

Monsanto

FROM (NAME & LOCATION) R. L. Neary (4-8156) - General Offices

DATE April 20, 1970

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SUBJECT Aroclor Fractionation - 1242-B

REFERENCE

TO : J. O. Bright

C O N F I D E N T I A L

Introduction

An estimate was developed for capital and manufacturing costs for Aroclor fractionation to reduce higher chlorinated materials from Aroclor 1242. This study is based on a production rate of 30M pounds/year obtained by converting Krummrich facilities from the straight flash takeover distillation to a fractionation. The Krummrich plant was selected based on its ability to use the hiboiler stream. It is assumed that a sidestream of hiboilers will be taken from the bottom of the column and utilized in 1254 or 1260 manufacture. The bottoms will be sent to the existing residue recovery system for yield recovery.

Summary

1. The estimated capital cost for installation of Aroclor 1242-B fractionation facilities is \$500M based on a preliminary equipment cost estimate of \$111M and a Lang factor of 4.5. The equipment list and flow diagram is attached as Appendix A.
2. The fractionation will increase the manufacturing cost by 0.5¢/pound as shown in the table below.

\$ 30M Utilities
\$ 30M Repairs (6% of Capital)
\$ 50M Depreciation (10% of Capital)
\$ 15M Factory Indirect Expense (3% of Capital)
\$ 20M Labor, TSD and Miscellaneous
<u>\$145M/30M pound/year = 0.5¢/pound</u>
3. A price increase of 1¢/pound is recommended to provide about 10% A.T. return on new capital.

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Future Work

The following recommendations are made for future Research work on this product:

1. Develop a means to analyze column performance and control its operation.
2. Define required overheads and bottoms compositions.
3. Demonstrate feasibility of continuous distillation with hiboiler side draw without lime in the feed. Check effect on quality.
4. If a continuous system is feasible, determine column requirements by:
 - a. demonstration in laboratory unit OR
 - b. develop true boiling point curve

If the continuous distillation with lime in feed is not feasible, a batch distillation will be adopted. In either case, CED will work with Research to help define column requirements for demonstration and optimization.

5. Evaluate fractionation of Aroclor 1130 to remove 4,4'-dichlorobiphenyl and hiboilers.

Details1. Process Description

It is visualized, based on a single Research batch fractionation, that a 30 plate distillation column could be installed in parallel with the existing flash takeover still. Crude 1142 will be pumped from the existing intermediate storage to the new column. The overheads fraction (82% of feed) is pumped to the existing surge tank to feed the present alumina treatment system. It is also visualized that a hiboiler sidestream (14% of feed) would be removed from tray two or three and held in a new surge storage tank for use in making the higher chlorinated 1254 and 1260 materials. Column bottoms will be transferred to the existing residue still for recovery of additional hiboilers which will also go to the new hiboiler storage. A slurry tank and pump will be used to continuously add lime to the column sump. The existing overhead receiver, catch pot and jet system will be used with the new column.

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The new column size was estimated from the 5/1 reflux ratio used in the batch lab distillations by J. L. Bernhardt (Reference 1). The number of trays was increased to 30 from the 25 used in the lab unit.

2. Cost Estimate

The total capital cost was estimated at \$500M from an estimated equipment cost of \$111M and a Lang factor of 4.5. An equipment summary with estimated costs is included in the Appendix.

Manufacturing costs are based on 1970 standard cost sheet for Krummrich. Additional cost for repairs was taken as 6%, and depreciation was taken as 10% of the added capital. The increase in factory indirect expense was calculated as 3% of the new capital. Increased utility cost was calculated from the increased requirements of fractionation. An additional \$20M was added for inefficiencies in recycling hiboilers and for modest increases in TSD and PRD work. The increased conversion cost was calculated from the additional cost per year and a product rate of 30M pounds per year.

R. L. Neary
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Attachments

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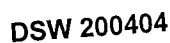
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APPENDIX A

1. Flow Diagram
2. Equipment List

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CENTRAL ENGINEERING DEPARTMENT EQUIPMENT INFORMATION SUMMARY									
PROJECT NAME		PREPARED BY		CEA NO.	AREA	PAGE			
HROCLOR FRACTIONATION 1243-B		R. L. NEARY		INITIAL ISSUE	REV NO.	REV ISSUED			
CEQ EQUIPMENT IDENTIFICATION NUMBER	DESCRIPTION OF EQUIPMENT ITEM	QTY.	SIZE, RATING, MODEL, ETC	MATERIAL OF CONSTRUCTION	** OPERATING WEIGHT (POUNDS)	REMARKS	ESTIMATED PRICE (\$)		
1-101-000	FEED PUMP	1	3x1/2-10 ASD 10GPM, 80' TDH	DUCTILE IRON			\$900		
1-101-001	MOTOR	1	3 HP, 1750 RPM			TEFC			
1-102-000	COLUMN	1	6' DIA. x 75' S.S. FULL VAC, 700°F	CARBON STEEL			\$39,000		
1-102-001	SIEVE TRAYS	30	6' DIA.	410 SS			\$8,000		
1-103-000	LIME SLURRY TANK	1	ATM, 500 OF 500 GAL	CARBON STEEL		WITH COIL	\$1,600		
1-103-001	AGITATOR	1	4 BLADE AXIAL TURBINE	CARBON STEEL					
1-103-002	MOTOR	1	3/4 HP, 1750 RPM			TEFC			
1-104	LIME SLURRY PUMP	1	DIAPHRAGM TYPE 0.5 GPM, 25' TDH	CARBON STEEL		WITH MOTOR	\$700		
DSW 200405									

