Job No. Report No. Date:

Title: Aroclor Manufacturing Improvement Plan

Objective: To develop a guide to improvements in cost, capacity, and quality in the Anniston Aroclor plant.

Personnel: J. MacPherson (L. C. Fuhrmeister)

Reported by: J. MacPherson

Summary:

The major emphasis will be on quality attainment in the liquid Aroclor product line and capacity increase in the solid Aroclors. A summary of targets and commitments is as follows:

Liquid Aroclors

Year	Target Capacity	Predicted Sales	Quality	Potential Savings/Earnings
1968	53	42.7	Intermediate	229,770
1969	53	44.7	Product Strategy	30,000
1970	65	46.3		1,330,000
1971	65	49.5		30,000

Solid Aroclors

Year	Target Capacity	Predicted Sales	Quality	Potential Savings/Earnings
1968	10.5	10.5	No Change	150,100
1969	12	11.7	No Change	233,800
1970	14	13.2	No Change	238,200
1971	14	14.3	No Change	121,700

A commitment of 1920 technical man-hours will be required to support the target programs.

This issuance of the MIP marks a departure from the previous PIP format although the contex is essentially the same. The plan issued on 2/9/66 has been partially absorbed by a CED project with the result that only one major savings item (Aroclor still modification) was available for implementation; the item has not been installed as yet.

Introduction

The Process Improvement Plan (PIP) is being replaced by a Manufacturing Improvement Plan (MIP). In general the contex is the same however the MIP is to present a broader base by including source information write-ups contributed by personnel other than the area T.S.D. engineer. The procedures used to publish the MIP will be the same as for a PIP, the plan will be in the form of a progress report. Updating will be done when expedient to do so; certain sections may be updated quarterly while others only on necessity.

As with the PIPan MIP is to serve as a continuing guide to improvements in cost, capacity, and quality.

The previous PIP was issued on 2/9/66. This plan was not implemented because of product strategy changes. Divisional goals set in May 1966 required a much improved quality, this was not a major objective of the previous PIP. The major savings item in the 2/9/66 PIP was a labor savings project in the finished goods area; this project has been absorbed in a CED project (Aroclor expansion CEA 1430). The second major item was a modification to the liquid Aroclor still to permit the use of indirect heating of the still and realizing fuel savings, less product decomposition and reduced maintenance, this project has not been installed as yet, tentative EDC is 3/1/68.

Recommendations to Attain Targets

1. Install adequate fixed bed refining capacity to handle all electrical grade 1242/1254.

2. Install still modifications to allow still capacity to match chlorination ability (65 M lbs./yr.).

3. Maintain a T.S.D. effort of at least 1 engineer to attain estimated savings/earnings.

4. Ensure that all personnel involved with Aroclor are aware of the capacity deficit situation in the solid product area.

TARGETS

Liquid Aroclors

Year	Capacity M lb/yr	Quality	Estimated Potential Savings/Earnings: labor savings	O.S.T. savings	earnings	total
1968	53	Intermediate	———	8,770	221,000	229,770
1969	53	Product strategy goal	10,000	20,000	———	30,000
1970	65	Product strategy goal	10,000	20,000	1,300,000	1,330,000
1971	65	Product strategy goal	10,000	20,000	———	30,000

Solid Aroclors

Year	Capacity M lb/yr	Quality	Estimated Potential Savings/Earnings: material savings	labor savings	O.S.T. savings	earnings	total
1968	10.5	No Change	30,000	———	120,000	———	150,100
1969	12	No Change	33,800	30,000	40,000	130,000	213,800
1970	14	No Change	38,200	30,000	40,000	130,000	238,200
1971	15	No Change	41,700	40,000	40,000	———	121,700

Synopsis of the Process

A. Chlorinator Area

There are four batch operated liquid chlorinators, one batch operated solid chlorinator, and one continuous chlorinator system. The continuous system consists of four chlorinators cascaded with overflow in series.

The liquid chlorinators are charged with biphenyl and ferric chloride catalyst; charges for the solids chlorinator depend upon the Aroclor to be produced. Chlorine gas added through a sparger reacts with the charge to release HCl and heat; the HCl gas goes to the Muriatic Acid department. The specific gravity of the crude is used as the monitoring and control variable.

Crude Aroclors from both batch and continuous chlorinator systems are transferred to a tank to be air blown before distillation. Figures 1, 2, and 3 in Appendix I are sketches of the batch, continuous, and solid chlorinators.

B. Still Area

There are four stills in the Aroclor department; stills No. 2 and 3 are used for liquid Aroclors only, No. 4 is for solids only, and No. 1 can distill any grade of liquid or solid with the exception of 1268 and 5460.

(1) Liquid Aroclors

Crude Aroclor is charged from a blowing tank or a feed tank to a still. Hydrated lime is added and a vacuum of 40 MM. Hg applied; the still charge is then direct fired by circulation through a coil in a gas furnace, the distillate goes forward to a receiver. The distillation is semi-continuous since ten receivers are distilled prior to drawing residue from the still. The receiver charge is in turn transferred to a blending tank where it is treated with Attapulgus clay and filtered. Finished product is transferred to storage tanks prior to loading into drums or tank cars. Figure 4 is a sketch of a typical liquid still.

(2) Solid Aroclors

Distillation of solid aroclors is similar to liquids with the exception that the vacuum is approximately 10 MM. Hg. absolute and that generally two still charges are distilled before withdrawing residue.

Solid Aroclors 5460 and 1268 are flaked; all other refined solids are drummed from the receiver.

Figure 5 is a sketch of the solid still system.

C. Chemical Equations

(1) Liquid Aroclors

Based on the forecasted demands through 1971, the average Liquid Aroclor could be called 1245.6.

$$C_{12}H_{10} + 3.66\ Cl_2 \rightarrow C_{12}H_{10}(CL)_{3.66} + 3.66\ HCL$$

154.20 70.9 283.8 36.5

(2) Solid Aroclors

Based on the forecasted demands through 1971, the average Solid Aroclor would contain 60.4% chlorine and 2.92% Biphenyl.

$$.971\ \text{Santowax R} + .029\ \text{Biphenyl} + 10\ Cl_2 \rightarrow \text{Solid Aroclor} + 10\ HCL$$

230.3 154.2 70.9 586.0 365

3. Market Analysis

Appendices II and III present (1) a comparison of competitive materials with Aroclors 1242 and 1254 and (2) an analysis if the world market for Aroclors. If Monsanto is to compete, the following goals must be met:

1242/1254 Goals

	In Plant Storage	As Packaged	As Delivered
1254	Resistivity 15,000>	10,000	> 5,000
	PF (1kc) .3% ± .1	<0.4%	< 0.5% (± 0.1%)
1242	Resistivity 10,000>	5,000	> 3,000
	PF (1kc) 0.6% ± 0.1)	<0.9%	< 1.0% (± 0.1)

Monsanto's share of the market in 1966 and the objectives for 1971 are presented below:

Capacitor Aroclor

	1966	1971
Domestic	78.4%	71.5%
Non-Domestic	71.5%	67.2%

Transformer Askarel

	1966	1971
Domestic	61%	67.4%
Non-Domestic	59.5%	65.8%

It must be emphasized that the quality goals presented above were introduced at the Corporate Aroclor meeting held in St. Louis on May 9 and 10; these goals represent marketing necessity as of 1967. The Product Strategy quality goals remain at a higher quality level since they represent a long range goal.

Monsanto
ORGANIC CHEMICALS DIVISION

FINISHED PRODUCT SPECIFICATION

PRODUCT		DEPT.
Aroclor 1254 - Export Grade Electrical Grade		27-L
PLANT	PRODUCT CODE	USE
Anniston	826.13	Sales
DATE EFFECTIVE	SALES CODE	
3/23/67	1040-280-16-009	

APPROVALS

PRODUCTION	RESEARCH
R. G. Moody/s/R. G. Moody 3/23/67	L. R. Stark/s/L. R. Stark 3/21/67
SALES	QUALITY CONTROL (Chief Chemist)
W. E. Ault/s/W. E. Ault 3/17/67	G. W. Miller/s/G. W. Miller 2/23/67

GENERAL DESCRIPTION: Mixture

CHEMICAL FORMULA:

MOL WT.

SUPERSEDES SPECS. OF	SAMPLE FOR ANALYSIS	ISSUED BY
Tentative 4/27/66	3 x 5 pt. Amber bottles	J. A. Liddle 2/21/67

CHARACTERISTIC	LIMITS	METHOD
UNRESTRICTED INFORMATION		
(R) Color, APHA	50 Max.	046
(R) Condition	Clear	G-1
(R) Specific Gravity @ 65/15.5 °C	1.495 - 1.505	052
(R) Acidity (mg KOH/gm.)	0.010 Max.	050
(R) Moisture (H_2O), ppm	35 Max.	047
(R) Refractive Index @ 25°C	1.6370 - 1.6390	048
(R) Inorganic (free) Chlorides, ppm	0.05 Max.	045
(R) Pour Point, °C	7 - 12	053
(R) Dielectric Constant 1000 Cycles @ 100°C	4.15 - 4.35	113
(R) Resistivity ohm-cm 500 VDC @ 100°C, 0.1" Gap	$10{,}000 \times 10^9$ Min.	121
(R) Hydrolysis Stability Test as chlorides, ppm	1.0 Max.	010
(R) Monsanto Stability Test as chlorides, ppm	0.5 Max.	133
(R) Distillation Range, ASTM D-20, corrected		054
10% Distilled by wt.	366 - 378°C	
50% Distilled by wt.	371 - 383°C	
90% Distilled by wt.	379 - 394°C	
(R) Biphenyl, %	0.025 Max.	100
Sulfates	None	
Dielectric Strength @ 25°C	35 KV, Min.	043
Flash Point	None to Boil	114
Fire Point	None to Boil	114
Viscosity @ 210°F (SUS)	44 - 48	049
Corrosion Test 6 hours @ 210°C with bright aluminum foil		
Change in wt. of Al (%)	0.0	
A.C. Color, APHA	60 Max.	046
A.C. Condition	Clear	G-1
A.C. Acidity (mg. KOH/g.)	0.010 Max.	050
A.C. Inorganic (free) chlorides, ppm	0.05 Max.	045

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RESTRICTED INFORMATION		
Power Factor @ 100°C & 60 Cycles	Report	113

(R) Routine Analysis, All others Analyzed by request Only

Monsanto
ORGANIC CHEMICALS DIVISION

TENTATIVE SPECIFICATION

PRODUCT: Aroclor 1242, Electrical Grade		DEPT.: 27-L
PLANT: Anniston	PRODUCT CODE: 826.12	USE: Sales
DATE EFFECTIVE: 6-12-67	SALES CODE: 1040-240-16-009	
AUTHORIZED BY: G. W. Miller	SOURCE OF SPECIFICATION: P. G. Benignus Memo dated 5-11-67	

GENERAL DESCRIPTION

CHEMICAL FORMULA

MOD. NO. / ISSUED	EFFECTIVE UNTIL	SAMPLE FOR ANALYSIS	ISSUED BY
	6-1-68	3 x 5 pt. Amber bottles	J. A. Liddle 5/29/6

CHARACTERISTIC	LIMITS		METHOD
UNRESTRICTED INFORMATION			
(R) Color, APHA	40 Max.		046
(R) Condition	Clear		G-1
(R) Specific Gravity @ 25°/15.5°C	1.381 - 1.392		052
(R) Acidity (mg KOH/gm)	0.010 Max.		050
(R) Moisture, H_2O, ppm	35 Max.		047
(R) Refractive Index @ 25°C	1.6240 - 1.6260		048
(R) Inorganic (free) Chlorides, ppm	0.05 Max.		045
(R) Pour Point, °C	-14 or lower		053
(R) Dielectric Constant 1 KC @ 100°C	4.70 - 4.90		113
(R) Resistivity ohm-cm 500 VDC @ 100°C, 0.1" Gap	$5{,}000 \times 10^9$ Min.		121
(R) Hydrolysis Stability Test (as chlorides) ppm	0.5 Max.		010
(R) Monsanto Stability Test (as chlorides) ppm	0.4 Max.		133
(R) Biphenyl, %	0.05 Max.		100
(R) Distillation Range (ASTM D-20, Corrected)			054
10% Distilled by wt.	325°C Min.		
90% Distilled by wt.	360°C Max.		
Sulfates	None		12169 (WGK)
Dielecrric Strength @ 25°C	35 KV Min.		043
Flash Point (°F)	338 - 392		114
Fire Point	None to Boil		114
Viscosity @ 100°F (SUS)	82 - 92		049
RESTRICTED INFORMATION		Typical Values	
Power Factor @ 100°C			113
60 cycles	Report	0.30 - 0.50	
1000 cycles	Report	0.08 - 0.10	

/s/G. W. Miller - 5-31-67
G. W. Miller - Chief Chemist

/s/H. L. Williams - 6-1-67
H. L. Williams - Production

/s/Wm. E. Ault - 6-8-67
W. E. Ault - Sales

/s/L. R. Stark - 6-12-67
L. R. Stark - Research

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(R) Routine Analysis. All others Analyzed by request only.

5. Process Analysis

Liquid Aroclors

A comparison of the Product Strategy quality goals and YTD Anniston performance is as follows:

	Aroclors 1242	Aroclors 1254	Project Strategy Goals (1242 & 1254)
Color (APHA)	14	18	10 Max.
Water (ppm)	24	26	20 Max.
Resistivity @ 100°C ($\times 10^9$ ohm-cm)	1,450	7,750	10,000 Min.
Power Factor @ 100°C (% at 60 cps)	2.70	.85	0.2 Max.
Thermal Chemical Chloride Stability (ppm)	.26	.42	0.1 Max.

