MONS..NTO COMPANY
ANNISTON PLANT

SOLID AROCLOR EXPANSION
CEA 2080
START-UP OPERATIONS MANUAL

January 1970

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TOWOLDMON0048411

MONSANTO COMPANY

ORGANIC CHEMICALS DIVISION

ANNISTON, ALABAMA

SOLID AROCLOR EXPANSION

CEA 2080

START-UP OPERATIONS MANUAL

January 1970 Copy No. 6

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SOLID AROCLOR EXPANSION
CEA 2080
START-UP OPERATIONS MANUAL

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SOLID AROCLOR EXPANSION

CED PROJECT 2080

START-UP OPERATIONS MANUAL

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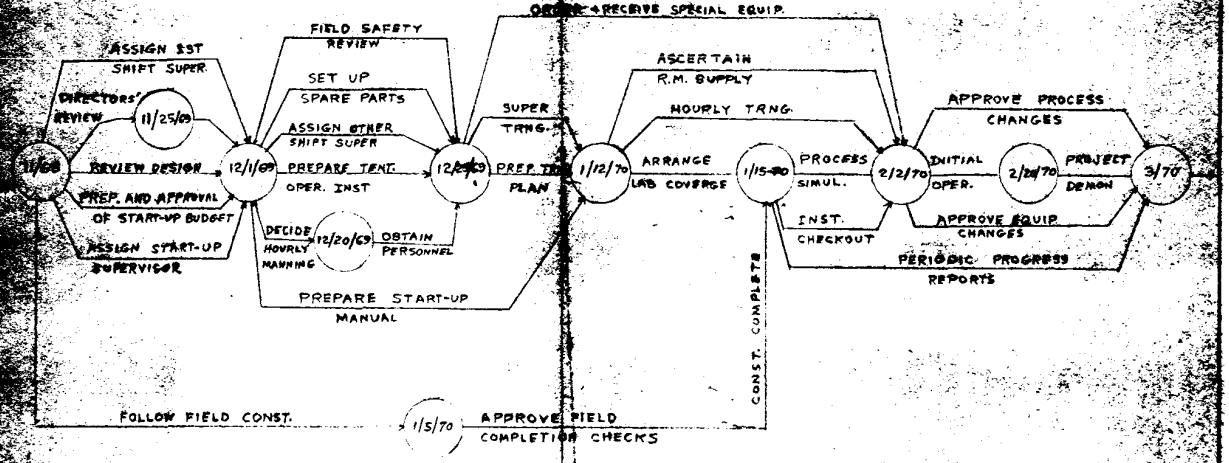

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TITLE SOLID ARCLOR EXPANSION

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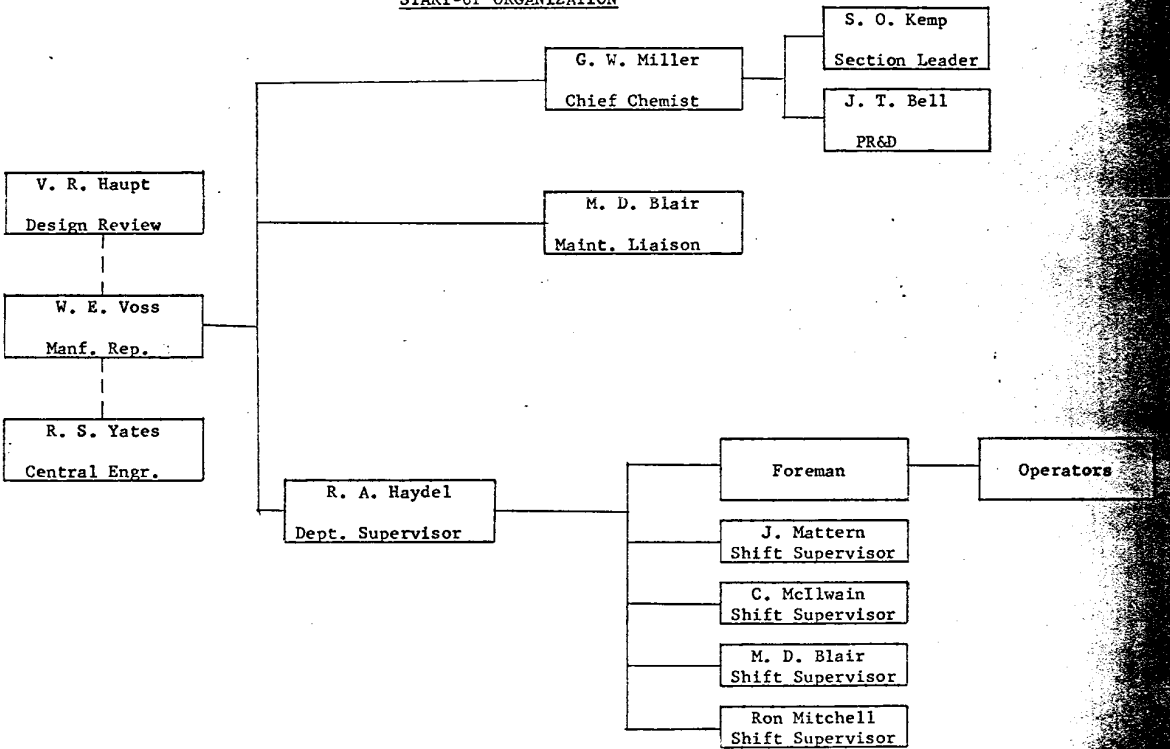
SOLID AROCLO EXPANSION
CEA 2080

START-UP ORGANIZATION



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DISTRIBUTION OF COMMUNICATIONS

	Organic Administration	Manufacturing	Engineering	Plant
1. Start-up Manual				
Demonstration Plan & Schedule		TPM, MPD	PM	(PLM, MS
Expense - Code of Accounts		TPM		OMS
Operating Instructions			PM	OMS
Training Plan		TPM	PM	OMS
Process Simulation Plan		TPM	PM	OMS
Initial Operations Plan		TPM, DM	PM, SM	PLM, OMS, CC
Project Demonstration Plan		TPM, DM	PM, SM	PLM, OMS
2. Budgets, Cost Standards,)		TPM		PLM, OMS
Variance Predictions)		TPM		DS, PA, TSS
3. Start-up Progress Reports		TPM, MPD	PM	PLM, OMS, DS, TSS
4. Daily Status Reports	BGD	DM, TPM, MPD	PM, SM	PLM, OMS, DS, TSS
5. Engineering Changes		TPM	PM, SM	PLM, OMS, DS, MS, TSS
6. Process Changes		TPM	PM, SM	PLM, OMS, TSS, DS
7. Project Completion Report	BGD	DM, TPM	PM, SM	PLM, OMS, MS

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DISTRIBUTION OF COMMUNICATIONS

(Cont'd)

Distribution Code

Manufacturing - Technical Production Manager	TPM
Manager, Production Planning & Distribution	MPD
Director of Manufacturing	DM
Engineering - Project Manager	PM
Section Manager	SM
Plant - Plant Manager	PLM
Organic Manufacturing Superintendent	OMS
Maintenance Superintendent	MS
Chief Chemist	CC
Manufacturing Representative	MR
Technical Services Superintendent	TSS
Plant Accountant	PA
Department Supervisor	DS
Organic Administration - Business Group Director	BGD

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CODE OF ACCOUNTS

505	Purchased Raw Material	641	Rentals-Equipment
520	Interplant Raw Material	644	Start-Up Expense
526	Raw Material Handling	651	Production Process Research
530	Steam	661	Waste Disposal
533	Electricity	694	Mechanical Expense
539	Water-Purchased	698	Depreciation
542	Water-Plant	715	Consultant Fees
545	Gas	760	Factory Indirect Expense
570	Wages	780	Insurance
575	Salaries	790	Lunches Served Guests
578	Payroll Overhead	798	Meetings & Conferences
590	Factory Supplies	804	Outside Contract Work
601	Packing Labor	824	Plant Trucks
603	Packaging Overhead	855	Sundries
610	Laboratory	864	Office Supplies
614	Clothing & Laundry	867	Switching Expense
621	Technical Service	880	Communications
635	Experimental Expense	883	Travel

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Monsanto

FROM (NAME & LOCATION) Anniston, Alabama

DATE : December 2, 1969

EXT :

REFERENCE

TO : W. A. Kuhn
J. E. Smith

cc: H. L. Williams
R. A. Haydel
A. G. Hill
V. R. Haupt
M. D. Blair
C. K. Eastman
W. B. Papageorge

The start-up budget for the Anniston Solid Aroclor Expansion CEA 2080 is attached for your approval.

The total start-up expenses are estimated at $93,310. Preparation Phase expenses through October 1969 are actual as collected in Plant Account 916.56.

Summary

Preparation	$41,780
Operation	$51,530
Total Budget	$93,310
Percent of Approved Capital	8.5
Actual and Estimated Expenditure in 1969 - Preparation	$20,230
Estimated Expenditure in 1970 Preparation and Operation	$73,080

The Operation Phase Budget is estimated variances from the 1970 Solid Aroclor Cost Standard Bracket 3. It is expected to begin with production of Aroclor 5460 in the new equipment on February 2, 1970.

W. E. Voss

:md
Att.

0360355

IN-10 REV. 11-65

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SOLID AROCLOR EXPANSION
ANNISTON - CEA 2080

JOB NO. 916.56

	PREPARATION PHASE			START-UP BUDGET				
	1st Qtr. 1969	2nd Qtr. 1969	3rd Qtr. 1969	Oct. 1969	Nov. 1969	Dec. 1969	Jan. 1970	TOTAL
Manufacturing Wages	--	--	--	--	--	--	4,000	4,000
Manufacturing O.H.	--	--	--	--	--	--	700	700
Salaries	867	895	1,690	20	2,000	7,500	7,500	20,472
Salary O.H.	155	158	308	4	360	1,350	1,350	3,685
Supplies	--	--	70	--	100	2,000	2,000	4,170
Clothing & Laundry	--	--	--	--	--	--	150	150
Travel	164	150	189	--	750	500	200	1,953
Stationery-Printing	--	--	--	--	200	500	200	900
Mechanical Expense							5,000	5,000
Meetings & Conferences						300	450	750
TOTALS	1,186	1,203	2,257	24	3,410	12,150	21,550	41,780

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PREPARATION PHASE - START-UP BUDGET

EXPENSE DETAILS

MANUFACTURING WAGES $4,000

Training for 12 men - 40 overtime hours

Operating personnel for the expanded plant will be those now operating in the Aroclor Department. These operators are familiar with the process and the general type of equipment being installed on CEA 2080. Due to their continuing operating duties up to the time of start-up of CEA 2080, all training must be performed on overtime.

SALARIES $20,472

Through October 1969, only the required portion of the manufacturing representative's salary has been charged to the Preparation Phase. Late in November one technical man will be picked up to begin detailed preparation of the start-up manual. In December and January the budget provides for full time utilization and training of four (4) shift supervisors, the start-up supervisor, and the manufacturing representative.

SUPPLIES $4,170

Housekeeping Equipment
Safety Equipment
Safety Signs
Utility Lockers and Cabinets
Training Supplies
Other Miscellaneous purchases

TRAVEL $1,953

Trips for the Manufacturing Representative to visit CED. Attendance of concerned personnel at the Director's Review Meeting requires the large budgeted amount in November.