CENTRAL ENGINEERING DEPARTMENT EQUIPMENT INFORMATION SUMMARY									
PROJECT NAME		PREPARED BY	CEA NO.	AREA	PAGE				
APPROVED BY		INITIAL ISSUE	REV. NO.	REV. ISSUED	2 OF 4				
AROCOR FRACTIONATION 1242-B			4-9-70						
CED EQUIPMENT IDENTIFICATION NUMBER	DESCRIPTION OF EQUIPMENT ITEM	QTY.	SIZE, RATING, MODEL, ETC	MATERIAL OF CONSTRUCTION	OPERATING WEIGHT (POUNDS)	REMARKS	ESTIMATED PRICE (\$)		
1-105-000	REBOILER PUMP	1	4x6 - 11 1/2 900GPM, 60' TDH	CAST STEEL		JACKETED BEARINGS + SEALS	N 2,400		
1-105-001	MOTOR	1	40 HP, 1750 RPM			TEFC	N		
1-106	REBOILER FURNACE	1	3.5 M ² 8TH/HR	STEEL COIL		GAS FIRED	N 20,000		
1-107	CONDENSER	1	3.5 M ² 8TH/HR 600 FT. ²	SHELL - STEEL TUBESIDE - MONEL			N 9,400		
1-108-000	REFLUX PUMP	1	3x1 1/2 - 13 A 30 450GPM - 100' TDH	3/16 SS			N 1,200		
1-108-001	MOTOR	1	5 HP, 1750 RPM			TEFC	N		
1-109-000	TEMPERED WATER PUMP	1	3x2-13 A 30 300GPM, 100' TDH	DUCTILE IRON			N 1,100		
1-109-001	MOTOR	1	15 HP, 1750 RPM			TEFC	N		

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CENTRAL ENGINEERING DEPARTMENT				EQUIPMENT INFORMATION SUMMARY				CEA NO.	AREA	PAGE
PROJECT NAME				PREPARED BY	INITIAL ISSUE	REV. NO.	REV. ISSUED			
1242-B				P.L. NEARY	4-7-70			3 OF 4		
APPROVED BY										
CED EQUIPMENT IDENTIFICATION NUMBER	DESCRIPTION OF EQUIPMENT ITEM	QTY.	SIZE, RATING, MODEL, ETC	MATERIAL OF CONSTRUCTION	OPERATING WEIGHT (POUNDS)	REMARKS	ESTIMATED PRICE (\$)			
1-110	H1BOILER STORAGE	1	15,000 GAL VERTICAL	STEEL		WITH PLATE COIL	\$5,800			
1-111-000	H1BOILER STORAGE PUMP	1	3X2-10 A60 100GPM, 50' TDH	DUCTILE IRON						
1-111-001	MOTOR	1	5HP, 1750 RPM			TEFC	\$3,100			
1-112	1242 B STORAGE	1	12' 6" DIA X 24' 35. 22,000 GAL	ALUMINUM		WITH PLATE COIL	\$7,200			
1-113-000	TRANSFER PUMP	1	3X2-10 A60 150GPM, 100' TDH	316 SS						
1-113-001	MOTOR	1	20HP, 1750 RPM			TEFC	\$3,500			
1-114	SAME AS 1-112	1					\$3,200			
DSW 200407										
1-115-000	SAME AS 1-105-000	1								
1-115-001	SAME AS 1-105-001	1					\$2,400			

* SOURCE: N=NEW E=EXISTING R=TO BE RELOCATED
 ** ESTIMATED WEIGHT FILLED WITH NORMAL CONTENTS OR TEST MATERIAL, WHICHEVER IS HEAVIER

CENTRAL ENGINEERING DEPARTMENT EQUIPMENT INFORMATION SUMMARY

PROJECT NAME		PREPARED BY		CEA NO.	AREA	PAGE	
APPROVED BY		APPROVED BY		INITIAL ISSUE	REV. NO.	REV. ISSUED	
Acceler Fractionation 1202-8		R.L. NEARY		4-9-70		4 OF 4	
CED EQUIPMENT IDENTIFICATION NUMBER	DESCRIPTION OF EQUIPMENT ITEM	QTY.	SIZE, RATING, MODEL, ETC	MATERIAL OF CONSTRUCTION	OPERATING WEIGHT (POUNDS)	REMARKS	ESTIMATED PRICE (\$)
1-116-000	H/BOILER PUMP	1	1 1/2 X 1-6 AA 26PM, 30' TDH	STEEL		JACKETTED BEARINGS + SEALS	1500
1-116-001	MOTOR	1	3/4 HP, 1750 RPM			TEFC	
1-117	H/BOILER COOLER	1	6" DIA X 8' 40 FT ²	STEEL			1000
						TOTAL	111000

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* SOURCE: N = NEW E = EXISTING R = TO BE RELOCATED
 ** ESTIMATED WEIGHT FILLED WITH NORMAL CONTENTS OR TEST MATERIAL, WHICHEVER IS HEAVIER