process design is on schedule for mid November completion.

Details (continued)

5. Linear Dimer (LD) (con't)

b. There may be an OSHA problem with the feed for LD (α methyl-styrene).

6. S-100

a. Design is on schedule for S-100 manufacturing facilities at WGK with completion by mid November.

b. The S-100 facilities at DR have now been issued in a preliminary project definition report. We will use the equipment information summary from this report and estimate it on the same basis as the other product cost estimates.

c. It was mentioned that CED should consider the possibility of manufacturing pseudocumene (1,2,4 trimethyl benzene) in the S-100 facilities. We do not plan to consider pseudocumene manufacture at this time since we will not be able to meet the schedule if another evaluation is included.

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