MECHANICAL EXPENSE $5,000

Instrument Check-Out and Calibration
IFO's

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SOLID AROCLOR EXPANSION
ANNISTON - CEA 2080

OPERATION PHASE - START-UP BUDGET

COST ABOVE 1970 SOLID AROCLOR COST STANDARD

	February 1970	March 1970	Total
Raw Materials	5,100	--	5,100
Steam	1,000	--	1,000
Salaries	6,000	2,500	8,500
Salary O.H.	1,080	450	1,530
Factory Supplies	1,000	500	1,500
Laboratory	1,200	600	1,800
Production Research	1,000	--	1,000
Mechanical Expense	15,000	10,000	25,000
Performance Volume	6,100	--	6,100
TOTALS	37,480	14,050	51,530

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OPERATION PHASE - START-UP BUDGET

EXPENSE DETAILS

BASIS: Begin producing Aroclor 5460 — 2/2/70

Schedule Production - Bracket 3 — 1,235,000

New Facility will produce-Feb. 90% Bkt. 3 — 1,115,000
Mar. 100% Bkt. 3 — 1,235,000

Yield on Raw Materials (Santowax R) Feb. 73%
Mar. 80%

From 1970 Cost Standard

Raw Material Cost at:	73% Yield on Santowax R	$6.09/cwt.
	80% Yield on Santowax R	$5.64/cwt.
F & B Cost		$5.09/cwt.

YIELD VARIANCE

Feb. 1970: 1,115,000 (lbs. 5460) X $\frac{(\$6.09-\$5.64)}{100}$ — $5,018

PERFORMANCE VOLUME

Feb. 1970: (1,235,000 - 1,115,000) X $\frac{\$5.09}{100}$ — $6,108

MECHANICAL EXPENSE

Feb. 1970: Appropriation Request Approval for Start-Up Modifications — $15,000

Mar. 1970: Additional Correction Expense — $10,000

SALARIES

Feb. 1970: 4 Shift Supervisors (transferred from other groups)
1 Manufacturing Representative
1 Start-Up Supervisor — $6,000

Mar. 1970: 2 Shift Supervisors (part time)
1 Manufacturing Representative — $2,500

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LABORATORY

Feb. 1970:	1 Man full time for Special Analysis	$1,200
Mar. 1970:	1 Man half time	$ 600

PRODUCTION RESEARCH

Feb. 1970:	1 Man 75% of Month for investigation of quality and production problems that might occur	$1,000

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III. TENTATIVE OPERATING INSTRUCTIONS

A. SYNOPSIS OF PROCESS

This expansion is providing for increased capacity for Solid Aroclors in the design amount of 20 M pounds per year. The new facilities are intended for production of Aroclor 5460 while the old facilities will be used to produce the other Solid Aroclors.

General operation of the new system is as follows:

Santowax R from the Biphenyl-Santowax department is pumped into a terphenyl feed tank (weigh tank) until a pre-determined weight is collected in the tank. Ferric Chloride is introduced into the Santowax and the mixture is agitated. From the weigh tank, the charge is pumped into one of two similar chlorinators.

The Santowax in the chlorinator is circulated through a therminol cooled shell and tube heat exchanger through the tube side and back to the chlorinator. Chlorine is fed into the circulating mass at a controlled rate over a 12 hour period. The heat of reaction is removed in the therminol cooled exchanger. Both the chlorine feed and temperature of the mass are controlled and stepped up during the length of the chlorination period. The control for determining when the reaction is complete is softening point. HCl gas is liberated throughout the chlorination and is sent to the Muriatic Acid Plant for processing into acid.

After chlorination is completed, the 5060 (Crude 5460) is pumped to a blow tank where residual HCl is removed by air sparging. A slight vacuum is drawn on the tank by a water scrubber to remove the HCl fumes. The blow tank will hold material from both chlorinators, (2 chlorinator batches).

From the blow tank, the 5060 is transferred to a still pot. Again, two chlorinator batches constitute a still charge. Lime is added to the still and the still is buttoned up. Vacuum is then drawn on the still receiver system by a four-stage steam ejector. The mass is circulated through a gas fired furnace which provides the heat for distillation.

The vapors from the still pass up through a cyclone separator to remove entrainment and then on through a therminol cooled condenser where they are liquefied and drop into the still receiver. The distillation takes place over a 12 hour period.

After distillation is completed (as determined by the softening point of the 5460), the 5460 in the receiver is pumped on to the flaking area to be packed in bags. The Montar (still bottoms) is drawn out in drums from the still pot after every second run.

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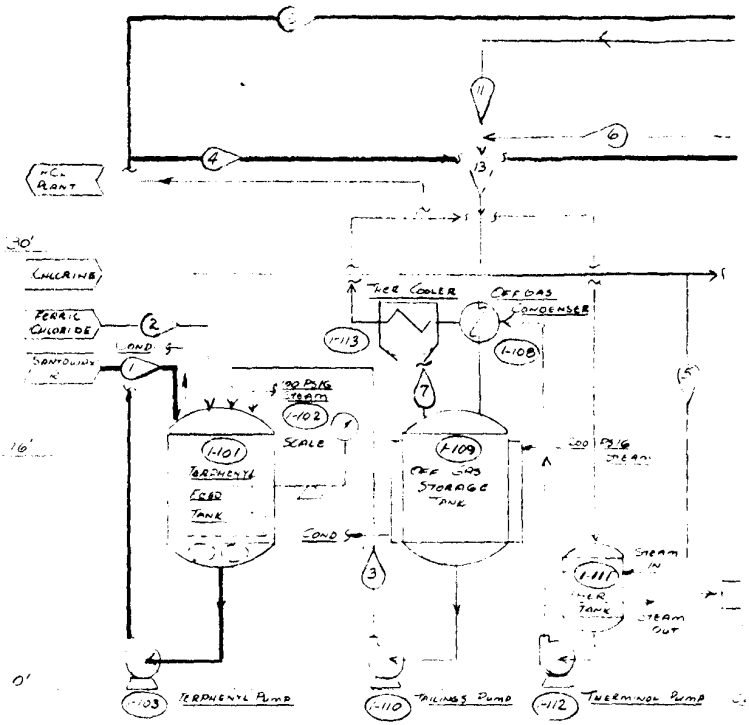

COMPONENT \ STREAM	FORMULA	MOL WT	1	2	3	4	5	6	7	8	9	10
SANTOWAX R	$C_{18}H_{14}$	230.3	11200			11200					11200	
FERRIC CHLOR	$FeCl_3$	162.2		15		15				15	15	
CHLORINE	Cl_2	70.9					32400	25	50			32[illegible]
AIR		29.0					3500	3500	7000			35[illegible]
HYDROGEN	H_2	2.0					100	100	200			10[illegible]
CRUDE 5060										25900		
HYDROGEN CHLOR	HCL	36.5						17425	34850	250		
LIME	$Ca(OH)_2$	74.1										
5460	$C_8H_4Cl_{10}$	574.8										
MONTAR 5												
TAILINGS					945	945		945			945	
TOTAL LBS/BA			11200	15	945	2160	36000	21995	42100	26165	12160	360[illegible]
GAL/BA			1330		95	1450				2160	1450	
CU FT/BA							30800	331080	479258			108[illegible]
GPM AVG					100	125				250	125	
GPM MAX					100	125				250	125	
DENSITY LB/GAL			8.4		10	8.4	0.358 LB/CU FT	0.067 LB/CU FT	3.09 LB/CU FT	12.1	8.4	0.358 LB/CU FT
VISCOSITY CP			1.0		100	2.6				12	2.6	
TEMP °C			160		100	160	15	250		250	160	15
PRESSURE ATM			1		1	1	1.35	1.35	1.35	1	1	1.35

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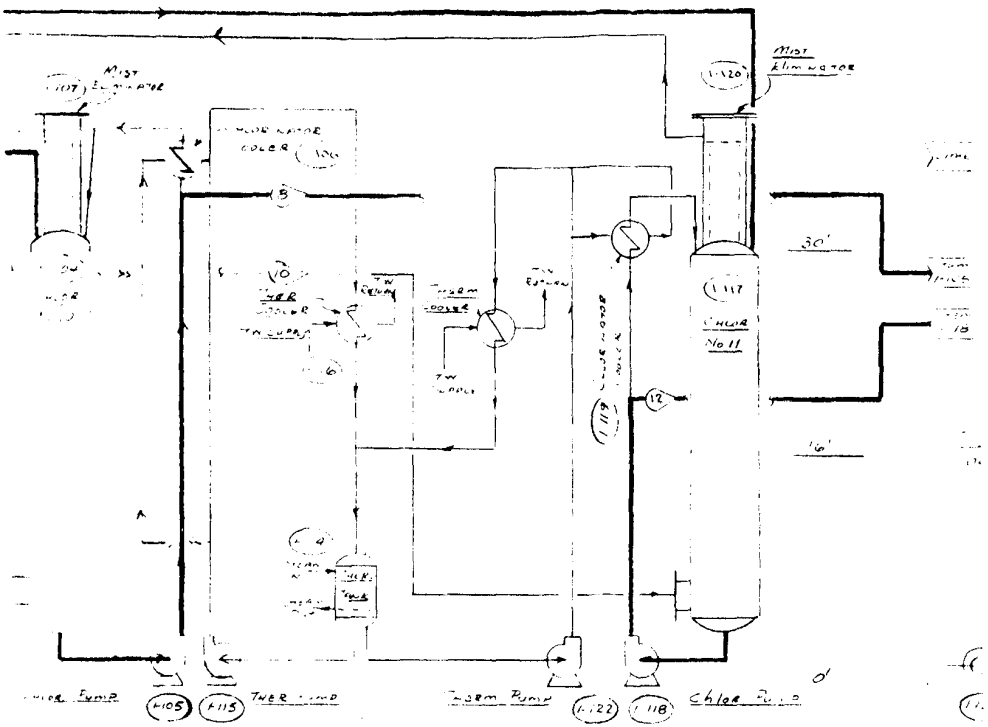

10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
		F				30					30			
2420	25		50											
500	3500		7000	300	500									
100	70		200											
		5900				5,800								
	7425	250	14850		500									
							400				400			
								37950	50	37900		100	37800	37800
											3900			
	45		1890											
6000	1345	2465	41990	300	800	5,830	400	37950	50	37900	14330	100	37800	37800
		2160				4180			42	3020	1120		3020	3020
3000	330000		2 @	2910	1750			6 @ 6000				14650		
		250											125	
		250											125	
Tank Capacity	Flow Rate	124	0.004 gpm	0.103 gpm	0.018 gpm	12.4		0.009 gpm	240	12.5	3	0.007 gpm	12.5	12.5
		12								120	40		120	120
15	250	250	250	15	100	200		320-370	320-370	160	370	150	160	160
1.35	1.35	1	1.35	1.35	1	1		.033	.033	.047	1	.047	1	1