Intermediate product specifications are presented on the specification sheets included in this section.

To attain the targeted quality goals it will be necessary to (1) improve the treatment capability of Aroclor refining, (2) reduce the atmospheric contamination during processing and storage, and (3) eliminate ionic contamination from the handling equipment.

It is possible to produce target quality 1254/1242 guides by multiple (3 or 4) batch absorbent treatments using Porocel (activated bauxite LVM grade). An apparent tachological breakthrough for the treatment operation is the utilization of a fixed bed absorbtion unit charged with Procel; figure ____ shows a resistivity versus time for an experimented unit installed on the No. 2 liquid still system in May 1967. The technique definately will product goal quality 1242. Laboratory tests are being conducted on Aroclor 1254, it is anticipated that 1254 will upgrade easily. The installed unit is considered a pilot unit for a larger capacity bed to be designed in December 1967.

Degradation of product occurs during transfer to the storage tanks, on occasion while in storage, and in loading operations. The quality decrease is attributed to atmospheric contamination since the blending tanks and storage tanks (with the exception of the two major tanks for 1254 & 1242 storage) are free breathers and to ionic contamination from exposed surfaces in the galvanized piping and tank linings. In-plant projects have been approved to install nitrogen blanketing facilities on the storage tanks and refining systems. A comprehensive project, CEA 1430 - Aroclor Expansion, has been prepared by CED to provide improved storage and handling of product Aroclors. In the liquid area this will include 11 new bulk storage tanks, 3 blend tanks, pumps, filters, separate product pipe lines, tank car and tank truck loading facilities.

Seeking all possible innovations to assist in the quality drive it has been proposed that Anniston PR&D initiate a program to define process conditions needed to determine when air blowing of the crude liquid is complete; TSD will prepare a project to remove contaminents from the blowing air supply.

The basic weakness of the Liquid Aroclor area is the fact that all the still systems are batch operations and half of the available chlorinators are batch units. Conversion to continuous would offer increased capacity, improved labor efficiency, and optimum quality control. Projects oriented to continuous operation include (1) an Anniston PR & D program to evaluate pulling sidestreams for various grades of Aroclors from a continuous chlorination system, (2) a proposed CED evaluation of crude blowing and distilling in the same unit, and (3) a CED evaluation of converting No. 3 liquid still system to continuous operation.

A basic need in the liquid Aroclor area is the establishment of the relationship between product isomer distribution and sales specifications; this in turn will lead to control of process variables affecting isomer ratios and the establishment of optimum operating conditions. A TSD project to do such a study is active.

The handling of the residue (Montars) from the stills offers a hazard to the operators and promotes labor inefficiency. Current practice is to drain the still residue into drums and transport the drums to the company dump. A survey of the Montar problems has been completed, evaluation and recommendations will be completed by 12/15/68.

Solid Aroclors

Solid quality is specified by softening point and color of the finished product. Quality problems were not evident until Santowax-R from the new still (on stream Dec. 1966) was used for routine production of Aroclor 5460. Immediate production problems included excessive HCl evalution during distillation, increased still residues, high product color, and longer chlorinator cycles. Laboratory investigations indicated that a higher quaterphenyl content in the Santowax-R was responsible; PR & D work is continuing in an effort to provide relationships between polyphenyl content, crude chloriator levels, and yields. A TSD study based on the lab data, will be implemented to determine the most economical operating conditions.

A primary need is an in-line analytical instrument to measure chlorine content of the chlorinator charge either continuously or on demand with short lag time. TSD will conduct a survey of available instrumentation and recommend a section based on the duties (buy, develope, or wait).

Residue handling is a hazard as in the liquid still area, a major difference is that the majority of residue (Montar 5) is solid. Recommendations for handling the solids Montars will be generated during the analysis of the Montar survey.

Capacity Analysis

Detailed analysis of the liquid and solid product lines follows however it is important that the capacity goals of the Anniston plant be presented before any discussion. Table ____ is a projection of the commitments and desirable capacity goals for the Aroclor plant.

TABLE ____

Anniston Capacity Goals

$\bar{M}$ lbs./yr.

		1968	1969	1970	1971	1972
Liquid	commitment	42.74	44.67	46.26	49.51	51.72
	surge (30%)	12.80	13.40	13.88	14.85	15.50
	Total	55.54	58.07	60.14	64.36	67.22
Solid	commitment	10.47	11.66	13.15	14.33	15.02
	surge (30%)	3.14	3.50	3.94	4.30	4.51
	Total	13.61	15.16	17.09	18.63	19.53

Liquid Aroclors

A brief summary of the liquid Aroclors production is as follows:

	1966	1967 YTD (Aug.)
Actual production	40,735,885	29,639,219
Scheduled production	41,663,295	29,821,118
Capacity rate (lbs/hr)		
(1) design	5,974	5,974
(2) demonstrated	6,059	6,779
O.S.T.	88.92	87.51

The capacity rates necessary to make scheduled production were 5430 lbs/hr for 1966 and 5955 lbs/hr for YTD, these rates are based on the actual O.S.T. However if the scheduled production had been equivalent to 48 M lbs/yr the rates would had to have been 6255 lbs/hr and 6430 lbs/hr based on the same O.S.T., rates of this magnitude have been demonstrated but it is stillimperative that the O.S.T. of the liquid area be improved. It is obvious that O.S.T. itself does not set the production rate, it is the combination of capacity rate and productive time. The objective is to eliminate as many causes of the non-productive time as possible and to permit the plant to set its productive capacity by varying the capacity rate. Appendix V presents a tabulation of the non-productive time for 1966 and 1967 YTD (May). Table ____ is a comparison of downtime for 1966, 1967 TYD, 1967 projection, and the standard values.

TABLE ____

Liquid Aroclors Downtime Comparison

	Standard Hours	1966	1967 YTD (Aug.)	1967 Projection
Repair	259	220	196	294
Process	173	355	122	183
Other	173	369	317	475
	605	944	635	952

Table ____ presents a summary of downtime causes and corrective actions; the estimated time savings are 58.0 process hours and 104.3 other hours. An additional 29.3 other hours should not re-occur. A projection, based on successful completion of the indicated actions, for future downtime is:

Repair	294
Process	125
Other	342
Total Hours	761

O.S.T. for this downtime sum would be 91.2%, requiring a capacity rate of 6100 lbs/hr. which has been demonstrated. Capacity beyond 48 M lbs/yr can be gained by installing level instruments on the still receivers, blend tanks, and filtrate receivers and by replacing the existing still receiver pump with identical but new pumps. The capacity rate estimated for this modification is 6650 lbs/hr or 53 M lbs/yr.; a project has been approved for this modification.

The 53 M lbs/yr. must be considered on interim production plateau since the chlorination capacity is estimated at 65 M lbs/yr. Steps to exceed the 53 M lb. level include items such as improved preheat for the still feed, improved still condensers, and higher capacity vacuum jets; an estimated investment of $85,000 will allow the still system to match the chlorination capacity.

It appears that Anniston can meet the capactiy goals through 1971.

TABLE ____

Downtime Cause	Corrective Action	Time Savings - hrs.	Responsibility
1. Waiting on room in blend tanks	a. Export grade 1242 to be refined in fixed bed refining unit.	14.5 Process	Unit installed, production to accept as manuf. unit at end of 12/10/67 demonstration period. (12/10/67)
	b. Install second fixed bed refining unit to handle all 1242; first unit to handle all 1254.	8.5 Process	T.S.D. to design based on data from first unit. EDC for installed unit-6/1/68.
2. Waiting on crude	Change trim size of chlorine valves on batch chlorinators.	35 Process	Maintenance
3. Cl_2 plant down	Install drowning system so that Aroclor does not have accept Cl_2 air mixture during maintenance operations in chlorine plant.	27.5 Other	T.S.D. to design drowning system - EDC?
4. Export grade Aroclor	a. Same as 1. a.	20 Other	1. a.
	b. Same as 1. b.	12 Other	1. b.
5. Inventory Adjustment	Install adequate finished product storage.	44.8 Other	C.E.D. design package; estimated installation date 10/15/68.
6. a. Low Cl_2 pressure b. Empty Cl_2 cars	Install RR spot/loading station to handle additional cars.	17.3 Other	Project approved, T.S.D./ consultant design package ready by 12/15/67.

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Solid Aroclors

A summary of the Solid Aroclors production is as follows:

	1966	1967 YTD (Aug)
Actual production	8,287,766	6,280,503
Scheduled production	9,435,599	6,275,675
Capacity rate (lbs/hr)		
(1) design	1247	1289
(2) demonstrated	1789	1485
O.S.T.	73.23	79.17

Design capacity for the plant is 10 M lb/yr.; design rates for 1967 have been adjusted to reflect the change in O.S.T. standard, 90% versus 93% (1966). When discussing capacity it important to remember that the plant ability is measured by both O.S.T. and capacity rate. For instance, in 1966 a 1789 lb/hr rate was recorded with an 81.46% O.S.T. and a 1312 lb/hr rate was experienced with 88.69% O.S.T.; YTD O.S.T. was 79.17% with a 1349 lbs/hr. The first objective in the solid Aroclor area is to reduce as many downtime causes as possible in order to improve the O.S.T. and maintain capacity rates at levels required to meet design production (10 M lbs/yr).

Appendix V presents a tabulation of the non-productive time for 1966 and 1967 Y.T.D. Table ____ is a comparison of downtime for 1966, 1967 Y.T.D., 1967 projection, and the standard values.

TABLE ____

Solid Aroclors Downtime Comparison

	Standard Hours	1966	1967 YTD (Aug.)	1967 Projection
Repair	431	732	630	945
Process	172	1039	209	314
Other	172	486	168	252
	775	2257	1007	1511

Corrective actions for some if the downtime causes are presented in Table ____. Predicated on the successful completion of the proposed projects, future downtime is estimated at:

Repair	868
Process	313
Other	104
	1285

This non-productive time represents 14.8% downtime or 85.2% O.S.T.; at 10 M lbs/yr. this would be capacity rate of 1360 lbs/hr., this rate has been demonstrated. To produce more than 10 M lbs/yr there must be:

1. bottleneck elimination
2. improved yield
3. Improved O.S.T.

The most immediate bottleneck is the solids flaker; this unit can process 10.2 M lbs/yr. A new flaker capable if handling 16 M lbs/yr is to be installed, estimated incentive for this new unit is presented in Appendix VIII. Timing of this installation will depend upon whether the unit is to be part of a CED design package or an in-plant project.

The estimated capacity of the solids system is:

$$1349 \frac{\text{lbs}}{\text{hr}} \times 8640 \frac{\text{hr}}{\text{yr}} \times .90 \text{ O.S.T.} \times \frac{90 \text{ goal yield}}{73 \text{ actual YTD yield}} = 13 \text{ M lb/yr}$$

To gain this 13 M lb., yield must be improved from the YTD 73% to 90% and the O.S.T. advanced to 90%; the improved O.S.T. must be gained while maintaining at least a 1349 lbs/hr capacity rate.

A increase in yield can be gained by an improvement in the quality of the crude (5060) produced in the No.9 chlorinator. From January 1 - January 4, 1967 the solids still had difficulty in finishing a distillation and experienced high evaluation of HCl at the end of a batch. The problems were traced to high quaterphenyl content (17.20%) in santowax R for the new still system. A laboratory investigation of this phenomena reported that not only did reduced quaterphenyl content improve yield but also reduced the chlorination time. Based on these preliminary lab results, the first estimate of the capacity gain at a 5% quaterphenyl content would be:

$$1590 \frac{\text{lbs}}{\text{hr}} \times 8640 \frac{\text{hr}}{\text{yr}} \times .90 \text{ O.S.T.} \times \frac{90 \text{ yield}}{73 \text{ yield YTD}} = 15.26 \text{ M lb/yr.}$$

This calculation assumes an 2 hour decrease in chlorination time and an improvement in yield to 90%. A plant study on the effects of varying quaterphenyl content is scheduled to be completed by December 1967; data from the study will permit a firmer estimate.

The program to-date has the ability to improve the O.S.T. to 82.5%; continued planning and updating of the project networks will be required to push the O.S.T. to 90%. Efforts will be continued to define targets for O.S.T. improvement.

Another opportinuity to gain in capacity to gain in capacity rate is in chlorine quality; YTD chlorine delivered to the Aroclor chlorinators is 82.4%, chlorine quality at the header from the Cl_2 plant is 90%. The chlorine used in the solid system has a higher quality since the Cl_2 vaporizer output is predominately used by solids, estimated quality is 90%. However if the delivered Cl_2 quality can be raised to 90% the solid feed chlorine quality would become approximately 94.5%; this could raise the capacity rate from 1349 lbs/hr to 1415 lbs/hr. If the SW-R yield studies are fruitful that projected 1590 lbs/hr could be raised to 1672 lbs/hr., 16.02 M lbs/yr at 90% O.S.T. and 90% yield.

Based on the analysis it would appear that Anniston can meet the solid goals through 1970. If the solids market continues to expand it may be necessary to install a second solids chlorinator.

A summary of capacity calculations is presented after Table ____.

