

*Given to
W. L. Jones
3/3/71*

MONSANTO COMPANY
APPROPRIATION REQUEST

To: Mr. E. J. Bock
President

March 1, 1971

cc: Messrs.
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TITLE: MCS 1016 (AROCOR) DISTILLATION
(Specialty Products Business Group)

NEW FIXED CAPITAL REQUESTED: \$820,000

DIVISION: Organic Chemicals PLANT: W. G. Krummrich

REQUEST NO: CEA 2417 FORECAST NO. 3018

FIRST LISTED IN THE CONSTRUCTION FORECAST: October 1, 1970

I. SUMMARY

A key part of Monsanto's announced program for control of PCB's (polychlorinated biphenyls) is the introduction of a new dielectric fluid which will be less persistent if released to the environment. This project provides for a fractionation system to adapt existing Aroclor manufacturing facilities at the Krummrich Plant to produce MCS 1016. This new fluid will replace Aroclor 1242 for sale to capacitor manufacturers.

The new product differs from Aroclor 1242 in that it contains a minimum of the more persistent highly chlorinated homologs. Therefore, any fluid lost from scrapped capacitors is unlikely to accumulate in the environment to a harmful or measurable level.

The high chlorine fraction left from making MCS 1016 will be further processed to make Aroclor 1254 and 1260, which will be sold as transformer askarel fluid. This is a closed system application with an incineration and reclamation service available to close the loop.

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Monsanto tests have shown MCS 1016 to be fully equivalent to Aroclor 1242 as a capacitor impregnant. Customer tests presently underway might lead to minor product revisions but these would be within the capabilities of the equipment as installed.

While this project is presented as non-earnings, it does provide tankage to permit consolidation of all liquid Aroclor production at Krummrich with the Anniston unit to be mothballed. The resulting improvement in costs, together with the recent price increase, has more than compensated for the manufacturing costs entailed in the new product. The overall financial effect of the PCB program on total dielectrics is shown in Appendix A.

Central Engineering has reviewed this request and its comments are incorporated in those sections where it has shared responsibility.

The Group Vice-President has reviewed this project and recommends approval.

Recommended by H. L. Minckler, General Manager
Organic Division

II. PREMISES

Since liquid Aroclors have been reported by some researchers to be harmful to some species of wild life and persistent in the environment, they are being withdrawn from "open system" applications. However, as to the applications where Aroclor safety and electric stability are irreplaceable, we believe and have indicated to regulatory agencies, concerned legislators, and the public that "closed system" applications pose no threat to the ecology. While the capacitor application is a closed system, since the capacitor is sealed for its long useful life, it may eventually leak when junked or incinerated. Thus, a less persistent dielectric fluid would be further insurance against accumulation in the environment.

It has been found that isomers containing five or more chlorine atoms per molecule are the persistent components in chlorinated biphenyl. While Aroclor 1242 contains three chlorine atoms per molecule on the average, 5 - 8% of the total is chlorinated to five or higher. This is also true of corresponding competitive products made overseas. The new fluid, MCS 1016, will be fractionated to nearly eliminate the persistent components resulting in a product 10 times better from an environment standpoint. A light ends cut may also be made to return to a similar average chlorine content. The key premise of this project is that this substantial reduction in the potential entry of persistent PCB's to the environment via scrapped capacitors is a responsible solution to this aspect of the PCB environmental challenge.

This project is to provide facilities to produce a nominal 50M lbs/year of MCS 1016 based on a 10% light ends for-cut by fractionation of crude Aroclor. Facilities will also be provided for those Aroclors formerly made only at Anniston. Production of these products will be discontinued at Anniston to reduce total manufacturing cost and terminate expenditures there for PCB process improvements.

Central Engineering has based its process design and capital estimate on the data given in the revised Project Scope Report dated December 30, 1970. Sufficient information was available to develop a reliable cost estimate.

III. ALTERNATE COURSES

A. Alternate Processes for MCS 1016

A continuous refining system was considered instead of the batch system selected, however, the required flexibility of being able to take a forecut called for the batch system.

Crystallization was also considered, but this was felt to be impractical due to the low temperatures and high viscosities involved with this product.

B. Alternate Products for Capacitor Dielectrics

Alternate products, based on Aroclor chemistry or new chemistry, are being explored. However, any product which does not closely mimic Aroclor 1242 in electrical performance, even if superior, would require redesign of capacitors by our customers, and would thus require more lead time than is acceptable for a response to the PCB problem. We will continue to pursue this alternate and it may become a reality in a few years.

C. Abandon the Capacitor Aroclor Business

This alternate has been explored with the Corporate Management Committee in arriving at our present PCB strategy and was rejected because the electrical industry has no viable alternate.

IV. MARKET

Forecasted requirements for capacitor fluid are as follows:

(000 lbs)	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>
Domestic	28,200	26,000	27,000	28,000	29,000
Export	<u>3,627</u>	<u>4,500</u>	<u>4,700</u>	<u>4,750</u>	<u>4,850</u>
Total	31,827	30,500	31,700	32,750	33,850

The market for capacitor fluid is confined to a small number of firms with General Electric and Westinghouse dominant.