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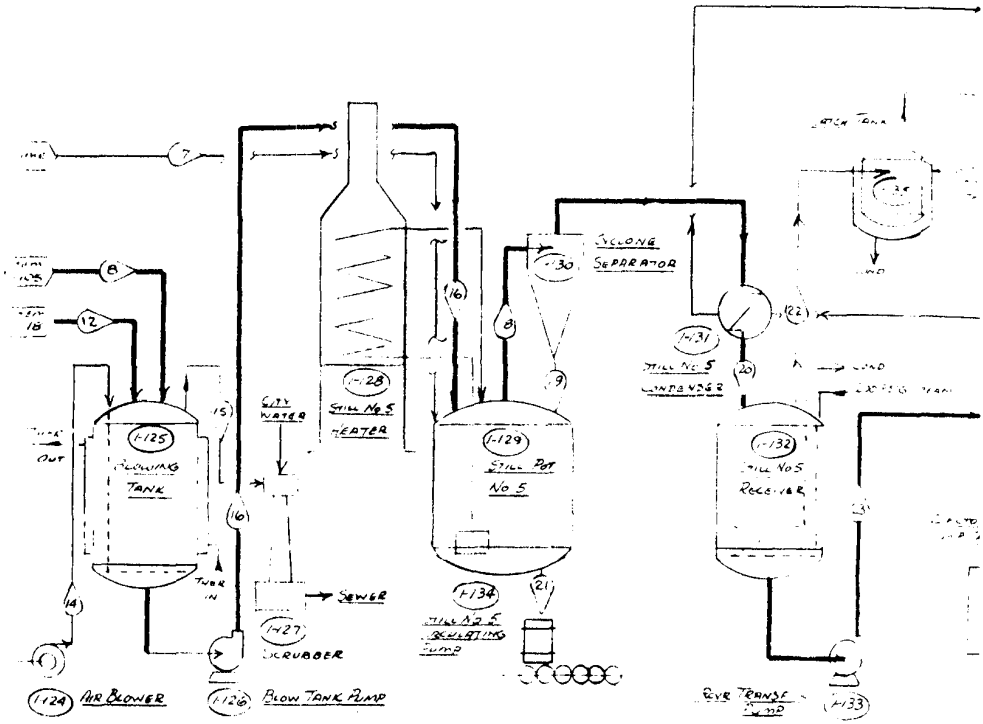

BATCH CHLORINATOR CYCLE	TIME - HRS
CHARGE SANTOWAX (4 to 9)	0.50
CHLORINE AT 1500 LBS/HR (5 to 10)	1.00
2000 "	1.00
3000 "	9.00
EMPTY (9 to 11)	0.50
TOTAL	12,00 HRS

BATCH STILL CYCLE	TIME - HRS
CHARGE STILL (6 to 19)	2.50
HEAT UP	2.00
DISTILL (19 to 23)	8.50
EMPTY	1.00
TOTAL	12.00 HRS

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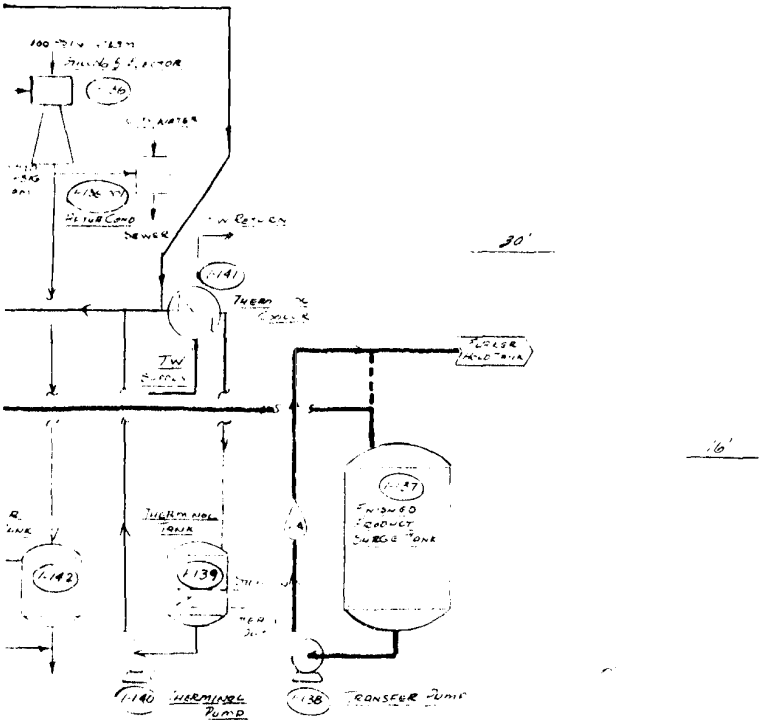

BATCH x BATCH/HR = OPERATING HRS

2000 LBS/BATCH x 1 BATCH/12 HOURS x 6350 HRS

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LOCATION AROCLOR	AUTH. NO. 208C
	JOB. NO. 849

PROCESS FLOW DIAGRAM & MATERIAL BALA
SOLID AROCLOR EXPANSION
CHLORINATION & DISTILLATION

	BY	DATE	REVIEWED BY	DATE	RE BY
DRAWN	RLB	1-2-70			
CHECKED					
APPROVED PROJ ENGR					
APPROVED					

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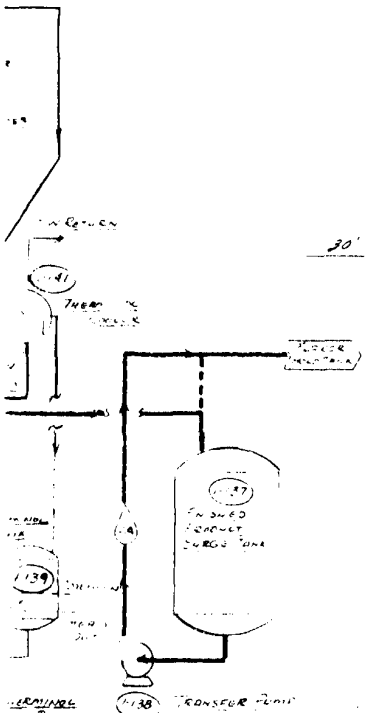

REV.	DATE	DESCRIPTION	BY	CKD.	APPD.

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LOCATION Aroclor

AUTH. NO. 2080
JOB. NO. 849

Process Flow Diagram & Material Balance
Solid Aroclor Expansion Chlorination & Distillation

	BY	DATE	REVIEWED BY	REVIEWED DATE	REVIEWED BY	REVIEWED DATE
DRAWN	RLB	1-2-70				
CHECKED						
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APPROVED						

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TENTATIVE OPERATING INSTRUCTIONS
FOR
SOLID AROCLOR - CEA 2080

B. SAFETY AND HOUSEKEEPING

Safety of operations in the Aroclor Plant depends on the individual operator. Materials being handled and operations must be observed closely to guard against the following:

	Cause and Action to Prevent
1. Chlorine Gas	Chlorine gas is a very toxic corrosive gas. Leaks or high pressure can occur to liberate it.

Action to Prevent

a. Report Chlorine gas exposure immediately for treatment with Antidote. Milk may be used in mild cases to relieve throat irritation. Oxygen from the resuscitator in the Dispensary is available.

b. Keep gas mask in good condition. Keep a good canister in the mask. Use these type masks only in chlorine concentrations to 2-3% chlorine in air.

c. Use a Scott Air Pak in concentrations of chlorine gas above 3% in air. Three units are available in the Aroclor-Biphenyl Dept.

d. If caught in chlorine gas without a mask, hold your breath and go cross wind until you are out of range of the gas. Place a handkerchief over your nose in small quantities of chlorine.

e. Report all chlorine leaks for repair immediately. Make temporary repairs with tape if possible.

f. In case of a major chlorine leak, the source of chlorine gas must be stopped.

Cut off chlorine from cars.

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Cause and Action to Prevent

2. Thermal Burns

Contact with hot uninsulated product lines at the chlorinators and still areas.

Contact with uninsulated steam lines and open steam.

Contact with hot Aroclors from broken lines or leaks.

Contact with open flames at stills or from heating lines in the department.

Action to Prevent

a. Know that contact with equipment and product will cause a thermal burn due to the high temperatures. Make changes in operations with this hazard in mind.

b. Know the first aid treatment for burns. Use Cold Water Treatment (See Appendix A - Emergency Section).

c. Wear gloves and long sleeve shirts with the sleeves rolled down when operating. Gloves and clothing can make the difference between first and second degree burns.

d. Report uninsulated lines for repair of insulation.

e. Use only steam lines with hose and hose clamps in good condition.

f. The following operations are hazardous and should be done with care:

   (1) Catching samples at the Aroclor chlorinator circulating lines.

   (2) Sampling the Solid Aroclor still receiver.

   (3) Drawing bottoms on the Aroclor stills.

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Cause and Action to Prevent

3. Explosion

An explosion could occur in the chlorinators by slugging liquid chlorine to the distributor. Slugs of liquid chlorine could react fast enough to cause excessive pressure in the vessel. A rupture of the chlorinator could occur.

Action to Prevent

a. Observe operation of the chlorine vaporizer and do not let liquid chlorine get into the rotameters. Pipe lines will be frosted.

b. In case chlorine feed lines are frosted, close liquid chlorine feed valve to the vaporizer. Check steam addition to the vaporizer. Do not start up until source of trouble has been located.

c. Do not close valve in water discharge line from the chlorinator coil.

d. Observe temperature of the chlorinator periodically and be sure it is not too hot.

4. Falls

Slipping on cement floors, stairs, Aroclor on floor, ice conditions; tripping over objects (hose, pipe, valve handles, etc.); or losing footing on ladders, etc., can cause falls.

Action to Prevent

a. The majority of minor, serious, and near-miss injuries in the Aroclor Dept. are the result of falls. Prevention is always within the ability of the operator by use of expert operating practices.

b. The following items should be done:

(1) Return hose to rack after using.

(2) Keep operating areas clean of all foreign objects.

(3) Return ladders to racks when not in use.

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Cause and Action to Prevent

4. Falls (Contd.)

(4) Keep gloves on and hands out of pockets, especially going up and down stairs.

(5) Place guards around any area that presents a hazard that should be guarded.

c. Poor lighting due to burned out bulbs should be corrected at once. Poor lighting due to inadequate facilities should be reported.

d. Spills must be cleaned up immediately following their occurrence. Report any spill that cannot be cleaned up within the shift to the Chief Operator. Spills are to be reported in the log book.

5. Fires

Fires can occur by:

Biphenyl, Santowax R, or Santowax C ignition.

Chlorine problems in the vaporizer allowing reaction with steam to release hydrogen.

Furnace burner backfire.

Wood, rags, or paper on hot lines.

Sparks from welding apparatus of open flames.

Action to Prevent

a. Area must be clear of trash or flammable materials. Use trash skips and cans.

b. Smoke only in areas so designated.

c. Use spark producing equipment only with a fire permit and proper inspection.

d. Use care in lighting gas torch or the still furnaces.

e. Fire fighting equipment includes:

(1) Two wheeled dry powder units.

(2) Hose house with 200 ft. of hose.

(3) Two dry powder hand extinguishers, one CO_2 hand extinguisher.

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Cause and Action to Prevent

5. Fires (Contd.)

(4) Two 3/4" water hoses.

(5) Hose connection north of Santowax.

(6) Scott Air Paks.

(7) Fire truck in fire house.

f. Observe visitors in the plant and be sure they observe safety rules.

6. The following is a list of chemicals handled in the Aroclor Plant operations and the precautions to be taken during their handling:

a. Chlorine Gas — This is a corrosive gas which is toxic. Leaks or back pressure can occur and liberate chlorine gas in the area. Operators should have their cartridge type respirators handy at all times while in the area.

If you are caught without a gas mask, and large amounts of chlorine gas are liberated, hold your breath and go cross wind until you are out of range of the gas. Once out of the area, obtain an emergency gas mask and return to the area and correct the trouble.

A victim of chlorine gas fumes must be removed as quickly as possible from the gaseous area. Place patient on his back with head and back elevated. Milk may be used in mild cases as a relief from throat irritation. If the patient has stopped breathing, start artificial respiration immediately.

b. Biphenyl — Biphenyl is a flammable material which will burn. Burning should not be done in the presence of Biphenyl or Biphenyl vapors. The melting point is 68.7°C., and the auto ignition temperature is 258°C. Inhalation of Biphenyl fumes is not recommended, since it can cause a drugged effect on the person.

c. Santowax R — Santowax R is a flammable material which will burn. It is relatively non-toxic to human beings. However, the vapors of Santowax R are irritating to the mucous membranes and bronichial tract. Prolonged breathing of the vapors should be avoided. The melting point is 140°C.

d. Santowax C — Same as Santowax R, since it is the crude material prior to distillation.