TABLE ____

Downtime Cause	Corrective Action	Time Saving Hours	Responsibility
1. Still circulatin line plugged	Install flowmeter capable of withstanding high temperatures	11.3 Process 46.5 Repair	TSD select and install instrument - EDC - ?
2. (a) Switch Cl_2 car (b) Low pressure, Cl_2 cars (c) empty Cl_2 car	Install RR spur to handle two additional Cl_2 tank cars; loading stations will be required.	148 Other	Project approved; TSD working on design, installation will be construced - EDC 2/1/68
3. Cl_2 plant down	Install drowning system so that Aroclor does not have to accept Cl_2/air mixture during maintenance operations in Cl_2 plant.	90 Other	TSD to design system EDC -
4. (a) Chlorinator pump (b) Cl_2 distrubutors	Improve availability of spare parts	30 Repair	Maintenance

Solid Aroclor Production Potential

October 18, 1967

$17{,}500 \frac{\text{lbs}}{\text{batch}}$ @ $16\frac{1}{13}$* hr/batch

* includes downtime
1 = real cycle

1. No damage in yield or cycle time: improved O.S.T. only

$$17{,}500 \frac{\text{lbs}}{\text{batch}} \times \frac{8640 \text{ hr}}{\text{yr}} \times \frac{\text{batch}}{13 \text{ hr}} \times .7917 \text{ O.S.T.} = 9.21 \bar{M} \text{ lbs/yr}$$

$$9.21 \bar{M} \text{ lbs/yr} \times \frac{.8500}{.7917} = 9.88 \bar{M} \text{ lbs/yr}$$

$$9.21 \bar{M} \text{ lbs/yr} \times \frac{.9000}{.7917} = 10.48 \bar{M} \text{ lbs/yr}$$

2. Yield raised from 73% to 90%

lbs/yr	O.S.T.
11.38	.7917
12.18	.8500
12.92	.9000

3. Yield raised from 73% to 90% and cycle time dropped from 13 hrs to 11 hrs.

lbs/yr	O.S.T.
13.42	.7917
14.40	.8500
15.26	.9000

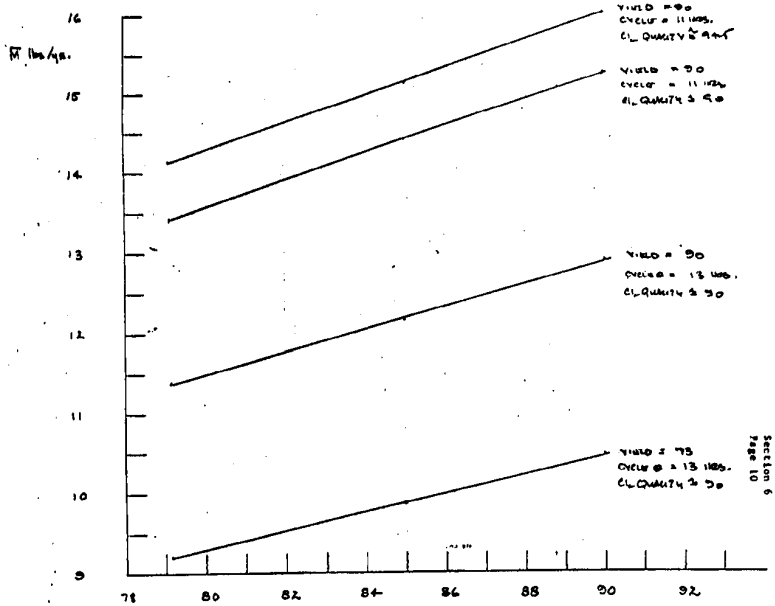
4. Yield = 90%

cycle time = 11 hr

improved Cl_2 quality; YTD supplied by Cl_2 plant = 82.5 % YTD est. at solid chlorine = 90%*
*combination of Cl_2 plant, chlorine + vaporizer supply

Target quality = 94.5 for solid system

lbs/yr	O.S.T.
14.10	.7917
15.10	.8500
16.02	.9000



Section 6
Page 10

BY ..... DATE .....
CHKD BY ..... DATE .....
SUBJECT .....
JOB NO ..... SHEET NO ..... OF .....

Cost Analysis

1. Cost Variances

Table I presents a summary of the YTD variances (July 1967) for Liquid and Solid Aroclors. Comments on the individual variance items and copies of the YTD cost report are presented in Appendix X.

The total product cost variance for 1967 is projected to be $340,000; of this amount 74% ($252,000) will be in direct conversion costs. These costs are due for the most part to unforseen increases in TSD, Research, and Experimental costs and in some items unrealistic cost standards. A savings item in this cost category is the production department containers; this cost in incurred by the present procedures for handling the waste Montars from the Aroclor plant. A study is being conducted to determine possible alternate handling techniques, potential savings are estimated to be $9,300/yr.

A target in the material costs is chlorine. Total Cl_2 variances for the Aroclor plant amount to approximately $70,000/year. Programs required to reclaim these costs include (1) an improved monitoring system for the cell efficiency in the chlorine plant, (2) a study to determine how to improve chlorine quality, and (3) a study of chlorinator efficiences in the Aroclor department. Anticipated dates for the recovery of the $70,000 are not available at this time.

Of particular interest are labor savings to he gained by the installation of improved drumming, flaking, and storage facilities (CEA 1430) in the Aroclor department. Labor requirements to meet projected production rates are compared below in two categories, with existing facilities and with the improved plant:

Year	Existing Plant	(CEA 1430) Improved Facilities
1968	11	8
1969	12	8
1970	12	8
1971	13	8

Labor savings by CEA 1430 may range from $30,000 to $50,000/yr.

An unusual cost item is the handling of Montar 5 which is the residue from the Solids still. The material is solid in three basic forms (1) coarse crush 375 lbs/drum (2) fine crush 375 lbs/drum, and (3) fine crush 350 lbs/drum. A comparison of selling price and cost are as follows:

	$/lb Selling Price	Cost
Coarse crush 375 lbs/drum	$.053	$.0569
Fine crush 375 lbs/drum	$.053	$.0835
Fine crush 350 lbs/drum	$.053	$.0606

A study will be made on the production of labor costs in the handling of this product. However this will continue to be a marginal item since drum/material costs are as follows:

	$/lb Drum/Material Costs	Selling Price
Coarse crush 375 lb/drum	$ .0412	$ .053
Fine crush 375 lb/drum	$ .0412	$ .053
Fine crush 350 lb/drum	$ .0412	$ .053

The required reduction in labor costs is as follows:

	Present Labor	Labor Cost to match Manuf. Cost	Labor Cost Reduction
Coarse crush 375 lb/drum	$ .0157	$ .012	$ .0037
Fine crush 375 lb/drum	$ .0423	$ .012	$ .0303
Fine crush 350 lb/drum	$ .0183	$ .012	$ .0063

TABLE I

YTD (July 1967) Cost Variances for Aroclors

	Material Cost	Direct Conv. Cost	Indirect Conv.	Product Cost
Liquid Total	$ 18,234-	$ 119,794-	$ 227-	$ 138,175-
Solid Total	$ 19,567-	$ 7,648-	$ 5,857-	$ 42,615-

Potential Raw Material Savings

Improve Santowax R/Biphenyl yields in the Solid Aroclors product line. If all yields can be raised to 90% the following material savings potentials exist:

	1968	1969	1970	1971	1972
Solid Aroclors	$30,100	$33,800	$ 38,200	$ 41,700	$ 43,700

Production Cost Standard yields are as follows:

	Santowax R	Biphenyl
1269	___	78
4465	78	78
5442	92	___
5460	78	___

YTD (July) yields are 73% vs. 78%.

Anniston, Alabama

September 22, 1967

AROCLOR COMPETITION

George R. Buchanan

General Offices

A Manufacturing-Improvement Plan is being prepared for the Aroclor product line at Anniston. One section of this report is entitled competitive technology. Comparison of competitive materials has been performed at Anniston, however, a description of the competing companies is not available. Can you provide data on Bayer, Prodelec, and _____? Items such as home office, assets, product lines, etc. would be most desirable.

Thank you.

John MacPherson

JM:kd

Anniston, Alabama

November 8, 1967

R. C. Loyer
Patent Attorney
General Offices

A Manufacturing Improvement Plan is being prepared for the Aroclor product line at Anniston. One section of this report is entitled patent status. Can you furnish a brief description of the patent situation for the Aroclors?

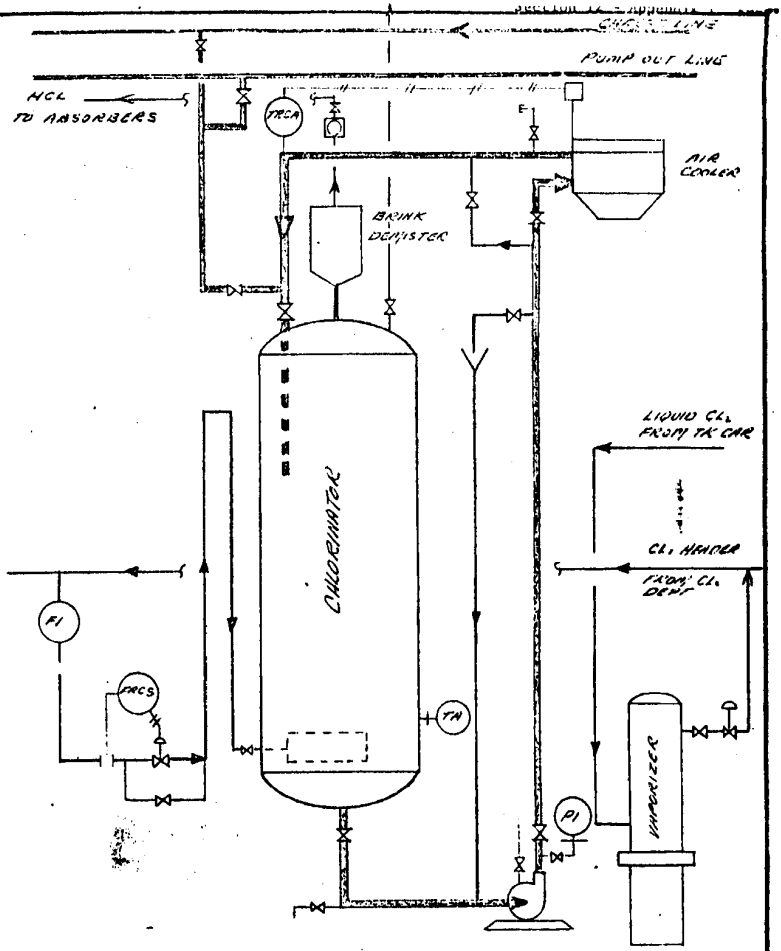
Thank you.

John MacPherson

JMP:kd

Stream and Air Pollution

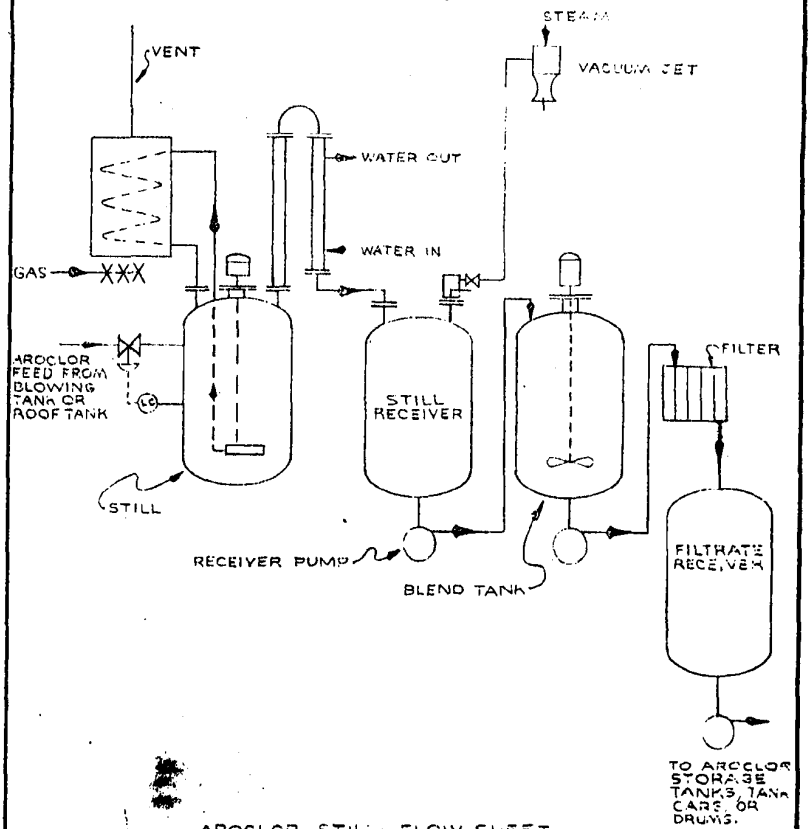
A survey of the Aroclor plant pollution will be completed by 2/15/68.



ANNISTON PLANT — MONSANTO COMPANY — ANNISTON, ...