Aroclor impregnated capacitors occupy a distinct niche in the total capacitor market having advantages in such uses as fluorescent ballasts, motor running, and power-factor correction. The market for capacitor Aroclor is therefore sensitive to business conditions in such industries as construction and air conditioning. A negative factor in the short-term growth of capacitor Aroclor will be the increasing use of polypropylene film in capacitors, since less Aroclor is required to impregnate such units, although the resulting improvement in cost/performance ratio should lead to an increase in units sold. A careful assessment of capacitor technology leads to the forecast figures shown above.

Monsanto has had no domestic competition in capacitor impregnants. Advantages of Aroclor are fire resistance, good dielectric constant, reasonable price, and service, quality and technical service. However, the PCB problem has created real concern among the capacitor manufacturers, and it is essential that Monsanto show leadership in developing capacitor fluids free of ecological implications. Thus, MCS 1016 will be brought into the market place replacing Aroclor 1242 in capacitors completely as soon as possible, with other products developed for introduction as rapidly as technically and commercially feasible.

V. TECHNOLOGY

The proposed project involves batch fractionation of crude Aroclor which will be produced in existing and modified existing facilities at the W. G. Krummrich Plant. The overhead product (MCS 1016) is expected to be a less persistent material than Aroclor 1242, for which it will be a substitute.

The system can be operated on a semi-continuous basis, if a light ends forecut is not required.

Research has made several runs in bench scale equipment, and one short production run was made at Mound Laboratories. A Tentative Process Report has not been issued; therefore, Engineering worked closely with Research to obtain the necessary design data. It is believed that sufficient information is available to properly size equipment.

The fractionator will be capable of making a second-generation product, MCS 1043, which will be further reduced in environmental persistence, when capacitors have been redesigned.

A technical risk at this time is in the use of a stainless steel column and condenser to be relocated from Chocolate Bayou. Materials technology personnel in Texas have inspected the column and found the internals in good condition, and the condenser has been inspected and pressure tested at a local shop in Texas. Therefore, the risk is minimal.

VI. SIGNIFICANT CONTRACTS

There are no significant contracts affected by this project.

VII. PATENT SITUATION

No problems of patent infringement are associated with the manufacture, use or sale of MCS 1016 or MCS 1043.

Monsanto has no patent position with respect to these MCS products, and it is considered unlikely that any preferred position can be established.

VIII. EARNINGS

While this is presented as a non-earnings project, it is pertinent to examine the continuing effect on dielectric fluid earnings of the actions taken since adoption of the PCB plan.

Increase in Unscheduled Capacity cost due to abandonment of plasticizer and other open system uses	0.6¢/lb.
Increase in fixed and budgeted cost due to this project	0.4¢/lb.
Increase in labor cost for this project and to cover reclamation service and consolidation at WGK	0.2¢/lb.
Cost reduction at Anniston resulting from mothballing	<u>(0.5¢/lb.)</u>
Net Cost Increase	0.7¢/lb.

The recent price increase of 2¢/lb. has covered this cost increase as well as some of the non-recurring costs for Research on biodegradation, toxicology and plant clean-up methods. Appendix A shows profitability of the dielectric fluids.

IX. CAPITALA. Scope of Project

This project proposes to install facilities in Dept. 246 at WGK Plant to produce MCS-1016 polychlorinated biphenyl. The nominal capacity will be 50M lbs/year with a 10% forecut. Facilities will also be included to produce Aroclors 1221 and 1242 now produced at Anniston.

Major process equipment items include a 30-plate sieve tray distillation column, column condenser, still pot, direct fired reboiler, and a residue surge tank. In addition, a lime slurring system and a column vacuum jet system will be installed.

Of the above, the distillation column and column condenser are existing and will be relocated from Chocolate Bayou. The direct fired reboiler is existing at WGK and will be relocated to Dept. 246.

An additional absorber, filters, and storage tanks will be installed to produce the Aroclors 1221 and 1242 now manufactured at Anniston.

All general utilities are available within the Dept. 246 battery limits.

This project will provide a relocated fuel oil tank and pump for the column reboiler standby fuel.

Finished goods storage will be in eight existing 20,000 gallon tanks and three new 20,000 gallon tanks to be installed on this project.

Raw material storage facilities are existing.

B. Estimate

<u>Capital</u>	
Installed Machinery & Equipment	\$820M
Buildings	---
Total Capital	\$820M
<u>Divisional Expense</u>	
Dismantling	\$ 30M
Repairs	7.5M
Relocations & Modifications	20M
Taxes	3.5M
Total Divisional Expense	\$ 70M
<u>CED Expense</u>	\$.5M

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The capital figure was obtained from a firm equipment list, instrument list, rough piping take-off and a preliminary electrical motor list. The estimate has a confidence level of $\pm 10\%$.

The dismantling estimate allows for the dismantling of the fractionation column, column condenser and a pump at Chocolate Bayou and a section of existing control panel in Dept. 246 at W GK.