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6. (Continued)

e. Ferric Chloride	Ferric Chloride is a black-brown solid. It causes only slightly irritating effects on the skin or mucous membranes. When heated it will decompose and release toxic fumes of chlorine. It will react with water to produce toxic and corrosive HCl fumes.
f. Attapulgus Earth	This material is a dried earth. No danger in handling. Wash off with water to clean.
g. Hydrated Lime	No particular hazard in handling this material. The dust is irritating to the eyes and skin, and should be washed off with water.
h. Crude Aroclors	Crude Aroclors are hot, since all are handled in steam traced or jacketed lines. They can easily cause thermal burns in contract with the skin. Prior to air blowing, the material has HCl fumes entrained in it which are irritating to the skin or mucous membranes.
i. Hydrogen Chlorine Gas	This is a corrosive gas which is toxic. It is irritating to the mucous membranes, to the eyes, and to the respiratory tract. It will react with water to form Hydrochloric Acid.
j. Still Bottoms or Residue	Fumes from still bottoms are toxic. They are extremely irritating to the mucous membranes, to the eyes, and respiratory tract.

HOUSEKEEPING

The Aroclor chlorinator and still operators are responsible for housekeeping during their shift. Good housekeeping is the mark of good operations, safety practices, quality, and costs.

Housekeeping duties are equal in importance with all other operating duties.

Poor Practices	Action to Prevent
1. Hoses, valve handles, dip sticks, rags, and other material on ground or floor.	a. Replace after use. b. Have place to store all necessary operating aids. c. Report needs to supervision.

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HOUSEKEEPING (Contd.)

Poor Practices		Action to Prevent
2. Product Leaks.	a.	Tighten valve packing glands and flange bolts.
	b.	Report leaks to Chief Operator for maintenance alteration.
3. Trash and Crude Drums.	a.	Contact Chief Operator to have drums moved from area.
	b.	Use trash skip in area.
4. Product spills or clean out messes.	a.	Prevent necessity of clean-out by keeping tracing, insulation, or jacket in good repair by getting items turned in for maintenance work.
	b.	Spills must be cleaned up when they are made. Clean up will continue through the following shifts to finish the job.

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TENTATIVE OPERATING INSTRUCTIONS
FOR
SOLID AROCLOR 5460

PROCESS FUNCTION OUTLINE

III. C. I. MAIN THERMINOL HEATER SYSTEM

1.1 Scope

This covers the charging, start-up, shutdown, normal operation, and emergency situations involving the Therminol heater in the Aroclor Department.

1.2 Description of Process

Therminol FR-2 (Aroclor 1248) or FR-1 (Aroclor 1242) is circulated through a pipe system in the Aroclor Department. This heating system is used to heat up tanks, transfer lines, and material involved in producing solid Aroclors.

There are three separate circulating systems drawing off the same surge tank (Item 149). They should not be confused with the Therminol cooling systems other places in the process. The first system circulates 400 GPM through the furnace to heat the Aroclor to 250°C. The second system can circulate 1,000 GPM through the old system (existing users). The third system can circulate 300 GPM through the new Solid Aroclor Expansion area (CEA 2080 users). The pumps are equipped with a seal guard system.

II. PROCESS DIAGRAM

Attached.

III. OPERATION OF PROCESS

3.1 a. Charge System with Therminol FR-2 (Aroclor 1248)

1. Use temporarily relocated Pyranol pump to charge Therminol surge tank.
2. Position 55 gallon drum next to pump. Remove drum bung and vent cap.
3. Connect flexible hose to pump suction and the stainless steel pipe to be inserted into the drum.
4. Position discharge line from the pump into the tank.
5. Open valve on pump suction. Insert pipe into drum and start pump.
6. Adjust the suction valve on the pump until flow is steady.
7. Continue to fill the tank until 65 drums or approximately 3,550 gallons total are in the surge tank (Item 149).

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C. III. 3.1 b. Therminol 1242 can be charged directly to the surge tank (Item 149) by the following procedure:

1. Align valves from storage tank No. 5 to surge tank (Item 149). Care must be taken to ensure that all valves to the other surge tanks are closed. They are also filled from this storage tank line.

2. Check level gauge at surge tank.

3. Start storage tank pump.

4. Observe the level gauge at surge tank and shut off pump when you have 3,550 Gals.

5. Close valves in line from storage tank to surge tank.

3.2 Start-Up

A. Initial Start-Up

1. Turn on circuit No. 5 at the still panel and the switch at the field control box.

2. Place TRCA-629.12 in "Manual" with the output pressure at 15 psig. Blower air control valve is air to open.

3. Check to be sure Therminol is in the surge tank (Item 149). Temperature should be 100°C. minimum.

4. There is no flow control through the heater. The old FIC instrument will be used as a flow indicator, FIA-159-1. An alarm will sound if the pump stops and furnace shutdown will occur below 200 GPM.

5. Open natural gas valves in line to furnace.

6. Open blower air valves in pilot and main air lines.

7. Actuate red inset safety lever inside the Honeywell Protectoglo unit (lower right cover of case). You must wait 10 seconds between settings of this lever in case it has to be redone.

8. Set the temperature shutdown control point on Honeywell coil outlet temperature indicator at 325°C. (617°F.).

9. Start Therminol circulating pump (Item 159).

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C. III. 3.2 A. 10. Start air blower. Use pushbutton at side of field panel. Red light on Protectoglo unit should light up. Air pressure at the blower discharge should be above 1 psig.

11. Check pressure gauge at main air inlet to burner. It must be above 15 o.s.i.

12. Wait 6 minutes. Green light on Protectoglo unit lights up indicating purge period is over.

13. Press ignition "Start" pushbutton on side of control box and hold in until white light on Protectoglo unit lights up. Red and green lights should go out. Pilot lights up indicated by 0-7 reading on micro amp meter.

14. Adjust manual valve in air line to burner until pressure is below 1-1/2 o.s.i.

15. Reset the two North American safety valves in the main gas line. Handle on both valves must be in UP position prior to opening either valve.

16. Adjust manual valve in air line to burner until pressure is between 15 and 22 o.s.i. It must be above 15 o.s.i.

17. Adjust TRCA-629.12 to temperature at outlet of coil and transfer instrument to "Auto". This is for low fire start-up.

Use care to make this change, since you can cause shutdown of the furnace.

18. Shut steam valve to coil in the surge tank. Vent coil line to atmosphere.

19. The furnace must be dried out prior to Step 20. Details will be provided.

20. Observe the furnace temperature at the coil outlet. Do not exceed 50°C. increase for first two hours. Set TRCA-629.12 in automatic and raise the temperature 50°C. per hour until you reach 220°C.

Open the manual air valve slowly to raise the temperature.

Place TRCA-629.12 in "Auto" position and put set point at 250°C. System will circulate until needed.

Check stack temperature and do not exceed 400°C. on the multipoint temperature recorder.

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C. III. 3.2 A. 21. The therminol will continue to circulate from surge tank to heater and back to surge tank until the pumps for the other two systems are turned on. (Items 150 (existing users) and 158 (CEA 2080 users)).

22. To put the therminol through these two systems, fill the lines one at a time. Open each branch valve at feed and discharge to drive out air.

B. Start-Up Following Temporary Shutdown

Assume circulating pump is running (FIA-159-1) and the pilot light is burning.

1. Check to be sure Therminol is in the surge tank (Item 149).

2. Check temperature in surge tank (Item 149), TI-149-2. It should be 100°C.

Turn on steam to tank coil if necessary.

3. Adjust set point TRCA-629.12 at 126° - 150°C. and controller in "Auto" position.

4. White light on the Honeywell Protectoglo unit will be on indicating the pilot is on.

5. Adjust manual valve in air line to burner until pressure is below 1-1/2 o.s.i.

6. Reset the two North American safety valves in the main gas line.

7. Adjust manual valve in air line to burner until pressure is between 20-22 o.s.i.

8. Adjust TRCA-629.12 to temperature at outlet of coil and transfer instrument to "Auto". Gradually raise the set point to 250°C.

9. Start circulating pumps to both areas (existing old system and 2080 system). Fill lines one at a time, opening discharge and feed line at each feeder.

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C. III. 3.3 Routine Operations

When the Therminol heater system is operating normally, the following conditions will exist in the process.

A. FIA-159-1 will indicate 400 GPM.

B. PI-159 pump discharge pressure 40 psig.

C. PI-150 (existing users) pump discharge pressure 40 psig.

D. PI-158 (CEA 2080 users) pump discharge pressure 42 psig.

E. PI-629.16 heater coil outlet pressure _____.

F. TRCA-629.12 heater coil outlet temperature set at 250°C.

G. Honeywell coil outlet temperature indicator at 250°C. Shutdown alarm set at 325°C.

H. TI-149-2 surge tank temperature is around 245°C.

I. Air blower reduced discharge pressure - above 15 o.s.i. less than 22 o.s.i.

J. Main natural gas pressure 40 psig.

K. Natural gas reduced pressure 3-5 o.s.i.

L. Natural gas feed to burner atmospheric pressure (0 o.s.i.).

3.4 Safety Features

A. Honeywell Protectoglo unit has the following safety features:

1. Ignition period 10 second delay between actuation periods for warp switch to cool.

2. Blower reduced air pressure must be above 15 o.s.i. and less than 22 o.s.i.

3. Heater coil high temperature outlet shutdown set at 325°C. (617°F.).

4. Main natural gas low pressure shutdown set at 20 psig, and at 10 psig.

5. Natural gas high reduced pressure shutdown set at 5.0 psig.

6. Circulating pump low flow rate shutdown set at 200 GPM.

7. Air blower start-up sets up automatic 6 minute timed purge before next step of start-up can proceed.

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C. III. 3.4 A. 8. Minimum 15 o.s.i. air pressure is necessary at the main burner for the purge period.

9. A low air pressure ignition for lighting main burner is necessary. Set for air pressure to be below 1-1/2 o.s.i. to main burner.

10. Pilot flame must be burning to start up unit, indicated by 0-7 microamperes on current meter. Meter gives an alternating off-on reading.

B. Check surge tank, Item 149, to be sure therminol level is adequate.

3.5 Shutdown

A. Temporary Shutdown

Main gas burner off with pilot light on and circulating pump running.

1. Adjust TRCA-629.12 set point to zero (instrument in "Auto"), or

2. If instrument is in "Manual", adjust controller for output pressure to zero, or

3. Close the 6" manual valve in the main air line to the furnace burner. In case it is necessary to cool the furnace quickly, leave the air valve open.

4. Normally, the circulating pump is left on to cool the heater coil and prevent overheating.

5. Close one or both of the North American safety valves in the gas line to the main burner.

B. Complete Shutdown

Main gas burner pilot light and circulating pump off.

1. Push ignition "Stop" button on side of field control panel.

2. Push "Stop" button for air blower.

3. Close manual valve in the main air line.

4. Close manual valves in main gas supply line.

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C. III. 3.5 B. 5. Allow circulating pump to continue pumping until furnace coil outlet has cooled to 150°C. then shut off the circulating pump.

6. Check surge tank level (Item 149) to be sure the tank does not overflow.

7. If a temperature of 100°C. is to be maintained in the surge tank, it may be necessary to open the valve in the steam line to the tank coil.

8. Set points on TRCA-629.12, heater coil outlet, and the Honeywell Protectoglo unit set point can be left in position when shut off.

9. Shut off circuit No. 5 behind the still panel if the shutdown is to be an extended one.

C. Emergency Shutdown

In case it becomes necessary to shut down fast, the following methods can normally be used.