TITLE					AUTH. NO.
BATCH CHLORINATOR					JOB NO.
DRAWN BY	CHECKED	APPROVED	DATE	SCALE	TS-A 804-5
ELLIS			12-2-65		

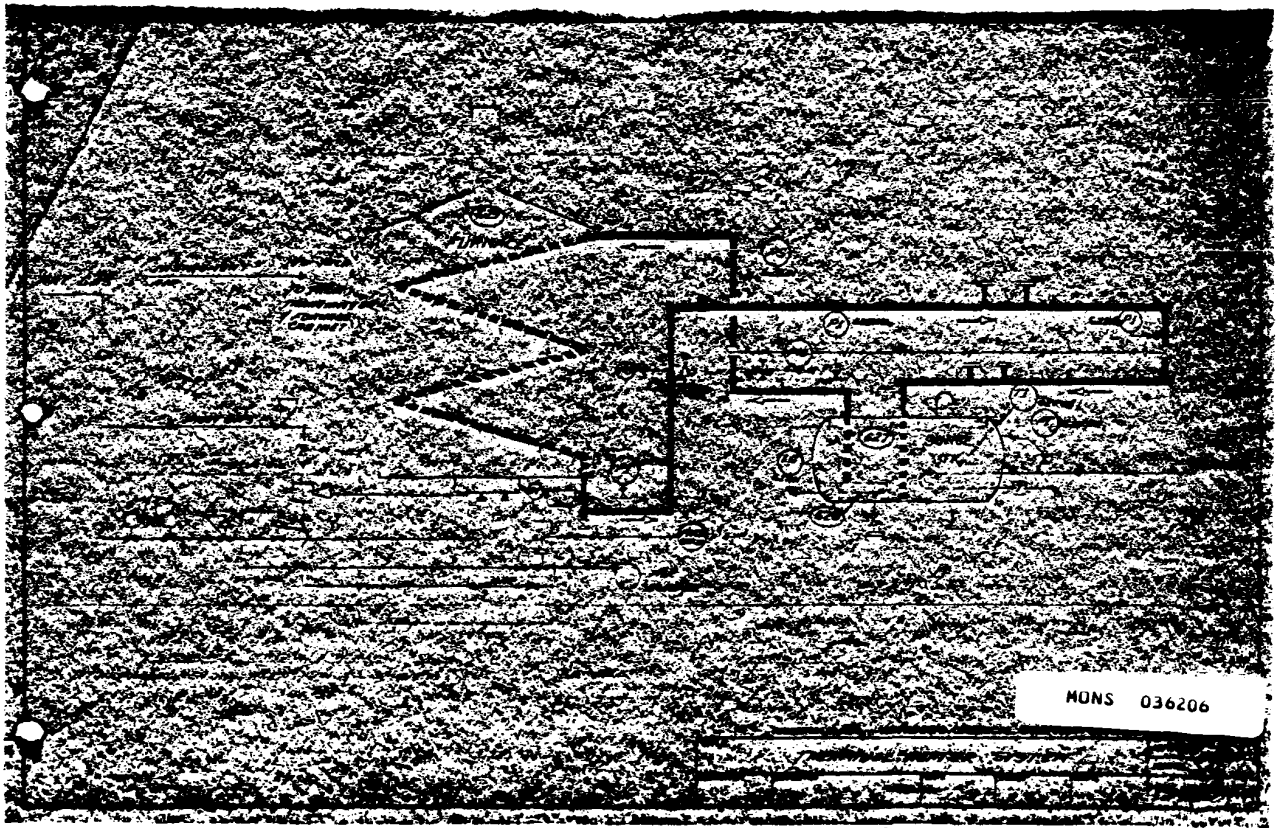
MONS 036204



AROCLOR STILL - FLOW SHEET

ANNISTON PLANT - MONSANTO CHEMICAL COMPANY - ANNISTON, ALA.

TITLE					AUTH. NO.
AROCLOR STILL - FLOW SHEET					JOB NO.
DRAWN BY	APPROVED	DATE	SCALE	DEPT.	
EAE		8-10-64	NONE	AROCLOR	TS-A-704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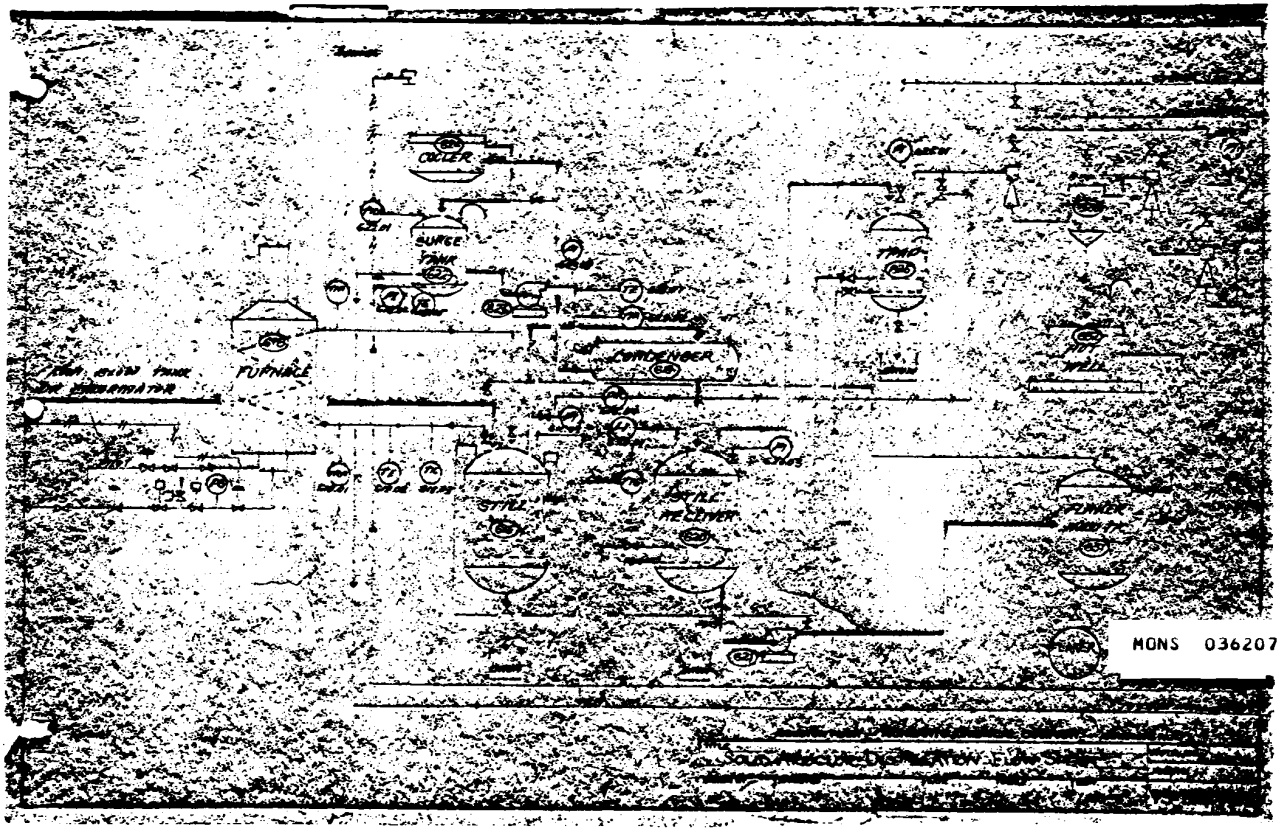
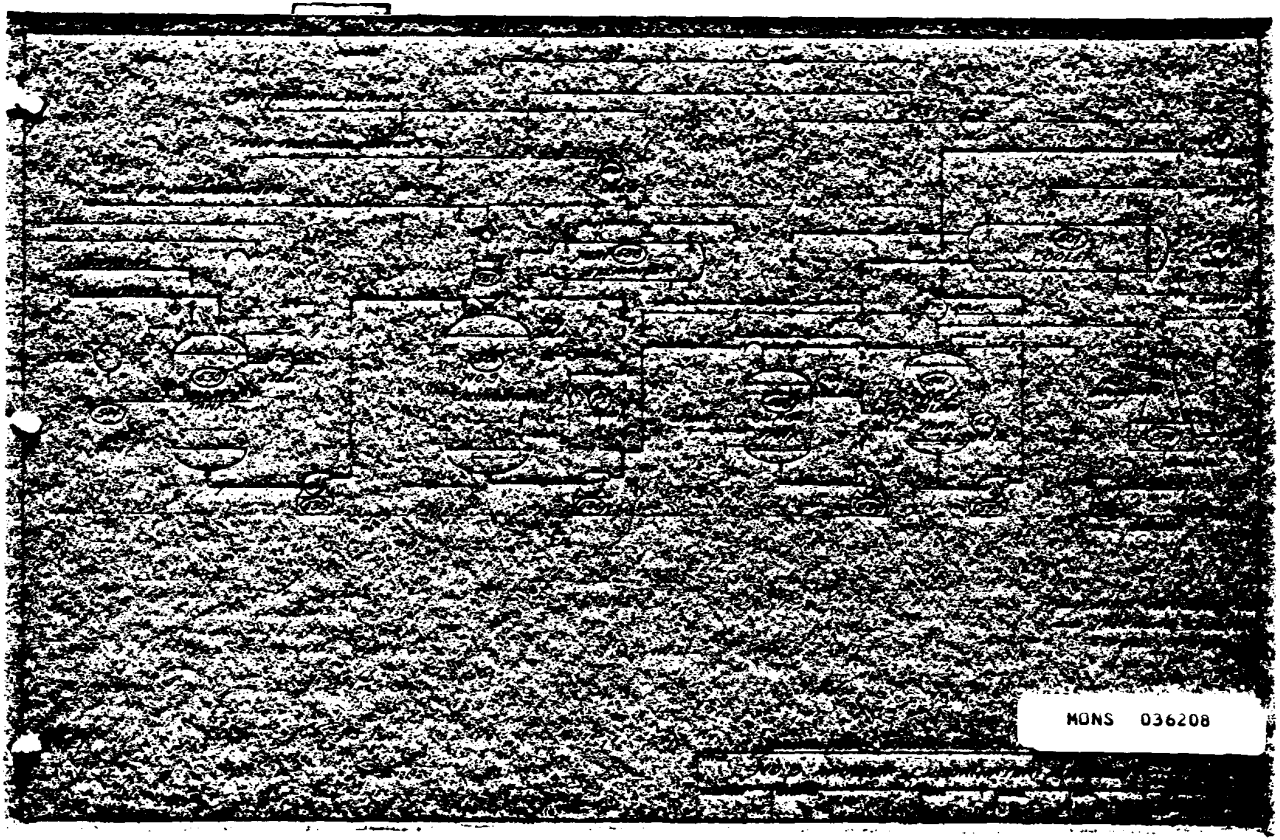