Repair costs cover repairing of insulation on the column and column condenser, and pump repairs.

The relocation and modification estimate covers nozzle modifications on existing tanks in Dept. 246, and modifications to existing piping.

C. Project Status

Supporting research work for the basic process is continuing to define parameters for customer needs.

Project pre-approval has been received to proceed with definitive design and commitment of long delivery equipment and initiation of field construction.

Design is now underway.

Project completion is scheduled for June 1971.

XI. PERSONNEL

One additional operator per shift will be needed to operate this equipment.

XII. RISK EVALUATION

No additional hazards to personnel or property over that of the present installation are involved.

It was concluded that the major incident which could occur would be rupture of a tube in the reboiler furnace. The repair cost was estimated at approximately \$5M. The time for accomplishing repairs was estimated at one week on an expedited basis. This would result in a business interruption loss of approximately \$50M.

The foregoing is an excerpt from Pre-Project Loss Prevention Report No. 70-37 dated July 30, 1970.

XIII. POLLUTION AND TOXICITY PROBLEMS

The new area will be curbed, trenched and sumped to prevent discharge to the sewer in the event of a spill or equipment failure.

The vapor stream to the new ejector system will be cooled to essentially eliminate the possible discharge of polychlorinated biphenyls to the atmosphere.

XIV. INTERNATIONAL ASPECTS

The primary purpose of this project is to modify domestic capacitor Aroclor. A similar project may be required at the Newport (U.K.) Aroclor unit, although contract fractionation may be an attractive alternate.

Since there is competition outside the U.S., similar actions by the other suppliers will be needed to produce a real reduction in losses to the environment in the rest of the world.

XV. CENTRAL DISTRIBUTION REVIEW

The new fractionation system for the Krummrich Plant will not generate any new distribution problems.

No change in freight classification is anticipated, and existing rate structures on Aroclor 1242 will be applicable to the new product.

XVI. FINANCE

The present project provides distillation equipment to produce a new product (MCS 1016) designed to provide a composition giving a ten-fold reduction in potential for entry of polychlorinated biphenyls into the environment upon scrapping electrical capacitors. This project is a part of Monsanto's overall plan to reduce threats to the ecology from the Aroclors. The measures provided by this project are believed to be adequate for the present since biodegradation studies to date are reassuring. However, the request recognizes the possibility that these efforts may not be sufficient to allay the concerns of outside groups and agencies. The new system allows for this by providing design capability for a second generation product, further reducing environmental persistence, but such a product would require redesign of customer's capacitors.

Consideration was given to abandoning the capacitor Aroclor business but that approach was rejected since the electrical industry has no viable alternative capacitor fluid. Monsanto's strategy is to show leadership in developing fluids free of ecological implications. The product line is budgeted for an ROI of 10.8% in 1971, which compares with 7.4% ROI in 1969, the last full year free of the impact of the PCB problem.

There are no unusual Treasury, Accounting or Tax Department problems anticipated in connection with this project.

APPENDIX A

This analysis compares actual financial performance in 1969, the last full year free of significant impact from the PCB problem, with the 1971 budget. Subsequent years will approximate the 1971 situation, except for growth, until different products are introduced.

<u>DIELECTRICS</u>	<u>Actual</u> <u>Yr '69</u>	<u>Budget</u> <u>Yr '71</u>
<u>Domestic</u>		
Net Sales (\$M)	\$ 5,683	\$ 7,728
Cost of Goods Sold	<u>3,283</u>	<u>4,299</u>
Gross Profit	2,400	3,429
SARE - Division	<u>1,203</u>	<u>1,051</u>
Operating Income - Division	1,197	2,378
Corp. Investment Charges & Excess SYD	246	359
Net Income (A.T.)	<u>526</u>	<u>1,026</u>
Sales Quantity M Lbs	39,974	44,575
Unit Price	.142	.173
Unit Cost	.082	.096
Unit Margin	.060	.077
<u>U.S. Export</u>		
Net Sales	1,186	1,333
Cost of Goods Sold	<u>743</u>	<u>906</u>
Gross Profit	443	427
SARE - Division	<u>230</u>	<u>200</u>
Operating Income - Division	213	227
Corp. Investment Charges/Incl Exc SYD	17	64
Net Income (A.T.)	<u>97</u>	<u>91</u>
Sales Quantity M Lbs	7,579	8,063
Unit Price	.156	.165
Unit Cost	.098	.112
Unit Margin	.058	.053
<u>Gross Profit</u>	<u>Margin on Sales %</u>	
Domestic	42.2	44.4
U.S. Export	37.4	32.4
<u>Net Income (A.T.)</u>		
Domestic	9.3	7.5
U.S. Export	8.2	6.8

	Actual <u>Yr '69</u>	Budget <u>Yr '71</u>
<u>Domestic and U.S. Export</u>		
	Return on Investment	
	(Net Income A.T.)	
Fixed Investment	6,274	8,056
Inventories	832	813
Other Assets	<u>1,298</u>	<u>1,469</u>
Gross Investment - \$	8,404	10,337
Return on Gross - %	7.4	10.8