1. From the Field

a. Push ignition "Stop" button on side of field control panel to shut off pilot and main burner.

b. Turn temperature shutdown set point on Honeywell Protectoglo unit below the furnace coil outlet temperature.

c. Close manual valve in air blower discharge line or stop the air blower.

d. Push "Stop" button for the circulating pump located at side of field control panel.

Main and pilot gas burner will be shut off, while air is being blown through the furnace.

Item d. is the least preferred of the above methods. Normally, the circulating pump will continue to be operated.

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C. III. 3.5 C. 2. At the Still Panel

a. Turn off circuit No. 5 behind still panel.

3. At Motor Control Center

a. Shut off circulating pump circuit breaker. This method is least preferred.

b. Shut off blower circuit breaker.

D. Emergency Shutdown with Alarm

Pilot and main gas burner off. Circulating pump still on.

1. High coil outlet temperature - above 325°C.(617°F.)
2. Low natural gas supply pressure - below 20 psig or below 10 psig
3. Low blower outlet pressure - below 1 psig
4. High reduced natural gas pressure- above 5 psig
5. Low coil flow - below 200 GPM
6. Failure of circuit 5 behind still panel.
7. Failure of "on-off" switch at side of field control panel or blowing 115 volt fuse in panel.

3.6 Control Loops, Interlocks, and Alarms

A. Control Loops

There are three major loops in this system.

1. Circulating Pump Flow Indication - FIA-159-1

Low circulation rate (below 200 GPM) will shut off natural gas to the furnace and sound an alarm horn.

2. Therminol Heater Outlet Coil Temperature Control - TRCA-629.12

Function of this loop is to maintain a constant temperature of 250°C. at the furnace coil outlet. This is accomplished by measurement of the temperature with a thermocouple and controlling the heat input to the furnace with a control valve in the main combustion air line. A low temperature alarm at 220°C. and a high temperature alarm at 325°C. will be actuated at too low or too high a temperature.

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C. III. 3.6 A. 3. Therminol Heater Furnace Control - 629A

The function of this loop is to provide a source of heat for the Therminol FR-2 (Aroclor 1248) circulating system. This is obtained with a North American burner and air blower which is used to heat the Therminol circulating through a direct fired coil. Control of this heating system is obtained by TRCA-629.12. There are four safety features in the furnace controls to shut the system down.

a. High coil outlet temperature - above 325°C.

b. Low natural gas supply pressure-below 20 psig or -below 10 psig

c. Low blower outlet pressure -below 1 psig

d. High reduced natural gas pressure-above 5 psig

B. Interlocks

Interlocks in this system are as follows. Each, except Items 1.a. and b., have alarms.

1. Start-Up of Furnace

a. Actuation of pilot ignition lever on Honeywell Protectoglo unit has a 10 second delay before second try can be made.

b. Ignition "Start" button at the Protectoglo unit has a 6 minute purge delay after the air blower has been started before the furnace will light up.

c. During purge period a minimum of 15 o.s.i. air pressure is necessary prior to completion of purge.

d. To light the main burner the air discharge pressure to the main burner must be below 1-1/2 o.s.i. for low fire start-up.

2. Automatic Furnace Shutdown with Alarms (Pilot and Main Gas Burner Off)

a. High coil outlet temperature - above 325°C. (617°F.)

b. Low natural gas supply pressure - below 20 psig or below 10 psig

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C. III. 3.6 B. 2. c. Low blower outlet pressure - below 1 psig

d. High reduced natural gas pressure - above 5 psig

e. Low coil flow - below 200 GPM

f. Failure of circuit No. 5 behind still panel.

g. Failure of switch at side of field control panel or blowing 115 volt fuse in panel.

C. Alarms

1. All shutdown items under Interlocks B.2. above.

2. Therminol heater coil outlet low temperature below 220°C.

3. Therminol heater coil outlet high temperature above 300°C.

3.7 Abnormal Conditions

A. Unusual high or low temperature readings can occur if the thermocouple extension wire for the Honeywell Protectoglo unit and TRCA-629.12 are mixed up. See note, Section IV-C., below.

IV. COMMENTS ON PROCESS

A. It is very important to be sure the coil in the surge tank (Item 149) is covered when the system is in operation. This assures the circulating pump has a positive suction and prevents surging in the heater coil. Surges in flow can cause coil hot spots and shorten the coil life.

B. FIA-159-1 flow indicator will shut the system down if the flow is less than 200 GPM.

C. At TRCA-629.12, be sure the iron constantan thermocouple extension lead wire (type J) is used to transmit to the control room and the instrument. The conduit run also contains a type K extension lead wire which is chromel alumel. If the type J wire is used, the indicator will read correctly. If the type K wire is used by mistake, the therminol will overheat by about 100°C. The high temperature switch should shut the furnace down at 325°C.

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C. IV. D. The Therminol furnace is rated at 8,000,000 Btu/hour heat input. This corresponds to 22 o.s.i. air pressure at the air inlet of the burner. The manual valve in the air line should be set for 22 o.s.i. when the automatic valve is wide open. This will assure the heat input will not exceed the design rate if the automatic valve should open wide.

E. Care must be taken not to fill the surge tank (Item 149) too full during normal operation. This can cause the tank to run over when the circulating pump is stopped. Normal level will be about _____ in the sight glass. The level in the tank will vary, dependent on the operating temperature of the system and the Therminol usage.

F. Temperature of the Therminol system is maintained at 250°C. for production of all solid Aroclors except 1168. During operation to produce 1168, the temperature is raised to 300°C. The furnace high temperature shutdown alarm is kept at the same position of 325°C.

G. To get natural gas to the main burner the North American safety valves must be reset. Prior to opening the valves the handle of each valve must be in the UP position. This sets the safety shutdown pressure switches.

H. Use care when opening the inner door to the field control panel at the furnace. The high temperature shutdown instrument pointer is free floating and can go above the shutdown pointer. The door must be opened slowly.

I. Gas to the venturi mixing chamber for the pilot light on the furnace should be at atmospheric pressure. Air pressure will be the blower discharge pressure (22 o.s.i.). The pilot light will not burn unless this pressure ratio is maintained to give the proper gas-air mixture.

J. In case of a power failure at the field panel for the Therminol Heater the reset button on the high temperature shutdown instrument must be pushed to restart the system. There is no apparent indication that this button has been pushed. The red no flame light will not light up and furnace can not be started.

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APPENDIX I

Item 149, Main Therminol Surge Tank

90" OD X 134" Long
Dished Heads

Depth (In.)	Contents (Gal.)	Depth (In.)	Contents (Gal.)
0	0	46	2148.3
1	7.4	47	2210.0
2	21.7	48	2271.7
3	39.4	49	2332.3
4	60.4	50	2392.8
5	84.1	51	2452.1
6	111.1	52	2512.3
7	139.7	53	2572.3
8	170.7	54	2631.0
9	203.1	55	2689.5
10	248.1	56	2747.8
11	273.9	57	2805.7
12	312.0	58	2862.3
13	348.0	59	2918.5
14	385.1	60	2975.4
15	433.3	61	2030.8
16	472.5	62	2085.7
17	512.7	63	3141.2
18	568.6	64	3195.1
19	610.8	65	3248.5
20	652.4	66	3300.3
21	712.0	67	3340.5
22	763.3	68	3397.9
23	815.2	69	3445.5
24	865.7	70	3494.7
25	922.9	71	3530.9
26	970.7	72	3592.3
27	1024.8	73	3637.8
28	1079.6	74	3682.3
29	1135.9	75	3724.8
30	1191.4	76	3765.2
31	1248.5	77	3804.5
32	1306.0	78	3843.5
33	1363.9	79	3880.3
34	1422.0	80	3915.6
35	1480.5	81	3948.4
36	1541.0	82	3979.7
37	1600.1	83	4010.1
38	1659.2	84	4036.6
39	1719.5	85	4059.9
40	1709.9	86	4081.7
41	1840.5	87	4100.7
42	1901.2	88	4115.1
43	1962.9	89	4125.6
44	2024.7		
45	2086.5		

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TENTATIVE OPERATING INSTRUCTIONS
FOR
SOLID AROCLOR 5460

PROCESS FUNCTION OUTLINE

III. C. I. NO. 2 WEIGH TANK, NO. 10 & 11 CHLORINATORS, AND NO. 5 BLOW TANK

1.1 Scope

This covers the charging, start-up, shutdown, normal operation, and emergency situations involving the No. 2 Weigh (charge) Tank, No. 10 & 11 Chlorinators, and the No. 5 Blow Tank for production of 5460 Solid Aroclor. To avoid confusion, the instructions for the chlorinators will be written for No. 10 with the corresponding item number, controller number, etc., for No. 11 appearing in parenthesis.

1.2 Description of Process

Crude 5460 (5060 Aroclor) is produced by the batch chlorination of a weighed quantity of Santowax R in a vertical reaction vessel with Ferric Chloride as a catalyst. Chlorine gas is added at the bottom of the vessel.

By-product HCl gas vented at the top of the chlorinator is recovered in the Muriatic Acid Department. The 5060 produced in batch chlorination is transferred to a blowing tank when the chlorination is completed. Chlorine gas is fed to the chlorinator from tank cars.

II. PROCESS DIAGRAM

Attached.

III. DESCRIPTION OF PROCESS

3.1 Start-Up

A. Charge Therminol Cooling System for the No. 10 (11) Chlorinator

Both chlorinator cooling systems use the same surge tank (Item 114). Therminol 1242 can be charged directly to the surge tank by the following procedure:

1. Align valves in line from storage tank No. 5 to surge tank (Item 114). Care must be taken to ensure that all valves to the other surge tanks are closed. They are also filled from this storage tank line.

2. Check level gauge at surge tank.

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C. III. 3.1 A. 3. Start storage tank pump.

4. Observe the level gauge at surge tank and shut off pump when you have 700 Gals.

5. Close valves in line from storage tank to surge tank.

B. Charge Therminol Cooling System for No. 10 (11) Chlorinator

Charge Therminol (1248 Aroclor) into the surge tank (Item 114) by the following procedure:

1. Use temporarily relocated Pyranol pump to charge the tank.

2. Position 55 gal. drum next to the pump. Remove drum bung and vent cap.

3. Connect flexible hose to pump suction and the stainless steel pipe to be placed in the drum.

4. Position discharge line from the pump into the surge tank (Item 114).

5. Open valve on pump suction. Insert pipe into the drum and start pump.

6. Adjust the suction valve on the pump until flow is steady.

7. Continue to fill the tank until 13 drums or 700 gallons are in the surge tank.

C. Start-Up Therminol Cooling System for No. 10 (11) Chlorinator

1. Set valves in the system to flow through the No. 10 (11) chlorinator heat exchanger (Item 106 (119)) and through the tube side of the therminol cooler (Item 116 (123)).

2. Close drain valve on the suction of the circulating pump (Item 115 (122)).

3. Close valves to put Therminol from the furnace system on the No. 10 (11) Aroclor chlorinator heat exchanger (Item 106 (119). Tag lines closed.

4. Open steam valve to coil on the surge tank (Item 114). Both chlorinator cooling systems use the same surge tank (Item 114). There is no temperature controller on this tank. The steam valve should be set to bring the temperature in this tank to 45°C. Once in operation, the valve can be closed. It will be reopened upon shutdown of both chlorinators or if required to maintain an adequate temperature.

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C. III. 3.1 C. 5. Check level in the surge tank (Item 114). Should have an adequate level in the tank.

6. Set TRCA-106-1 (119-1) in "Auto" with set point at 190°C. Low temperature alarm set at 120°C. - high temperature alarm set at 275°C.