COOLER
SURGE TANK
CONDENSER
STILL
STILL RECEIVER
MONS 036207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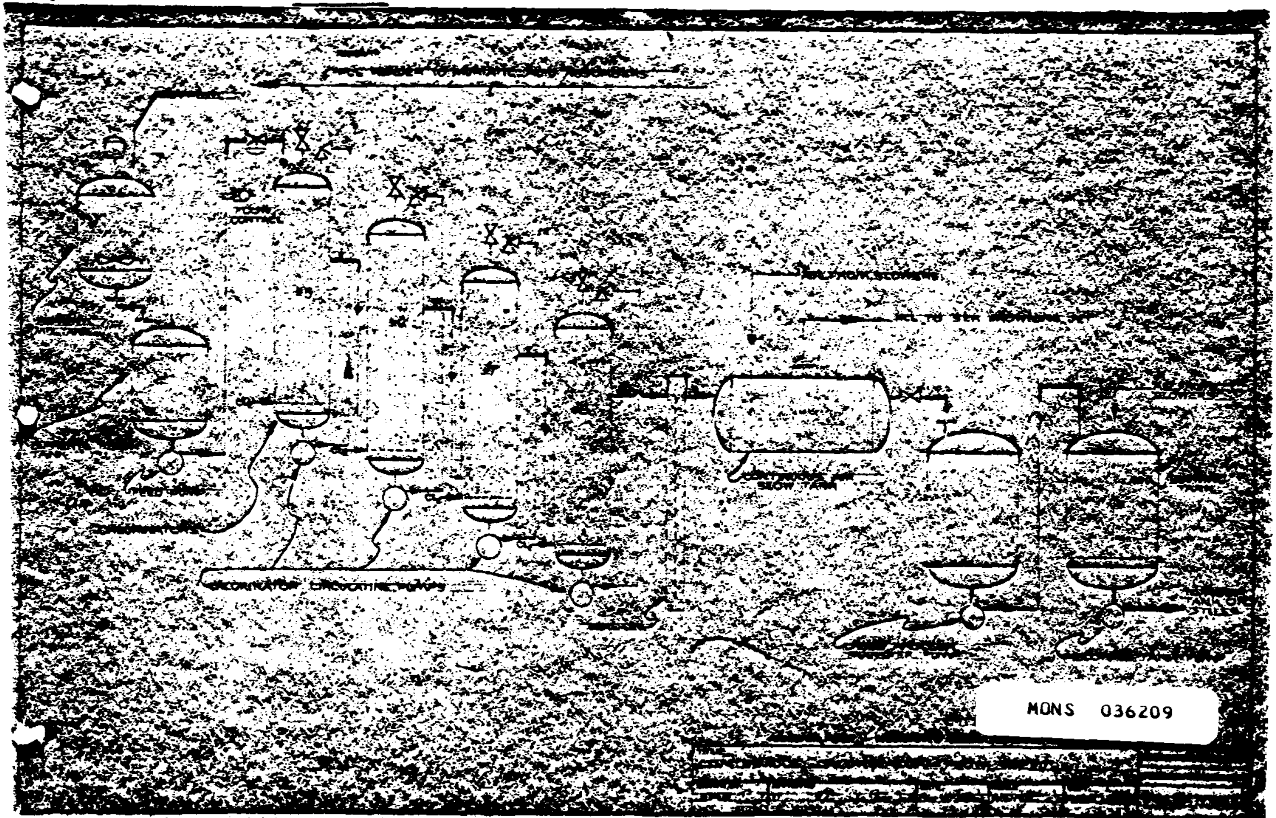
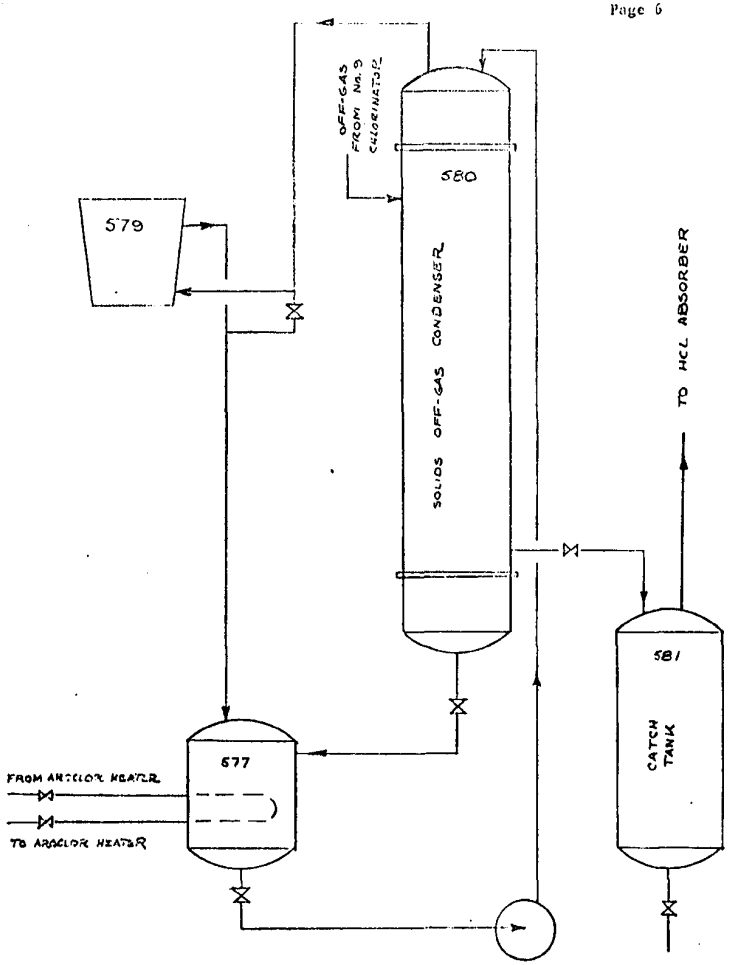
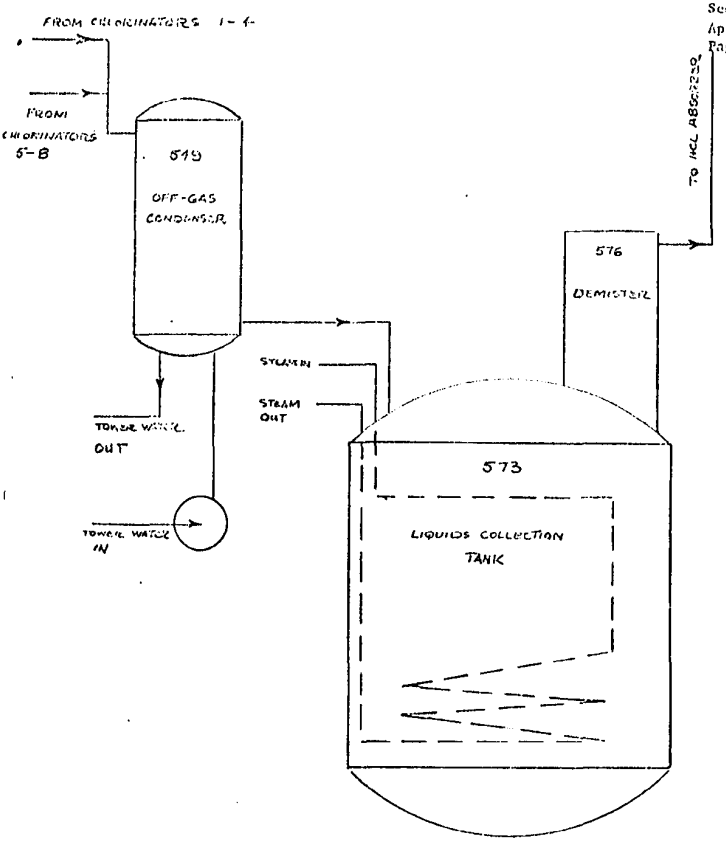



OFF-GAS FROM No. 9 CHLORINATOR
580
579
SOLIDS OFF-GAS CONDENSER
TO HCL ABSORBER
581
CATCH TANK
577
FROM AROCLOR HEATER
TO AROCLOR HEATER

MONS 036210

BY. J.M.S DATE 5/9/66 SUBJECT ... SHEET NO ... OF ...
CHKD. BY J.M.D DATE 5/9/66 LIQUID HCl OFF-GAS CONDENSATION JOB NO. ...



COMPANY CONFIDENTIAL

RESEARCH AND DEVELOPMENT REPORT
ANNISTON PLANT

Report No. L
Job No. 370-503
Date 5-5-67

OTHER LOCATIONS	GENERAL OFFICE	ANNISTON PLANT
J. R. Savage - WGK	H. C. Carder	W. B. Papageorge
P. E. Heisler - WGK	P. G. Benignus	L. C. Fuhrmeister
D. C. Armstrong - WGK	R. A. Steenrod	J. MacPherson
A. F. Regan - MCL	G. R. Buchanan	J. G. Bryant
C. R. Coleman - MCL	H. O. Hehner	V. R. Haupt
H. L. Hubbard - So. 2nd	R. A. Munch	W. B. Dunlap
	C. M. Williams	
	J. Cresce	

Title: Quality Report on Japanese Kanechlor 300 and Bayer Clophen A-50

Personnel: S. O. Kemp and G. W. Miller

Problem: Quality Surveillance of Competitive Insulating Fluids in Competition with Monsanto Aroclor

Justification: Protection of Domestic Sales and Increase Potential for Foreign Sales

Summary: Bayer Clophen A-50 is quite superior to Anniston and WGK Aroclor 1254 in electrical properties. This material as received exhibited a resistivity of 150,000 x 10^9 and thermal chemical chloride stability of 0.27 ppm.

Japanese Kanechlor 300 is also superior to Anniston and WGK Aroclor 1242. Even though this material had a 9,600 x 10^9 resistivity and 0.08 ppm TC it is still considerably better than any routine domestic production in Monsanto operations.

G. W. Miller

/dp

Background

The last report concerning competitive Aroclor type material was issued during October 1966. In that report (435-5-66) a comparison of Clophen A-30, Pyralene 1499, and Aroclors from the three Monsanto production facilities was presented. Also presented was a comparison of Pyralene 1476 and Anniston Aroclor 1254.

The additional data presented in conjunction with values cited from the above report should serve as a useful data source for summarization of Monsanto's marketing position at the end of 1966.

Discussion

Bayer Clophen A-50

This material was received in a 16 gauge, welded seam galvanized steel drum. Even though the drum was equipped with rolling hoops it was dented in several locations during transit. It is apparently characteristic of Bayer to use drums equipped with side wall bungs.

As in previous sampling of competitive drums this material was sampled by insertion of a clean glass tube and displaced into clean bottles with dry nitrogen. One sample of the material was obtained at room temperature; however, due to the high viscosity the drum was necessarily transferred to the Aroclor Department hot house to aid in sampling. Analysis of the sample drawn prior to warming the drum gave a resistivity of $190,000 \times 10^9$. This value could not be achieved after warming. Several replicate tests on the samples collected from the warm drum showed a maximum of $150,000 \times 10^9$. All stability tests were performed in duplicate or triplicate.

The dielectric fluid compares favorably with Monsanto Aroclor 1254 specifications in all areas except that gravity and index are too low and the dielectric constant is above our spec limit.

Isomer distribution and a full analysis report are included in the attached tables.

Japanese Kanechlor 300

This material was received in a 35 gallon welded seam galvanized steel drum. This material was sampled indoors without any heat being applied.

The material was submitted to at least two analyses on all electrical and stability properties.

There are no test properties on this material which are not within the specification limits of Aroclor 1242.

Isomer analysis and a full analysis report are included in the attached tables.

Future

Two five pint samples of these materials are being forwarded to WGK for analysis. It would be appropriate to report WGK results on the aforementioned materials in this report; however, in the interest of having this data available at the May 9 quality conference the report contains only Anniston results. If serious discrepancies develop in the data comparison with WGK, a follow-up report will be issued.

G. W. Miller

/dp

Att. 4

Research and Development Report No. 1
Job No. 370-503

Table I

Comparison of Competitive Materials
With Monsanto Aroclor 1242

Property	Bayer Clophen A-30	Prodelec Pyralene 1499	Anniston AH-248	MCL Z-16	WGK B ¢450	Kanechlor 300 Japan
Color, APHA	<5	<5	15	15	15	10
Acid No.	0.001	0.002	0.001	0.001	---	0.001
Ref. Ind. @ 25°C	1.6237	1.6245	1.6248	1.6249	---	1.6248
Sp. Gr. @ 25°C	1.378	1.387	1.386	1.388	---	1.390
Visc. @ 100°F, SUS	79.8	85.7	90.2	86.9	---	
Moisture, ppm	63	35	30	52	28	24
Free Chlorides, ppm	0.01	0.01	0.01	0.01	0.01	0.009 ~~0.09~~
HST, ppm Cl	0.11	0.16	0.14	0.32	0.50	0.11
n. Stab., ppm Cl	0.06	0.06	0.11	0.12	0.16	0.06
TC Stab., ppm Cl	0.07	0.12	0.28	0.48	0.48	0.08
Weat. Stab., ppm Cl	0.40	0.48	0.51	1.56	0.93	0.36
Resist. x 10^9, OHM/CM, 100°C	15,200	1,270	1,980	1,900	1,030	9,600
P.F. @ 100°C						
60 cycles	0.22	4.6	2.0	3.4	4.8	0.55
1 KC	0.06	0.33	0.17	0.25	0.28	0.13
D.K. @ 100°C, ~~60~~ 1000 cycles	4.90	4.87	4.83	4.80	4.90	4.82
Distillation 10%	327	330	328	327	---	331
90%	348	352	352	348	---	352
Type drum	Steel, galv. dipped, 16 ga.	Steel, welded seams. Type of lining to be determined	One coat phenolic lining	Two coats phenolic lining	Bottle	Steel welded seams, galvanized
Appearance of drum	Good, no dents	Head bent, rim seam split, lining flaking	Good as produced	Good, no major dents	Bottle	Good

Table II

Comparison of Competitive Material
With Aroclor 1254

Test Date	10-15-66	10-5-66	4-30-67
Property	Prodelec Pyralene 1476	Aroclor 1254 AH-68	Bayer Clophen A-50
Color, APHA	10	20	7
Acid No.	0.002	0.002	0.001
Ref. Ind. @ 25°C	1.6380	1.6382	1.6365
Sp. Gr. @ 25°C	1.503	1.504	1.490
Visc. @ 210°F, SUS	46.2	45.9	
Moisture, ppm	30	20	30
Free Chlorides, ppm	0.02	0.02	0.009
Hydrolysis Stab., ppm Cl	0.14	0.14	0.07
Thermal Chem. Stab., ppm Cl	0.32	0.30	0.28
Westinghouse Stab., ppm Cl	1.00	1.13	0.62
Resist. x 10^9, OHM/CM, 100°C	3,180	5,880	150,000
Power Factor @ 100°C, 60 cycles	1.5	0.60	0.288
1 KC	0.14	0.10	0.09
Dielectric Constant, @ 100°C, 60 cycles	4.23	4.25	4.37
Distillation - 10%	368	370	365
50%	376	376	373
90%	387	388	387
Monsanto Stability, ppm Cl	0.18	0.14	0.10
Type drum	Steel, welded seams, 16 ga. Type of lining to be determined	One coat phenolic lining	Steel welded seams. Galvanized rolling hoops
Appearance of drum	Good, no dents	Good as produced	Good