7. Set FICA-115-1 (122-1) in "Auto" with set point at 300 GPM. Low flow alarm should sound at 250 GPM.

8. When the material in the surge tank is at 45°C., start the circulating pump (Item 115 (122).

9. Check flow through the Therminol cooling system by observing the following items:

a. Pump discharge pressure should be 60 psig on the local gauge.

b. Flow through Therminol system should be 300 GPM. Check FICA-115-1 (122-1).

c. Check action of control valve to the No. 10 (11) Aroclor heat exchanger. See TRCA-106-1 (119-1). Valve should be closed.

10. Set TICA-116-1 (123-1) on the Therminol cooler to 70°C. Low temperature alarm is set at 60°C. - high temperature alarm is set at 80°C.

11. Check the following temperature points in the Therminol cooling system:

a. Pump discharge temperature, No. 10 (11) chlorinator heat exchanger outlet temperature, and the outlet temperature of the water-cooled heat exchanger for the therminol system (See TRCA-116-1 (123-1)).

12. If there are no problems with the system, let it continue to circulate until needed.

D. Initial Equipment Check for Start-Up

Open valves on steam lines to the Santowax supply to the weigh tank (Item 101). Open valves in the steam lines to the coil on the weigh tank.

1. Set temperature controller on the No. 2 weigh tank, TIC-101-1, at 160°C. The controller has no provision for manual operation.

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C. III. 3.1 D. 2. Check Therminol cooling system.

a. Therminol cooler controller TICA-116-1 (123-1) is set in "Auto" with a set point at 70°C.

b. Flow controller FICA-115-1 (122-1) in "Auto" with the set point at 300 GPM.

c. Pump pressure 60 psig.

3. The No. 5 blow tank temperature controller TIC-125-1 should be in "Auto" with the set point at 230°C.

4. Make sure the main Aroclor therminol heater system is in operation and is circulating at 250°C. This system provides the heat for high temperature line tracing and for the No. 5 blow tank coil.

5. Open therminol feeder lines to heat the following equipment:

a. Transfer lines from weigh tank (Item 101) to the transfer pump and to No. 10 (11) chlorinator (Item 104 (117).

b. Circulating line at No. 10 (11) chlorinator through the heat exchanger (Item 106 (119)) and back to the chlorinator.

c. Sample line at No. 10 (11) chlorinator. The supply for this line starts at the blow tank (Item 125).

d. Transfer line at No. 10 (11) chlorinator to the No. 5 blow tank (Item 125).

e. Coil in No. 5 blow tank (Item 125).

f. Transfer line from No. 5 blow tank to the pump (Item 126).

Observe temperature to be sure the therminol system stays at 250°C., or returns to this temperature after the various feed lines have been started up.

6. Open steam valve to mist eliminator (Item 107 (120)) tracing.

7. Open water valve to S&K jet (Item 127) - 40 psig water pressure. This unit stays in continuous operation.

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C. III. 3.1 D. 8. Start the air blower (Item 124). Open the valve at the No. 5 blow tank two turns.

9. Check the suction on the No. 5 blow tank (Item 125) to be sure it is adequate for operation.

10. Open the manual valves in the water system to the Aroclor cooler (Item 116 (123)).

E. Charge and Operating Temperatures for Crude 5460 Solid Aroclor

The charge and operating temperatures for the chlorinators are shown in Table I.

F. Charge No. 2 Weigh Tank (Charge Tank)

1. Charge 11,200 lbs. of Santowax R in the following manner:

a. Set the valves to receive the charge from the Santowax Department. Santowax R is obtained from the Santowax storage tank.

b. Open the manual valve in the Santowax R line.

c. Depress the pushbutton near the scale to open the automatic valve. This will put the annunciator window light out which is marked "Charge Complete Terphenyl Feed Tank".

d. Start the pump to charge the weigh tank. Santowax R is now entering the weigh tank.

e. When the measured weight reaches the set point, the automatic Santowax R control valve will close and annunciator window marked "Charge Complete Terphenyl Feed Tank".will be actuated.

f. If the charge valve does not close at 11,200 lbs. another switch will attempt to close it at 12,000 lbs. and also sound an alarm.

g. Close the hand valve in the Santowax R line. Turn off pump.

h. Open the automatic valve and allow the line to drain, then reclose the automatic valve.

i. Start the agitator in the weigh tank. Allow agitation to take place for a minimum of one hour. Stop the agitator just before material in the weigh tank is to be charged to the chlorinator.

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TABLE I

BATCH CHLORINATOR OPERATING CONDITIONS - 5060 AROCLOR	
Chlorinator Charge:(Lbs.)	
Santowax R	11,200
Approximate Pounds 100% Chlorine Required to Produce Batch:	32,400
Totalizer Chlorine Settings	
Lbs. Cl_2 @ 80%	25,900
Chlorinator Temperature:	
Beginning	160°C.
Ending	250°C.
Softening Point	105 - 115°C
Weight of Crude Batch - Lbs.:	25,900
Gallons	2,040

NOTE: ADD 15 POUNDS OF FERRIC CHLORIDE TO EACH BATCH CHLORINATOR CHARGE.

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C. III. 3.1 F. 1. j. Obtain a Santowax R sample before adding catalyst.

k. Open manual valve on top of the weigh tank (Item 101) and add 15 pounds of Ferric Chlorine. Close the manual valve after adding the Ferric Chloride.

l. The material is now ready for the next chlorinator charge when needed.

m. Take sample to Lab.

G. Charge No. 10 (11) Chlorinator and Start Chlorination

1. Programmed Chlorinator Operation

a. Close manual chlorine valves at distributors on No. 10 (11) chlorinator.

b. Close vent valve on chlorinator.

c. Open HCl valve to off-gas condenser and on to Muriatic Acid area.

d. Set the chlorine flow controller FRC-104-1 (117-1) in "Auto-Cascade". The controller set point is automatically altered in three steps - 1,500 lbs/hr. for first hour; 2,000 lbs/hr. for the second hour; and 3,000 lbs/hr. for each of nine subsequent hours. There is no provision for reducing the last set point on the flow controller thereafter until the end of the batch.

e. Set the temperature controller TRCA 106-1 (119-1) in "Auto-Cascade". The set points are as follows:

1st Hour	190°C
2nd Hour	200
3rd Hour	210
4th Hour	220
5th Hour	230
6- 7th Hour	240
8- 9th Hour	250
10-11th Hour	250

f. Check the following control instruments:

(1) #2 weigh tank temperature - TIC-101-1 at 160°C. Controller in "Auto".

(2) Therminol cooling temperature - TICA-116-1 (123-1) at 70°C. Controller in "Auto".

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C. III. 3.1 G. 1. f. (3) Therminol cooling flow - FICA-115-1 (122-1) at 300 GPM, controller in "Auto".

(4) No. 5 blow tank temperature - TIC-125-1 at 230°C, controller in "Auto".

g. Close the valve at the bottom of the chlorinator. Set valves to transfer charge from #2 weigh tank to the No. 10 (11) chlorinator. Special care must be taken to close the charge valve to the other chlorinator, since it is possible to pump to the wrong one. Be sure line to blow tank is closed.

h. Close pump discharge valve, open valve at bottom of weigh tank, start transfer pump (Item 103) and gradually open the pump discharge valve.

i. As pump-out proceeds and weight falls to 100#, a switch actuates to close down the pump (Item 103). An alarm sounds and the pump "Run Light" will go out.

j. The transfer pump (Item 103) can not be started if the charge valve is open and vice versa.

k. Close the charge valve on top of the chlorinator. Set valves to circulate the No. 10 (11) chlorinator batch through the heat exchanger (Item 106 (119)) and back to the chlorinator. Once again check line to blow tank.

l. Open the valve at the bottom of the chlorinator and start circulating pump (Item 105 (118)).

m. After circulation has been established and the temperature is below 260°C. the chlorine flow is started by pressing the start button on programmer XC1-CP1 (XC1-CP2). This injects both a flow and temperature set point into the respective controllers. The batch chlorine flow and temperature will be controlled according to the pre-set program. A flow integrator with two dials is used to read out 80% and total pounds of chlorine. When integrated flow equals the preset 80% mark, one dial stops counting, an alarm bell rings and "Chlorinator #10 (11) 80% chlorination" lights up. The second dial continues indicating total flow until chlorine flow stops. When the temperature is in its last set point the programmer will remain there until the start of the next batch.

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C. III. 3.1 G. 1. n. Open manual chlorine valves at the distributors on the chlorinator No. 10 (11). This should be done immediately after pushing the start button so the timer will control the batch correctly.

Chlorine header pressure control PIC-500-07 will control the pressure to 20-25 psig. A low pressure alarm is set at 15 psig - high pressure alarm at 25 psig.

o. After four hours, take a sample of the Aroclor and check for softening point. Samples are taken off the circulating line. This sample is a check to be sure a short charge was not transferred into the chlorinator. The next sample after that will be taken when the 80% alarm bell rings.

p. Check the following items during operation:

(1) Circulation temperature on TRCA-106-1 (119-1).

(2) Chlorine flow on FRC-104-1 (117-1).

(3) Therminol cooling system flow through FICA-115-1 (122-1) - 300 GPM.

(4) Therminol temperature on TICA-116-1 (123-1) - 70°C.

(5) Chlorinator body temperature on the multipoint #1 (7).

q. High chlorinator temperature or failure of the circulating pump will close the chlorine feed valve. This high chlorinator body temperature shutdown is set at 260°F. and is in addition to the high alarm - only of TRCA-106-1 (119-1).

r. The alarm bell will ring when 80% of the chlorine has been fed to the chlorinator. Immediately take a sample at the circulation line to determine the point which the chlorination has reached and the additional chlorine to add.

s. Continue the chlorination until complete. It may be necessary to run the softening point more often during the last one or two hours of the chlorination. A density measurement system DRC-104-4 (117-4) will be installed to determine the correlation between density and final softening point. This will in the future eliminate the time consuming softening point determination. For the present it will just record the density.

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C. III. 3.1 G. 1. t. At completion of the chlorination (softening point 105-115°C) shut off the manual chlorine feed valves to the distributors at the chlorinator. If the end corresponds to the end of the programmer time cycle, as it should, the automatic valve FV-104-1 (117-1) will be closed. If not, the controller FRC-104-1 (117-1) can be put in manual and the chlorine flow reduced to zero. This will close the valve.

u. When chlorination is complete, prepare to pump to the No. 5 blow tank.

2. Manual Operation

Complete manual operation is possible but is not recommended because the function of the programmer is to relieve the operator of the duty of keeping time and manually dialing in set points. The operation is very similar to the automatic programmed operation except for the following:

a. Place the chlorine flow controller FRC-104-1 (117-1) in "Automatic" (first align set point transmitter with the cascade value). Then place the set point at 1,500 #/hr. After one hour move it to 2,000 #/hr. and then one hour later to 3,000 #/hr. The controller can also be placed in "Manual" and the control valve positioned manually. The integrator digit counters will continue to totalize and will sound at the 80% point.

b. Place the circulating temperature controller TIC-106-1 (119-1) in "Automatic" and increase the set point in a number of steps which will simulate the programmer action. If the process is to be operated in "Manual" then this can also be done by manually positioning the control valve and observing the temperature on the controller.

c. Samples should be taken more often towards the end to ensure against over chlorination.

H. Transfer to No. 5 Blow Tank and Air Blow

1. Set transfer lines to pump to the No. 5 blow tank (Item 125). Be sure Therminol heat is on jacketed lines and that the temperature controller TIC-125-1 is set at 230°C.

The chlorinator is still vented to the off-gas storage tank.

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C. III. 3.1 H. 2. Check the level indication instrument, LIA-125-2.1 to be sure there is enough room to transfer into the blow tank (Item 125). The tank is sized to hold two chlorinator batches. There is a high level alarm - LIA-125-2.

3. Change final valve in the transfer line and allow material to pump from the No. 10 (11) chlorinator to the No. 5 blow tank. Observe transfer and note level increase in the No. 5 blow tank by LIA-125-2.1. Make sure the complete batch has been transferred. At the completion of the transfer, close valves in the circulating system and shut off the circulating pump (Item 105 (118)) on the No. 10 (11) chlorinator.

4. The chlorinator is now ready to charge back for the next chlorination.

5. Record transfer information on the chlorinator data sheet and in the log book.

3.2 Routine Operations

During normal operations of the #2 weigh tank, No. 10 (11) chlorinator, and No. 5 blow tank system, the following conditions will exist in the process.

A. Main Therminol Heater

1. Flow through the main therminol heater system will be indicated on FIC-628.1, 400 GPM normal.

2. TRCA-629.12 controls the temperature of the main therminol heating system. Set point normally at 250°C. Low temperature alarm set at 220°C. - high temperature alarm set at 300°C.

B. No. 2 Weigh Tank

1. Assuming a batch is charged into the weigh tank ready for the chlorinator, the following conditions will exist in the control room. The annunciator panel will indicate "charge complete terphenyl feed tank".

2. The control valve in the Santowax R charge line will be closed.

3. TIC-101-1 will be controlling the temperature in the weigh tank at 160°C.

4. Temperature on the Multipoint Indicator will indicate 160°C.

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C. III. 3.2 B. 5. The agitator will be running to keep the Ferric Chloride in suspension.

6. The transfer pump will be shut off.

C. No. 10 (11) Chlorinator

1. Chlorine flow will be indicated on FRC-104-1 (117-1). If in "cascade-auto" control, the Taylor Timer will be controlling the flow by program system.

2. Temperature will be controlled by TRCA-106-1 (119-1). With the system in "cascade-auto", the temperature will be controlled by a preset program. Initial starting temperature set point of 190°C., completion temperature 250°C.

3. No. 10 (11) chlorinator circulating pump will be in operation.

4. The Therminol chlorinator cooling system should have the following checks:

a. Flow will be indicated by FICA-115-1 (122-1). Normal set point 300 GPM. Low flow alarm set at 250 GPM.

b. Temperature in the circulating system is indicated by TIC-116-1 (123-1). Normal indication is 70°C. Low temperature alarm set at 60°C. - high temperature alarm set at 80°C.

c. Surge tank Therminol level (Item 114) should be above the steam coils.

d. The Therminol cooling system pump discharge pressure should be 60 psig.

5. Temperature of the No. 10 (11) chlorinator can also be observed on the Multipoint temperature recorder point 1 (7).

D. No. 5 Blow Tank

1. Temperature will be indicated by TIC-125-1. Normal set point 230°C.

2. Level in the No. 5 blow tank will be indicated by LIA-125-2.1.

3. Water valve should be open to the S&K jet providing suction on the No. 5 blow tank - pressure 40 psig.

4. The air blower (Item 124) should be operating with a discharge pressure of 8-10 psig.

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C. III. 3.2 E. Data Sheets

A Solid Aroclor system data sheet is available for the #2 weigh tank, No. 10 (11) chlorinator, and the #5 blow tank. Filling out this sheet is a normal portion of the operator's duties during the shift.

3.3 Safety Features

A. The weigh tank (Item 101) has an interlock system which will not allow starting the transfer pump (Item 103) when Santowax R is being charged into the weigh tank. This interlock is to assure that an overcharge of Santowax cannot be made to the No. 10 (11) chlorinator. A high weigh alarm set at 12,000 pounds will sound for an overcharge.

B. A high temperature alarm shutdown is set at 260°C. on the No. 10 (11) chlorinator (Item 104 (117)). A low temperature alarm is provided at 140°C. to prevent production of unstable Aroclors.

C. Chlorine flow stops will be placed on the chlorine flow control valve to the No. 10 (11) chlorinator set at 300 pounds per hour to prevent shutting off the chlorine feed in cases of air failure to the control valve. The control valve normally closes on air failure.

D. The main therminol heating circulation system has several safety features which can be found in the PFO for this heater system.

E. Check the level in the therminol cooling system surge tank (Item 114) to be sure the therminol level is in the sight glass.

F. The valves in the main therminol heating system used to put heat on the No. 10 (11) chlorinator heat exchanger (Item 106 (119)) will normally be tagged out since this heat exchanger is used for cooling. The Therminol heating system is available only for cases of unplugging the heat exchanger.

G. When the chlorine and temperature programmed control system is in operation, the preset program should not be disturbed since this can cause excessive chlorine flow or temperature problems to result.

H. Normally, when the programmed flow control system is in operation, a sample of the material being chlorinated will be taken after four hours of operation. This sample is taken to assure a short charge has not been made to the No. 10 (11) chlorinator. The sample should be checked for softening point. If this sample indicates a normal batch, the next sample would be taken when the 80% bell rings as preset by the chlorine flow totalizer. This sample is to assure a batch is not over-chlorinated and does not set up in the chlorinator preventing its transfer to the #5 blow tank.

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C. III. 3.4 Shutdown

Operations of the No. 2 weigh tank, the No. 10 (11) chlorinator, and the No. 5 blow tank can occur which will cause temporary or prolonged shutdowns. The following detailed information concerns individual shutdowns of each of the above items. If the entire system is to be shut down, the various sections can be combined to achieve this objective. Dependent on the reason for the shutdown, it may be necessary to isolate the system from the main therminol heating system to make the system safe. This must be considered, depending on the situation.

A. No. 3 Weigh Tank (Item 101)

1. Temporary Shutdown

a. Close the manual valves in the Santowax supply line to the weigh tank.

b. Close automatic valve in Santowax line to weigh tank.

c. Close the valve at the bottom of the weigh tank.

d. Open discharge valve to transfer pump to vent transfer line.

e. Leave TIC-101-1 in "Auto" with set point at 160°C.

f. Leave therminol heat on the transfer lines to the No. 10 (11) chlorinator.

g. The agitator and pump will normally be shut down unless in use.

2. Prolonged Shutdown

a. Close the manual valve in the Santowax supply lines to the weigh tank.

b. Close automatic valve in Santowax line to weigh tank.

c. Close the valve at the bottom of the weigh tank.

d. Open discharge valve to transfer pump to vent transfer line.

e. Move the weigh tank temperature control TIC-101-1 set point to 0°C. Close the manual valve in the steam supply line.

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C. III. 3.4 A. 2. f. The agitator and transfer pump will be shut off.

g. Close the valves in the main therminol heating system lines for the weigh tank transfer lines. Close valves in steam supply to Biphenyl lines.

h. The tank may or may not be empty, dependent on the work to be done or the cause for shutdown. Under normal conditions the tank will be empty.

i. Note shutdown information on data sheet.

j. Drain the weigh tank if necessary for repair work.

k. Leave the system in this condition until needed.

B. No. 10 (11) Chlorinator (Item 104 (117))

Operations can occur which will require a chlorinator to be cut back or temporarily shut down. Some of these items are failure of chlorine feed, or a tank car emptying. Normally, if a partial reduction in the chlorine feed occurs, the batch liquid chlorinators will be shut off and the No. 10 (11) chlorinator will continue to be operated.

1. Temporary Shutdown

a. The circulating pump (Item 105 (118) will normally be left in operation.

b. Close the chlorine valves at the distributor on the No. 10 (11) chlorinator.

c. Check the chlorine header pressure and chlorine feed to the other chlorinators. Pressure should be 20-25 psig.

d. Check to see that liquid chlorine is being fed to the vaporizer and that steam is on the vaporizer. Steam pressure should be 15 psig. Discharge pressure on the vaporizer should be 70-100 psig. Chlorine header pressure normally 20-25 psig.

e. If the shutdown is to be longer than two hours, it may be necessary to put therminol heat on the No. 10 (11) chlorinator circulating lines to keep the temperature at 120°C. minimum. The circulating pump will continue to run.

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C. III. 3.4 B. 1. f. Shutdowns should be minimized. If the cause of the cut back can easily be remedied, start the chlorinator back immediately.

g. Leave the therminol cooling system circulating.

h. Adjust control valve to TRCA-106-1 (119-1) for No. 10 (11) chlorinator to stop coolant flow on the heat exchanger. This is done by increasing the set point above the prevailing current temperature.

i. Leave the main therminol heating system circulating on the jacketed lines.

j. Notify your chief operator or department supervision immediately in case of a problem.

2. Prolonged Shutdown

a. Normally, when a chlorinator will be left down for a period longer than a few hours, the chlorination will be completed and the batch pumped out prior to shutdown. If Maintenance personnel are to work on the chlorinator, it may be necessary to vent the vessel and purge the chlorine lines and the chlorinator tank with CO_2.

NOTE: In case of a complete shutdown for maintenance work, the chlorine valves on the main header to the chlorinator, and the transfer lines into the vessel, will be tagged. The circulating pump circuit breaker box switch will also be tagged out.

b. Empty chlorinator by pumping it out. Then shut off the circulating pump. Drain the chlorinator.

c. Close chlorine valves at distributor on No. 10 (11) chlorinator.

d. Check chlorine header pressure as in Item 1.c. above.

e. Close the HCl vent valve on the chlorinator to the off-gas storage tank.

f. Notify your chief operator or department supervision the vessel is shut down.

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C. III. 3.4 B. 2. g. Shut down the therminol cooling system by:

(1) Shutting off circulating pump (Item 115 (122)).

(2) Leave FICA 115-1 (122-1) in "Auto" with set point at 300 GPM.

(3) TICA-116-1 (123-1) will be in "Auto" with the set point at 70°C.

(4) Leave the steam on the surge tank (Item 114). This will keep the system ready for use.

(5) In case the therminol cooling system must be worked on, it may be necessary to drain the system. If this should occur:

(a) Shut off the steam to the surge tank.

(b) Shut off water to the cooler (Item 116 (123)).

(c) Tag out the circulating pump (Item 115 (122)) circuit breaker; and

(d) Tag out the therminol heating valves to the No. 10 (11) chlorinator heat exchanger system.

h. Note shutdown information on the data sheet.

C. No. 5 Blow Tank (Item 125)

1. Temporary Shutdown

a. Close the valve at the bottom of the No. 5 blow tank (Item 125).

b. Vent pump discharge line into the blow tank.

c. Transfer pump will be shut off.

d. Leave TIC-125-1 set point at 230°C. Leave in "Auto".

e. The air blower will continue to run.

f. Water will remain on the S&K jet (Item 127), 40 psig.

g. The system will be left in this condition until need to start back up.

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C. III. 3.4 C. 2. Prolonged Shutdown

a. Normally if this vessel is to be shut down for any length of time, the material in the tank will be emptied.

b. Close the valve at the bottom of the blow tank.

c. Shut off the transfer pump (Item 126).

d. Adjust TIC-125-1 controller to 0°C. Close the manual valve in the therminol heating system to the coils on the No. 5 blow tank and tag out valves.

e. Shut off the air blower (Item 124).

f. Shut off water to the S&K jet (Item 127).

g. Leave the system in this condition until necessary to start back up.

D. Emergency Shutdown

Normally, an emergency shutdown does not occur concerning the weigh tank (Item 101) or the No. 5 blow tank (Item 125). However, emergencies can occur which make it necessary to shut down the No. 10 (11) chlorinator as fast as possible. The following methods can be used.

1. From the Field

a. Close the manual chlorine valves to the distributor, or the manual valve from the chlorine header feeding the No. 10 (11) chlorinator.

b. Shut valve in HCl pipe line to the Muriatic Acid Dept. if necessary.

c. Stop circulating pump (Item 105 (118)) if necessary.

d. Dependent on the emergency situation which has occurred, continue to shut this system down systematically by normal procedure.