Table III

GLC Analyses of Competitive Aroclor 1242

Peak	Anniston	Japan Kanechlor 300	WGK	England	Bayer	Prodelec	Identification
1	0.03	0.01	0.11	0.05	Trace	0.009	Biphenyl
2	0.79	0.01	0.13	0.18	0.003	0.01	2 Chloro
3-4-5	0.25	Trace	0.04	0.07	0.03	Trace	3 Chloro-4 Chloro
6-7	4.39	3.02	3.30	3.69	4.91	3.44	2,2'; 2,6
8-9-10	11.79	8.57	9.98	10.19	12.36	8.91	2,5; 2,4; 2,3'; 2,4'; 2,3
11	1.15	1.15	0.74	1.26	1.19	1.06	3,5
12-13-14-15	21.64	24.03	26.50	25.04	26.33	28.23	3,4; 3,4'; 2,5,2' 4; 4; 2,3,2'
16-17-18-19-20	27.56	32.27	32.72	32.78	31.32	34.26	2,5,4'; 3,4,2'; 2,3,4'
21-22-23-24	7.50	7.08	7.05	6.59	5.79	6.79	
25-26-27	10.04	10.22	9.69	8.84	8.58	9.51	3,4,4'
28-29-30-31	8.07	7.24	6.26	6.23	5.29	6.66	
32-33-34	3.50	3.31	2.51	2.64	2.32	2.60	
35-36-37-38-39-40	1.57	1.19	0.69	0.87	0.85	0.77	
41-42	0.69	0.62	0.23	0.36	0.46	0.40	
43-44-45-46	0.41	0.39	0.11	0.25	0.31	0.22	
47-48-49	0.09	0.21	0.02	0.08	0.16	0.09	
50-51	0.04	0.04	0.02	0.11	0.03	0.02	
52	0.01	0.04	Trace	0.03	0.01	0.005	
53-54-55-56	0.07	0.13	0.02	0.22	0.03	0.09	
57	NDA	0.08	NDA	0.02	NDA	NDA	
[illegible]-59-60	0.06	0.10	Trace	0.26	0.01	0.01	
61-62-63	Trace	0.08	NDA	0.17	NDA	Trace	
64	NDA	Trace	NDA	0.10	NDA	NDA	

Table IV

GLC Analyses of Competitive Aroclor 1254

Peak	Anniston 1254	WGK 1254	Bayer Clophen A-50	Prodelec Pyralene 1476
1	0.015	0.02	Trace	Trace
2	0.01	0.36	Trace	Trace
3-4-5	Trace	0.16	0.01	0.12
6-7	0.07	0.04	0.23	Trace
8-9-10	0.46	0.19	0.75	0.30
11	0.05	0.01	0.03	0.04
12-13-14-15	1.09	0.48	0.76	0.90
16-17-18-19-20	1.59	0.81	1.11	1.35
1-22-23-24	8.34	7.80	8.03	8.08
25-26-27	4.01	3.59	4.61	3.32
28-29-30-31	13.29	13.09	14.27	12.35
32-33-34	16.11	16.24	16.66	15.80
35-36-37-38-39-40	17.77	18.23	19.35	18.10
41-42	13.14	14.12	12.85	14.26
43-44-45-46	11.05	11.65	10.23	11.93
47-48-49	8.32	8.77	7.10	8.70
50-51-52	1.98	2.02	1.68	2.10
53-54-55-56	1.56	1.56	1.37	1.36
57	0.64	0.66	0.39	0.80
58-59-60	0.50	0.62	0.50	0.46
61-62-63	NDA	Trace	Trace	Trace
64	NDA	NDA	0.02	NDA

TABLE I

THE WORLD MARKET FOR CAPACITOR AROCLOR

Total Potential and Monsanto Share
1966 and 1971 (Estimated)

Metric Tons (2204 lbs)

DOMESTIC MARKETS

	1966		1971	
	Total	Monsanto Share	Total	Monsanto Objective
USA	11,000	11,000	13,000	13,000
UK	930	930	1,400	1,400
France	515	0	1,000	0
Germany	1,100	0	1,400	0
Japan	1,700	0	3,300	0
Total	15,245	11,930	20,100	14,400

NON-DOMESTIC MARKETS

EFTA	740	285	925	500
EEC	1,370	200	1,850	0
E. Europe	305	90	725	300
Asia-Pacific	330	235	665	500
Rest of Americas	1,035	975	1,940	1,900
Rest of World	370	100	600	400
Total	4,150	1,885	6,705	3,600
Grand Total	19,395	13,815	26,805	18,000

TABLE II

NON-DOMESTIC MARKETS FOR CAPACITOR AROCLOR

BY AREA - BY COUNTRY

Metric Tons

EFTA

	1966	1971
Austria	70	80
Denmark	25	45
Finland	95	100
Norway	30	50
Sweden	290	350
Switzerland	230	300
Total	740	925

EEC

	1966	1971
Italy	800	1,050
Belgium	350	500
Holland	220	300
Total	1,370	1,850

EASTERN EUROPE

	1966	1971
Czechoslovakia	20	45
East Germany	100	200
Hungary	15	50
Poland	70	200
Romania	15	100
Yugoslavia	85	130
Total	305	725

TABLE II (continued)

NON-DOMESTIC MARKETS FOR CAPACITOR AROCLOR

BY AREA - BY COUNTRY

Metric Tons

ASIA-PACIFIC

	1966	1971
Australia	170	350
India	150	300
Hong Kong	10	15
Total	330	665

REST OF THE AMERICAS

	1966	1971
Argentina	100	380
Brazil	250	450
Mexico	135	360
Canada	550	750
Total	1,035	1,940

REST OF THE WORLD

	1966	1971
Israel	30	50
South Africa	0	50
Spain	340	500
Total	370	600

TABLE III

ESTIMATED WORLD PRODUCTION CAPACITY*

TOTAL AROCLORS

		Million Pounds	Tons
USA	Monsanto	80	36,200
France	Prodelec	10	4,600
UK	MCL	10	4,600
Germany	Bayer	10	4,600
Italy	Caffaro	2	1,000
Spain	Flix	1	500
Japan	Kanegafuchi	7	3,500
		120	55,000

*Also produced in East Germany and Russia

TABLE IV

KNOWN WORLD MARKET BY PRODUCER - 1966

(Metric Tons)

	M.C.L.	BAYER	PRODELEC	CAFFARO	FLIX	KANEGA-FUCHI	M.C.	TOTAL
MAJOR DOMESTIC MARKETS	930	1,100	515	0	0	1,700	11,000	15,245
E.F.T.A.	220	155	365	0	0	0	0	740
E.E.C.	200	805	300	65	0	0	0	1,370
E. EUROPE	90	115	100	0	0	0	0	305
ASIA-PACIFIC	210	50	50	0	0	0	20	340
REST OF AMERICAS	0	50	0	0	0	0	985	1,035
REST OF WORLD	90	0	30	0	250	0	0	370
TOTAL	1,740	2,275	1,360	65	250	1,700	12,005	19,395

Section 12
Appendix III
Page 5

MONS 036223

TABLE V

ELECTRICAL AROCLOR

TABLE OF COMPETITIVE STRENGTHS

	MCL/MC	BAYER	PRODELEC	CAFFARO
R.M.POSITION				
Benzene	Buy/Make	Buy	Buy (Progil)	Buy
Chlorine	Make	Make	Make (Progil)	Make
PROD. QUALITY				
1254	Good/Fair	Good	Good	Good
1242	Fair/Fair	Good	Good	Fair
ANALYTICAL	Adequate	Adequate	Adequate	Adequate
DATE PROD. STARTED	1951/1930	1930	1938-1939	Post 1945
Years	14 35	35	27	
PRODUCT RANGE	Very large	Very large	Limited (Progil)	Limited
SALES ORGANIZATION				
Strength	Good	Good	Good	Italy only - Weak
Method	Direct/Agents	Direct/Agents	Direct/Agents	Direct
Visit Frequency		Europe more than MCL	Europe more than MCL	Italy OK
Customer Relations	Much respect	Much respect	Much respect	Bit amateur
TECHNICAL SERVICE	Good	Good	Good	Not as good as Big Three
OTHER ASSETS	EFTA (Large Comp.)	EEC (Large Comp.)	EEC (Progil)	Local
SUPPLY SITUATION	Drums OK	Drums OK	Drums OK	Drums OK
	Bulk ?	Bulk Good	Bulk Good	

Table I
(Page 2)

	MCL/MC	BAYER	PRODELEC	CAFFARO
RESEARCH EFFORT	Needs MC/MCL liaison	Not obviously energetic	Very active	Non-existent
NEW PRODUCTS	Yes	No	Very active (1500)	No
AROCLOR IMPORTANCE (%)	Small but valuable	Small but valuable	Large	Medium
PRICE LEADERS/ CUTTERS	Stability	Stability	Leaders	Cutters
PHILOSOPHY	Common schedule	Common schedule	Common schedule	To capacity

Section I
Appendix III
Page 7

TABLE I

THE WORLD MARKET FOR TRANSFORMER ASKAREL

TOTAL POTENTIAL AND MONSANTO SHARE

1966 AND 1971 (ESTIMATED)

1000 POUNDS - (FINISHED BLENDS)

	1966		1971	
	TOTAL	MONSANTO SHARE	TOTAL	MONSANTO SHARE
DOMESTIC MARKETS				
USA	17000	17000	25000	25000
UK	650	650	3000	3000
France	6100	0	7000	0
Germany	3600	0	4000	0
Japan	1600	0	2500	0
TOTAL	28950	17650	41500	28000
NON-DOMESTIC MARKETS				
EFTA	520	30	730	200
EEC	2000	0	2500	0
Eastern Europe	175	25	250	100
Asia-Pacific	620	270	750	500
Rest of Americas	3380	3380	3860?	3860?
Rest of World	750	300	1040	700
TOTAL	7445	4005	9130	5360
GRAND TOTAL	36395	21655	50630	33360

TABLE II

NON-DOMESTIC MARKETS FOR TRANSFORMER ASKAREL

BY AREA - BY COUNTRY

1000 POUNDS (FINISHED BLENDS)

	EFTA	
	1966	1971
Austria	100	150
Denmark	None	None
Finland	None	None
Sweden	None	None
Switzerland	300	400
Norway	20	30
Portugal	100	150
TOTAL	520	730

	EEC	
	1966	1971
Italy	750	1000
Belgium	1200	1400
Holland	50	100
TOTAL	2000	2500

EASTERN EUROPE

	1966	1971
Czechoslovakia	None	None
East Germany	?	?
Hungary	None	None
Poland	25	50
Romania	None	None
Yugoslavia	150	200
TOTAL	175	250

ASIA-PACIFIC

	1966	1971
Australia	280	350
India	340	400
Hong Kong	None	None
TOTAL	620	750

REST OF THE AMERICAS

	1966	1971
Argentina	70	120
Brazil	200	400
Mexico	170	300
Canada	2900	3000
Chili	20	20
Puerto Rico	10	10
Panama	10	10
TOTAL	3380	3860

REST OF THE WORLD

	1966	1971
Israel	70	100
South Africa	150	200
Spain	500	700
Pakistan	30	40
TOTAL	750	1040

TABLE ~~III~~ IV

KNOWN WORLD MARKET BY PRODUCER - 1966

1000 POUNDS (FINISHED BLENDS)

MARKET	MONSANTO UK	BAYER	PRODELAC	CAFFARO	FLIX	KANEGA-FUCHI	MONSANTO USA	TOTAL
Major Domestic Markets	650	3600	6100	0	0	1600	17000	28950
Efta	30	270	220	0	0	0	0	520
EEC	0	350	900	750	0	0	0	2000
Eastern Europe	25	0	150	0	0	0	0	175
Asia-Pacific	260	200	150	0	0	0	10	620
Rest of Americas	0	0	0	0	0	0	3380	3380
Rest of the World	300	0	50	0	400	0	0	750
TOTAL	1265	4420	7570	750	400	1600	20390	36395

Monsanto

FROM : H. J. Day, St. Louis General Offices

September 7, 1967

SUBJECT: LIQUID AROCLORS
Requirements Through 1972

TO : Mr. H. W. Tippee

J MacPherson
HIR 9/11

H. C. Carder - HCARD
G. R. Buchanan - GBUCH
J. Cresce - JCRES
Lou Furmeister - Anniston
P. E. Heisler - Krumrine
D. B. Hosmer - DHOSM
N. L. Sample - NSAMP
R. P. Stevens - RSTEV
Jack Molloy - Krumrine
Hill Williams - Anniston
Bob Yates - RYATE

The attached shows the U. S. requirements for Liquid Aroclors through 1972. This is based on sales estimates received by this group on August 17, 1967.

Note that the forecast is down somewhat from that calculated on July 13, 1967. Current Anniston capacity is 48,000 M lbs./year and WGK capacity is 28,800 M lbs/yr., total, 76,800 M lbs./year. It might be interesting to note that 7 months 1967 total liquid aroclor production has been at an annual rate of 73,700 M lbs./year and inventories at this writing are at a maximum.

Herb

H. J. Day

jms

Attachment

LIQUID AROCLORS
5-YEAR FORECAST (IN THOUSANDS OF LBS.)
TOTAL REQUIRED FROM U.S. PLANTS

	1968	1969	1970	1971	1972
Krummrich					
1242	16,107	19,037	21,484	23,772	25,572
1248	5,049	4,596	4,571	4,447	4,861
1254	4,831	5,039	5,462	5,957	6,257
1260	6,638	6,953	7,345	8,140	8,485
1262	125	135	145	155	165
	32,750	35,760	39,007	42,471	45,340
Anniston					
1242	28,686	29,745	30,691	33,491	35,247
1248	1,782	1,908	1,993	2,308	2,708
1254	8,647	9,426	9,555	9,445	9,265
1260	2,291	2,360	2,725	2,878	3,009
1262	630	649	641	656	694
1221	110	120	130	140	150
1232	593	463	526	593	645
	42,739	44,671	46,261	49,511	51,718
DIV. TOTAL	75,489	80,431	85,268	91,982	97,058

H. J. Day
9/7/67

MONS 036232

H. J. Day, St. Louis General Offices

September 8, 1967

SOLID AROCLORS

REQUIREMENTS THROUGH 1972

TO

Mr. H. W. Tippee

R. E. Bilger - REILG
H. C. Carder - HCAID
J. Crosse - JCRES
Lou Fuhrmeister - Anniston
D. E. Hosmer - DHOSH
Don Marriner - DMARR
N. L. Sample - NSAMP
R. P. Stevens - RSTEV
W. F. Waychoff - WWAYC
Hill Williams - Anniston
Bob Yates - RYATE

The attached shows the Anniston requirements for Solid Aroclors through 1972. This is based on sales estimates received by this group on August 17, 1967.

H. J. Day

/jms

Attachment

SOLID AROCLORS
FIVE-YEAR FORECAST (IN THOUSANDS OF LBS.)
TOTAL REQUIRED FROM ANNISTON

	1968	1969	1970	1971	1972
1268	290	300	310	320	330
2565	25	25	25	25	25
4465 - 6	865	925	985	1045	1105
5060	410	420	440	450	460
5442	180	210	240	270	300
5460 - 5	8699	9780	11150	12220	12800
	10469	11660	13150	14330	15020
Rated Capacity	10000	10000	10000	10000	10000
Deficit	469	1660	3150	4330	5020

H. J. Day
9/8/67

Liquid Aroclor

Process Non-productive Time

	1966		1967 YTD (May)	
	DN	RV	DN	RV
Plugged lines	43.4	2.0	15.8	---
Waiting on room in blend tank	---	33.7	23.0[3]	---
Switch products	---	4.5	---	---
Lack of still capacity	---	3.1	---	---
Draining out receiver	49.6	2.4	---	---
Waiting on crude	202.0	22.8	47.9[2]	---
Vacuum troubles	23.6	1.3	4.1	1.0
Repack pump	1.8	1.6	---	---
Miscellaneous	20.0	---	11.3	---
	340.4[1]	71.4	102.1	1.0

1. 1966 DN Time report is for February - December, years' total is 355 including January.
2. Requires change to Cl_2 control valve trim.
3. Due to export grade
4. For projection, use 10 hrs. for WOR in blend tanks and 20 hours WCC.

Liquid Aroclor

Other Non-productive Time

	1966		1967 YTD (May)	
	DN	RV	DN	RV
Faulty Cl_2 car	15.9	---	---	---
Low Cl_2 pressure	2.3	12.5	7.1	3.2
Cl_2 plant down	17.5	7.8	27.5	---
No Cl_2 car	---	6.4	---	---
Switch Cl_2 cars	7.2	---	---	---
Empty Cl_2 car	25.2	---	10.2	---
Poor Cl_2 quality	16.1	---	---	---
Steam press line	9.7	---	9.0	---
Product change	15.9	---	---	---
Rebrick furnace	11.4	---	---	---
Export grade Aroclor	44.6	---	32.0	---
Lack of still capacity	---	23.2	---	---
Inventory adjustment	50.0	---	44.8	---
Product demand low	91.1	---	---	---
Refining pilot plant	---	---	15.0	---
Miscellaneous	12.0	12.6	44.4	---
Water lines	---	---	14.3	---
	318.9[1]	65.5	204.3	3.2

1. 1966 DN line is for Feb. - December, year's total is 369 including January.

2. For projection of 1967 YTD use only 16 hrs. for export DN, 0 hrs. DN for pilot plant, 3 hrs. for low Cl_2 pressure, 5 hrs. for empty cars and 0 hrs. for water lines.

Liquid Arochlor

Repair Non-productive Time

	1966		1967 YTD (May)	
	DN	RV	DN	RV
Still receiver pumps	37.4	1.2	4.6	—
Still circulating pumps	28.2	—	11.8	—
Blend tank pump	—	—	11.5	—
Catalyst check	—	—	50.7	—
Chlorinator coil replacement	—	—	7.7	—
Still circulating coil	12.0	—	7.7	—
Cl_2 vaporizer	90.6	—	—	—
Piping failures	19.8	—	—	—
Miscellaneous	4.0	18.5	37.3	—
	212.0[1]	18.5	131.3	—

1. 1966 DN line is for File - December, year's total is 220 including January.

Solid Aroclors

Process Non-productive Time

	1966		1967 YTD (May)	
	DN	RV	DN	RV
Cl_2 feed lines plugged	28.9	—	7.5	
Chlorination cooler plugged	3.0		2.0	
Still circulating line plugged	70.3	—	11.3	
Waiting or flaker	159.6		6.0	
Vacuum trouble	194.6	61.4	8.0	—
Waiting on crude	37.0		1.0	—
Miscellaneous	186	21.0	10.0	8.8
Waiting on room, blow tank	37.1	—	—	—
Check softening point	2.0	—	—	—
Plugged liner	92.0	—	—	—
Operating errors	57.0	—	—	—
Drumming 4465	21.0	—	—	—
Vaporizer	21.6	—	—	—
	910.1	82.4	45.8	8.8

Solid Aroclors

Other Non-productive Time

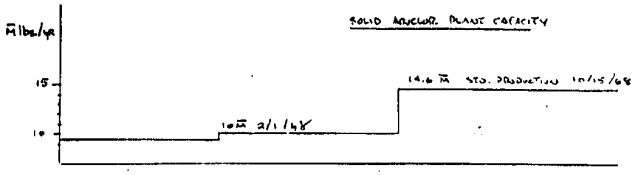
	1966		1967 YTD (May)	
	DN	RV	DN	RV
Santowax-R Cost	—	—	72.1	—
Switch Cl_2 car	83.5	—	75.8[1]	—
Low pressure Cl_2 car	38.7	—	6.5[1]	27.6
Water in SW-R	—	—	17.6	—
Cl_2 plant down	80.0	—	39.7	7.5
Empty Cl_2 cars	—	—	24.1[1]	—
Cl_2 quality	66.2	32.4	—	8.8
Cooling water problems	—	—	2.5	—
Steam problems	13.0	—	11.5	—
Therminol Tie-in	—	—	11.0	—
Miscellaneous	32.0	—	30.9	31.7
Product change over	38.5	—	—	—
Equipment modification	39.2	—	—	—
Still Therminol System	88.6	—	—	—
	487.7	32.4	291.7	75.6

1. Use 30 hrs. switching, 2 hrs. low pressure, 10 hrs. empty cars for projection time saving based on projection.

Solid Aroclor

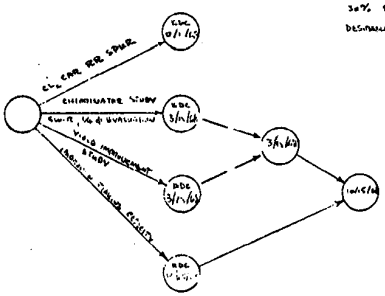
Repair Non-productive Time

	1966		1967 YTD (May)	
	DN	RV	DN	RV
Flaker-grinder gumming	—	—	51.7	
Therminol leak	—	—	55.8	—
Demister No.9 chlorinator	—	—	23.8	51.6
Weigh tank agitator	—	—	11.5	
Chlorinator pump			18.0	—
Still pump	152.7	5.0	13.0	—
Still entrainment separator		—	82.8	—
Chlorinator Cl_2 distributors	31.8	—	33.0	—
Therminol system	75.6	—	35.5	—
Cl_2 vaporizer	157.7	—	7.0	15.0
Cl_2 flow control valve		—	13.1	
Vacuum jet	21.6	—	9.0	—
Burst furnace coil		—	46.5	—
Miscellaneous	54.3	35.0	66.0	—
Off-gas condenser	48.0			—
Vacuum problems	64.0	—	—	—
Flaker	23.1	—	—	—
Steam leaks	11.3	—	—	—
Instruments	89.4	—	—	—
		—	—	—
	729.5	40.0	466.7	66.6



ESTIMATED CAPACITY REQUIREMENTS

	1968	1969	1970	1971
EST. SALES	9.9	10.6	11.3	12.0
30% SURGE	3.7	3.L	3.4	3.6
DESIRED CAPACITY	13.6	13.8	14.7	15.6



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SHEET NO.
JOB NO.
OF

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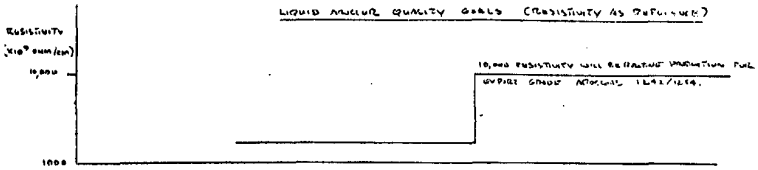

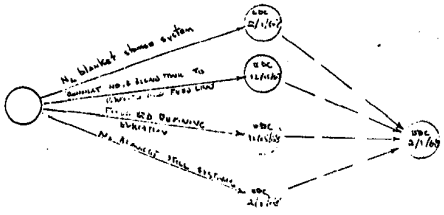

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Appendix VI
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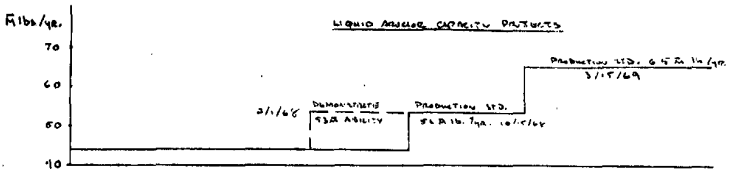

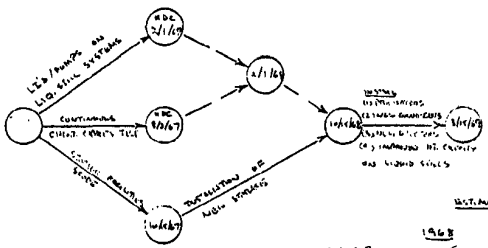

ESTIMATED CAPACITY REQUIREMENTS

	1968	1969	1970	1971
Est. Sales	40.5	42.63	44.82	47.16
30% Surge	12.10	12.80	13.30	13.75
Desirable Capacity	52.65	55.43	57.22	60.91

Section 12
Appendix VII
Page 3

BY
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JOB NO.

MONS 036241

VII. MIP Contributors

1. Production - A separate section will not be written by the Production Supervisor since the basic outline of the MIP developed in conversations between Production and TSD.

2. PR&D - to be written by 2/15/68.

3. Quality Operations Control - to be written by 2/15/68.

4. Maintenance - to be written.

TABLE ____

Authority No.	Description Approved Projects	Department	Capital	Savings B.T.	Success Factor
2026	Piping to Manifold Instruments	826.08	11,000	——	90%
2208	Aroclor Still Revision	826.08	13,600	3,900	85%
2219	Aroclor Alarm System	826.08	1,450	2,870	90%
2229	Fixed Bed Tower for Refining Aroclor	826.08	2,515	Quality	90%
2233	Level Indicator on #4 Still Receiver	826.17	2,020	1,500	75%
2236	Vertical Condenser on #4 Still	826.17	16,600	6,800	85%
2262	Railroad Spur for Chlorine Tank Cars	826.17	31,700	21,200	85%
2279	Drumout line for Aroclor 4465	826.17	1,495	3,400	70%
2543	Debottleneck Liquid Aroclor Still System	826.08	17,130	221,000	85%
2566	Platecoil Heat Supply for #1 Roof Tank	826.08	1,520	——	100%

Section 12
Appendix VIII
Page 1

MONS 036243

Man power available: 1 10 hrs/day × 20 days/mo. × 12 mo./yr. × ? ADvise's = 4800 Hours

Patent / AEU	[illegible]
Paul [illegible]	200
Vac./Sick Leave/[illegible]	500
Other	960

Man Power Requirements

Comments	MP Total	Start Up	Ch.E. Design	Evaluation/Scope	Job Description TSD Form/AFE's	Dept.
	56		16	40	Improve Crude [illegible] Quality 370:715 /	546.08
2099 - No. 2 Arsenic Still Revision	98	40	48	1	No. 2 Arsenic Still Revision 370:399 / A099	546.08
2324 - No. 4 Still Condenser	340	40	60	240	Operational Improvement No. 4 Still 370:416 / 2324	546.17
Cancell	72	16	16	40	Cl_2 Vaporizer Study 370:442 /	546.08 [illegible]
	16	-	1	-	No. 1 [illegible] Tank [illegible] Coil Installation 370:423 / 2566	546.08
	120	40	40	40	Convert Batch Chlorinators to a Continuous System 370:425 /	546.08
2357 : [illegible]	324	24	60	240	Performance Improvement No. 5 Chlorinator 370:451 / 2357	546.17
2542 - [illegible]	72	1	48	24	Chlorine Supply System Improvement 370:458 / 370:459 / 2542	546.08 546.17
	40	1	1	40	Flaker Improvement Study 370:463 / 2490	546.17
Improved Draining / Tank Car Loading / Storage Requirements / [illegible] in Storage Area / ~~[illegible]~~ / [illegible] Shed / - Assistance to CED on C&A 1430	280	1	40	240	Materials Handling 370:457 / 370:461	546.17 546.08
Need to evaluate ultimate capacity of continuous chlorination system, [illegible] operation	80	1	1	180	Chlorinator Study 370:465 /	546.08
2310 - Fixed Bed [illegible] Column	344	40	24	240	Fixed Bed Earth Treatment [illegible]	546.08

MONS 036244

TITLE: Technical Improvement Requirements, Aroclors 1967

ANNISTON PLANT - MONSANTO COMPANY - ANNISTON, ALA.

[illegible] systems, [illegible]	80	1	1	80	370:455/	
[illegible] fixed bed [illegible]	344	10	24	240	Fixed Bed Batch Treatment 370:456/2219, 2505	516.08
No Blanketing / Closed up systems	72	24	24	24	Atmospheric Contamination of Liquid Aroclor 370:458/2524, 2560	516.04?
CANCELL	68	4?	16	40	Improved Batch [illegible] Treatment 370:460/	516.0?
	96	1	1	96	Quality Goals for Electrical-Grade Aroclors 370:461	516.0?
COMPLETE	32	4?	4?	16	Solid Aroclor Still Condenser Coolant Control 370:483/	516.17
	96	1	1	96	Solid Aroclor [illegible] Study 370:482/	516.17
Evaluation of feed preheat, new condensers improved ht. transfer in #3/#1 Furnace unit	48	1	4?	40	[illegible] Stills 370:716/	516.0?
Storage. To be part of overall material handling. Assistance to CED only.	8	1	1	8	Pyranol-Inerteen Blends 370:717/	516.0?
	120	1	1	120	Material Handling 370:775/2384	516.17
	64	1	16	48	Batch Distillation Completion Determination 370:713/	516.17
	[illegible]	1	1	[illegible]		
	160	1	1	160	Aroclor PID 370:778	516.04 516.17
CANCELL	80	16	24	40	[illegible] of Liquid Aroclor Storage Area 370:724	516.0?
	32	1	16	16	[illegible] Still Pot Heating Coil 370:726	516.17
I have one analyzing day assigned to routine surveillance of plant operations (cycle time, etc.)	200	1	1	200	Operations Surveillance 370:728	516.08 516.17
	32	1	1	32	Pyranols Misc. [illegible]	

SECTION IV - APPENDIX VIII - PAGE 3

COMMENTS	MD TOTAL	START UP	C&E DESIGN	EVALUATION/SCOPE	MANPOWER REQ'MTS. JOB DESCRIPTION TBD JOB/AFE'S	DEPT.
	40	—	—	40	PRILLING OF SOLID ARUCLOR 370: 718	326.17
	40	8	24	8	FILTER PRESS LOSSES 370: 702 /	326.17
CANCEL					Aroclor 5460 Yield 370: 709	326.17
	24	8	8	8	NO. 3 BLOW TANK HEATING COIL 370: 714 /2562	326.17
	24	8	8	8	NO 4 STILL POT HEATING COIL 370: 726 /2562	326.17
	64	8	40	16	Pyranol Blend Tank Agitation 370: 742 /	8X. —
	32	—	8	24	STEAM / NITROGEN / CHLORINE METERS 370: 745 /	326.06
	48	16	16	16	INSTALL LI'S / NEW PUMPS ON 3 Liquid Refining Tanks 370: 756 / 2545	326.06
CANCEL (SAME AS 45X)					NITROGEN BLANKET LIQ. AROCLOR REFINING 370: 757 / 2544	326.06
		—	8	8	W.G.K. Assistance 370: 772	326.06
	16	—	8	8	Liquid Aroclor Sampling 370: 776	326.06

Roferences

1. TSD Job No. 370-500, Report No. 2, 4-20-67.

2. TSD Job No. 370-500, Report No. 1, 2-13-67.

Cost Analysis

A. Liquid Aroclors Cost Variances

1. Net material cost: major contributor (76% of total variance) is the chlorine cost; delivery of plant chlorine to Aroclor is based on cell efficiency, standard is based on pegged numbers. A program is planned for the improvement of cell efficiency monitoring.

2. Indirect conversion:

(a) steam - this is an assigned valve, true value will recorded when steam meters are installed.
(b) gas - negative variance is a result of pushing the stills (lower efficiency) to gain higher production rates
(c) labor - variance is the result of high overtime
(d) packing containers - high negative variance is the result increased export demand and the use of an improved drum ($0.50/drum)
(e) laboratory - high production rates have required increased laboratory effort.
(f) production department containers - increased production rates have exceeded predicted usage
(g) Pilot plant exp. - high positive variance resulted from delay in project for waste heat recovery
(h) Technical Services - increase in personnel assigned
(i) experimental - bauxite refining unit was installed under experimental expense funds
(j) research expense - increased activity
(k) plant process research - increased personnel assigned plus higher activity level
(l) mechanical expense - low budget

B. Solid Aroclors Cost Variances

1. Net material cost: major contributor (70% of total variance) is the chlorine cost; again this is a pegged value rather then a true measurement. The program planned for the improvement of chlorine cell monitoring will improve chlorine assignment to solid Aroclors.

2. Indirect conversion:

(a) steam - this is an assigned value, cost should improve as steam meters we installed

(b) gas - YTD reflects three months below capacity production

(c) packing containers - low estimate of required amount

(d) laboratory - YTD reflects increased sampling in previous months with production difficulties

(e) technical services - increased personnel assigned to department

(f) mechanical expense - low budget

COST REPORT YEAR TO DATE - ORGANIC DIVISION ANNISTON, ALA.

LIQUID AROCLORS DEPT. 82608 PRODUCTION CODE 82608 JULY 1967

ACTUAL PRODUCTION - YEAR TO DATE 25,815,484

SCHEDULED PRODUCTION - YEAR TO DATE 25,822,500

MATERIAL OR EXPENSE		YEAR TO DATE QUANTITIES ACTUAL QUANTITY	SCHED. QUANTITY	OVER-UNDER SCH.		
STEAM	MBTU	80,085	60,412	19,673-	530	0
ELECTRICITY	CKWH	8,881	10,325	1,444	533	0
WATER PLANT	MGAL	268,373	257,682	10,691-	542	0
GAS	MBTU	54,472	47,337	7,135-	545	0
LABOR	HRS	16,903	15,287	1,616-	570	0
PACKING LABOR			4,956	4,956	601	0
LABORATORY	HRS	2,449	1,931	518-	610	0
CLAY ATTAPULGUS		25,100	33,560	8,460	19400	0
FERRIC CHLORIDE		2,055	7,745	5,690	33510	0
LIME HYDRATED		141,967	129,078	12,889-	38800	0
NITROGEN		154,000		154,000-	43100	0
PORCCEL		14,185		14,185-	48289	0
BIPHENYL		14,786,618	14,914,095	127,477	82601	0
CHLORINE		25,882,425	25,117,633	764,792-	82638	0
H C L 100%		12,193,770-	12,193,770-		82851	0
MONTARS		576,248-	613,831-	37,583-	82868	0

MATERIAL OR EXPENSE	YEAR TO DATE AMOUNTS ACTUAL COST	SCHEDULED COST	OVER-UNDER SCH.		
CLAY ATTAPULGUS	985	1,397	412	19400	0
FERRIC CHLORIDE	329	1,242	913	33510	0
LIME HYDRATED	1,586	1,442	144-	38800	0
NITROGEN	330		330-	43100	0
PORCCEL	573		573-	48289	0
BIPHENYL	709,327	715,543	6,216	82601	0
CHLORINE	641,210	621,871	19,339-	82638	0
H C L 100%	198,148-	198,148-		82851	0
MONTARS	15,328-	16,328-	1,000-	82868	0
NET MATERIAL COST	1,140,864	1,127,019	13,845-		
RAW MATL. HAND.	4,389		4,389-	530	0
TOTAL MATERIAL COST	1,145,253	1,127,019	18,234-		

COST REPORT YEAR TO DATE - ORGANIC DIVISION ANNISTON, ALA.

LIQUID AROCLORS DEPT. 82608 PRODUCTION CODE 82608 JULY 1967
ACTUAL PRODUCTION - YEAR TO DATE 25,815,494
SCHEDULED PRODUCTION - YEAR TO DATE 25,822,500

STEAM	39,293	30,768	8,525-	530
ELECTRICITY	5,716	6,646	930	533
WATER PLANT	5,770	5,676	94-	542
GAS	16,295	14,595	1,700-	545
LABOR	63,681	58,343	5,338-	570
SALARIES	9,862	9,599	263-	575
PAYROLL OVERHEAD	13,318	13,783	465	578
SUPPLIES	11,699	9,525	2,174-	590
PACKING LABOR	15,718	15,794	78	601
PKG CONTAINERS	96,401	69,705	26,696-	602
PACKING O/H	3,543	1,743	1,800-	603
LABCRATORY	18,007	14,959	3,048-	610
CLOTHING LAUNDRY	1,379	971	408-	614
PROC DEPT CONTNR	11,718	1,931	9,787-	618
PILCT PLANT EXP	26,029	59,703	33,674	620
TECHNICAL SERVIS	27,746	11,767	15,979-	621
EXPERIMENTAL	30,708		30,708-	635
RESEARCH EXP	12,261	1,033	11,228-	651
PLT PROCESS RES	23,850	5,900	17,950-	657
MECH EXPENSE	59,587	40,344	19,243-	694
TOT DIRECT CONVERSION	492,579	372,785	119,794-	
TOT DIRECT MFG. COST	1,637,832	1,499,804	138,028-	
DEPRECIATION	56,079	58,764	2,685	698
FACT. IND. EXP.	40,249	37,337	2,912-	700
TOTAL INDIRECT CONV.	96,328	96,101	227-	
PERFORMANCE VOL.		80	80	994
TOTAL PRODUCT COST	1,734,160	1,595,985	138,175-	
PRICE & MAT. MIX		93,639-	93,639-	996
UNSCHEDULED CAP.		967-	967-	997
INV. VALUE & TOT VAR.		1,501,379	232,781-	

MONS 036251

COST REPORT YEAR TO DATE - ORGANIC DIVISION ANNISTON, ALA.

REF SOL ARCCLORS DEPT. 82617 PRODUCTION CODE 82617 JULY 1967

ACTUAL PRODUCTION - YEAR TO DATE 5,647,469

SCHEDULED PRODUCTION - YEAR TO DATE 5,990,324

MATERIAL OR EXPENSE	YEAR TO DATE QUANTITIES ACTUAL QUANTITY	SCHED. QUANTITY	OVER-UNDER SCH.	
STEAM MBTU	32,944	24,384	8,560-	530
ELECTRICITY CKWH	4,460	5,071	611	533
WATER PLANT MGAL	83,893	81,165	2,728-	542
GAS MBTU	43,263	35,807	7,456-	545
LABOR HRS	8,222	8,365	143	570
PACKING LABOR		5,138	5,138	601
LABORATORY HRS	650	337	313-	610
FERRIC CHLORIDE	928	1,694	766	33510
LIME HYDRATED	37,847	28,237	9,610-	38800
BIPHENYL	181,803	176,827	4,976-	82601
SANTOWAX R	2,968,658	2,821,294	147,364-	82602
CHLORINE	9,276,064	8,693,577	582,487-	82638
H C L 100%	3,857,071-	3,857,071-		82851
MONTARS	120,707-		120,707	82868
SOLID AROCLOR RE	1,462,695-	1,462,695-		82869

MATERIAL OR EXPENSE	YEAR TO DATE AMOUNTS ACTUAL COST	SCHEDULED COST	OVER-UNDER SCH.	
FERRIC CHLORIDE	150	273	123	33510
LIME HYDRATED	422	314	108-	38800
BIPHENYL	8,784	8,537	247-	82601
SANTOWAX R	132,292	125,775	6,517-	82602
CHLORINE	228,272	213,569	14,703-	82638
H C L 100%	62,677-	62,677-		82851
MONTARS	3,211-		3,211	82868
SOLID AROCLOR RE	35,836-	35,836-		82869
NET MATERIAL COST	268,196	249,955	18,241-	
RAW MATL. HAND.	1,326		1,326-	530
TOTAL MATERIAL COST	269,522	249,955	19,567-	

MONS 036252

COST REPORT YEAR TO DATE - ORGANIC DIVISION ANNISTON, ALA.

REF SOL ARCCLORS DEPT. 82617 PRODUCTION CODE 82617 JULY 1967
ACTUAL PRODUCTION - YEAR TO DATE 5,647,469
SCHEDULED PRODUCTION - YEAR TO DATE 5,990,324

STEAM	16,269	12,423	3,846-	530
ELECTRICITY	3,092	3,501	409	533
WATER PLANT	1,945	1,921	24-	542
GAS	12,931	11,281	1,650-	545
LABOR	30,951	31,885	934	570
SALARIES	4,714	4,845	131	575
PAYROLL OVERHEAD	7,596	8,617	1,021	578
SUPPLIES	907	3,500	2,593	590
PACKING LABOR	15,277	16,303	1,026	601
PKG CONTAINERS	19,639	11,863	7,776-	602
PACKING O/H	572	298	274-	603
LABORATORY	4,718	2,625	2,093-	610
CLOTHING LAUNDRY	682	595	87-	614
PROC DEPT CONTNR	5,802	12,181	6,379	618
TECHNICAL SERVIS	6,656	6,130	526-	621
EXPERIMENTAL	937		937-	635
		100	100	651
PLT PROC RES		600	600	657
MECH EXPENSE	26,878	23,250	3,628-	694
TOT DIRECT CONVERSION	159,566	151,918	7,648-	
TOT DIRECT MFG. COST	429,088	401,873	27,215-	
DEPRECIATION	42,130	40,455	1,675-	698
FACT. IND. EXP.	23,882	19,720	4,162-	700
TOTAL INDIRECT CONV.	66,012	60,175	5,837-	
PERFORMANCE VOL.		9,563-	9,563-	994
TOTAL PRODUCT COST	495,100	452,485	42,615-	
PRICE & MAT. MIX		34,155-	34,155-	996
UNSCHEDULED CAP.		30,654	30,654	997
INV. VALLE & TOT VAR.		448,584	46,116-	

MONS 036253