2. At the Panel

a. Stop chlorine feed to the No. 10 (11) chlorinator. This will be done as follows, dependent on operation:

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C. III. 3.4 D. 2. a. (1) Manual Operation

Controller FRC-104-1 (117-1) in "Auto". Move chlorine flow controller set point to zero. This will reduce chlorine flow to 300 lbs/hr. to the No. 10 (11) chlorinator.

Immediately shut off manual valves feeding this chlorinator in the field.

(2) Programmed Operation

Move chlorine controller FRC-104-1 (117-1) from "cascade" to "automatic" and adjust set point on chlorine feed controller to zero. Proceed as in Item (1) above.

b. Shut valve in HCl pipe line to the Muriatic Acid Department if necessary.

c. Stop the circulating pump (Item 105 (118) if necessary.

d. Continue shutdown of this unit as is necessary to handle the emergency which has occurred.

3. Emergency Shutdown Therminol Cooling System for No. 10 (11) Chlorinator

a. Stop therminol cooling system circulating pump.

b. Close manual valves as necessary in the system.

c. The pump can be shut off in Item a. above at the pump itself or at the motor control center circuit breaker.

3.5 Control Loops, Interlocks, and Alarms

A. Control Loops

There are nine (9) major control loops in this system.

1. No. 2 Weigh Tank Scale Loop - 101

The function of this loop is to allow setting the scale by the adjustable set point for Santowax R charges. When the material reaches the desired weight, it automatically closes the control valve in the feed line to the weigh tank and rings an alarm bell indicating "charge complete terphenyl feed tank". During charging of the weigh tank, the transfer pump (Item 103) cannot be started. In case the weigh tank is overcharged, an alarm horn will sound at 12,000 lbs. and will again attempt to close the charging valve.

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C. III. 3.5 A. 1. As pump-out proceeds and weight falls to 100 lbs., the pump (Item 103) is shut down. An alarm sounds and "terphenyl feed pump shutdown" is indicated. The pump running light will also go out.

2. Weigh Tank Temperature Control - TIC-101-1

The function of this loop is to maintain a constant temperature of 160°C. in the weigh tank. This is accomplished by measurement of the temperature and controlling the heat input by throttling a control valve in the steam line to the coil in the weigh tank.

3. No. 9 Chlorinator Chlorine Flow Control - FRC-104-1 (117-1)

The function of this loop is to control the chlorine flow to the No. 10 (11) chlorinator to regulate the chlorination rate. This is accomplished by measurement of the chlorine flow with an orifice and controlling this flow with a control valve in the chlorine feed line. This system can be operated manually, automatically, or by a preset programmed chlorine feed control.

a. Manual Control

The chlorine flow controller FRC-104-1 (117-1) is positioned in "Manual". The set point is regulated to give the desired chlorine flow to the No. 10 (11) chlorinator.

b. Automatic Flow Control

The No. 10 (11) chlorinator chlorine flow controller FRC-104-1 (117-1) is positioned in "Auto". The chlorine feed desired is set on the controller which will maintain this chlorine feed by adjusting the control valve as required.

c. Programmed Flow Control

The chlorine flow controller has the set points in "Auto-Cascade". The first chlorine integrator set point is adjusted on a digit counter for the desired chlorine alarm level. When the desired quantity of chlorine has entered the chlorinator, an alarm bell will ring and an annunciator light will flash indicating "No. 10 (11) chlorinator, 80% chlorination". A second digit counter will continue to totalize the flow. The integrator readout (X2) is total pounds of chlorine. The totalizer settings can be used with the automatic flow control above if the controller is not in "cascade". When the controller is in "cascade", the predetermined program will change the

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C. III. 3.5 A. 3. c. chlorine flow rate to the No. 10 (11) chlorinator. The chlorine flow program is set by turning the knob on each flow profile set point. This program, once set up, should not be disturbed without consulting supervision. It is: 1,500 #/hr. for one hour; 2,000 #/hr. for one hour; and 3,000 #/hr. for the remaining time.

4. No. 10 (11) Chlorinator Temperature Control - TRCA-106-1 (119-1)

The function of this loop is to provide temperature control of the chlorination batch in the No. 10 (11) chlorinator. This is accomplished by measurement of the temperature in the crude Aroclor circulating line at the heat exchanger and controlling the therminol cooling system to the shell of this heat exchanger (Item 106 (119). The temperature controls can be operated manually, automatically, or by a predetermined program temperature profile. The temperature system has a low temperature alarm at 120°C. - a high temperature laarm at 275°C. Range of the instrument is 0-300°C.

a. Manual Control

The temperature controller TRCA-106-1 (119-1) will be in "manual". Circulating of the therminol cooling system across the No. 10 (11) chlorinator heat exchanger can be controlled manually by adjusting the control valve with TRCA-106-1 (119-1) set point. Adjust until the desired temperature is acquired.

b. Automatic Control

The temperature controller TRCA-106-1 (119-1) is in "auto". The controller set point is adjusted to the desired temperature. It will automatically adjust the control valve to maintain the temperature as set.

c. Programmed Temperature Control

The temperature controller is placed in "auto-cascade". The chlorination temperature time profile is adjusted to the desired temperature by turning the knob on each temperature profile set point. A predetermined program is set up on the Taylor Timer. After start of the program, the Timer will automatically advance through the temperature profile as set up by the program. These set points will be directed to the programmer only if TRCA-106-1 (119-1) is in "auto-cascade". This program, once set up, should not be disturbed without consulting supervision.

TOWOLDMON0048472

C. III. 3.5 A. 5. Chlorine Header Pressure Control - PIC-500.07

The function of this loop is to maintain the chlorine header pressure to the Aroclor chlorinators within a range of 20-25 psig. This is accomplished by measuring the chlorine header pressure and throttling a control valve in the discharge from the chlorine vaporizer to maintain the chlorine header pressure within ± 1 psig of the set point. A low pressure alarm is set at 15 psig and a high pressure alarm at 35 psig.

6. Therminol Cooling System Flow Control-FICA-115-1 (122-1)

The function of this loop is to maintain a constant flow of 300 GPM in the Therminol cooling system. This is accomplished by measurement of flow with an orifice flow meter and adjusting a control valve to by-pass the No. 10 (11) chlorinator heat exchanger (Item 106 (119). Flow through the No. 10 (11) heat exchanger is regulated by the temperature control TRCA-106-1 (119-1). As the chlorinator heat exchanger needs more cooling fluid the control valve reduces the by-pass quantity. Normal operation of the system is with the controller in "Auto" and the set point at 300 GPM. A low flow alarm will sound at 250 GPM.

7. Therminol Cooling System Temperature Control - TICA-116-1 (123-1)

The function of this loop is to control the temperature of the cooling therminol system at 70°C. This is accomplished by measurement of the discharge temperature from the therminol water cooler (Item 116 (123) and automatically throttling the water flow on the shell side of the cooler. The low temperature alarm on this system is set at 60°C. - the high temperature alarm is set at 80°C. Experience has shown that a temperature controller is not needed on the surge tank (Item 114).

8. No. 5 Blow Tank Temperature Control - TIC-541.01

The function of this loop is to maintain a constant temperature of 230°C. in the No. 5 blow tank. This is accomplished by measuring the temperature in the blow tank and throttling the control valve in the Therminol heating system to the coils in the No. 5 blow tank. There are no alarms in this system.

TOWOLDMON0048473

C. III. 3.5 A. 9. No. 2 Blow Tank Level Indication - LIA-125-2.1

This loop measures the level of crude Aroclor in the No. 5 blow tank. This is accomplished by use of a bubbler differential pressure level indication instrument. A 0-100% dial indicates the tank level.

B. Interlocks

There are two interlocks in this system.

1. Weigh Tank System

The Santowax transfer pump (Item 103) cannot be started while Santowax R is being filled into the weigh tank. This interlock is energized when the control valve in the feed line is open. Conversely the charge valve cannot be opened if the pump is running.

2. High chlorinator temperature 260°C. or failure of chlorinator circulating pump will alarm and cause shutdown by closing the chlorine feed valve.

This interlock - alarm is in addition to the chlorinator cooler alarm (only) controlled by TRCA-106-1 (119-1).

C. Alarms

The following alarms exist through this system.

1. Weigh Tank (Item 101)

a. When the measured or preset weight approaches the set point on the scales, an alarm bell will sound indicating "charge complete terphenyl feed tank".

b. A high weight alarm will sound if the weigh tank is filled above 12,000 lbs. Immediate action should be taken to stop the filling by stopping the charge pump.

c. An alarm will sound upon completion of pump-out. The pump is shut off automatically.

2. No. 10 (11) Chlorinator System (Item 106 (117)

a. Chlorine Flow Alarm

(1) When the chlorine totalizer is being used, an alarm bell will ring when the batch is 80% chlorinated.

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C. III. 3.5 C. 2. b. Temperature Alarms

Abnormal temperature alarms are set on the cooler for a low circulation temperature of 120°C. and a high temperature of 275°C. In addition to the high temperature alarm - shut off (see B.2. above) an alarm will sound at 140°C. for low chlorinator temperature.

c. Chlorine Header Pressure Alarm

The chlorine header pressure will sound an alarm at a low pressure of 15 psig and a high pressure of 35 psig. This will actuate an annunciator on the chlorinator panel indicating "High-Low Chlorine Header Pressure."

d. Low Flow Alarm

A low flow alarm will sound for the Therminol cooling system if the flow falls below 250 GPM.

e. Abnormal exit temperatures on the therminol cooling system from the cooler (Item 116 (123) will sound an alarm. The low temperature alarm is set at 60°C. and the high temperature alarm at 80°C.

C. IV. COMMENTS ON PROCESS

A. Special flexible piping joints have been made to the weigh tank (Item 101) since this tank is placed on scales. These flexible piping joints should be carefully inspected to be sure there are no leaks since the material contained in them is extremely hot. During weighting of the raw material charge, the operator should be careful to eliminate problems with excessive movement of the scale.

B. Steam is provided on the incoming transfer lines and the coil to the weigh tank. From the bottom piping on the weigh tank, all the transfer lines and coils in process vessels have therminol heat up to the No. 5 still. Then steam is used in the transfer lines to the flaker hold tank.

C. The transfer pump (Item 103) for the weigh tank has steam on the casing of the pump.

D. The therminol heating system has been provided for this solid Aroclor facility to eliminate use of gas torches on vessels and pipe lines.

E. Care must be taken not to fill the therminol cooling system surge tank (Item 114) too full during normal operation. This can cause the tank to run over when the circulating pump is stopped.

TOWOLDMON0048475

APPENDIX I

SOLID AROCLORS PROCESSED CHLORINATION

TEMPERATURE & CHLORINE FLOW PROFILE

1. CHLORINE FLOW - FLOW RECORDER CONTROLLER (FRC-104-1 (117-1)

Time	Aroclor 5060
1st hour @	1,500 Lbs/hr.
2nd Hour @	2,000 Lbs/hr.
3rd & subsequent hours to end of batch @	3,000 Lbs/hr.

2. TEMPERATURE CONTROL - TEMPERATURE RECORDER CONTROLLER (TRCA-106-1 (119-1)

Time	Aroclor 5060
1st hour @	190
2nd hour @	200
3rd hour @	210
4th hour @	220
5th hour @	230
6 - 7th hour @	240
8 - 9th hour @	250
10 -11th hour @	250

Total Batch Time - Approximate hours - 10 - 12

TOWOLDMON0048476

APPENDIX II

METHOD OF RUNNING SOFTENING POINTS

1. Obtain representative sample of material from sample line at discharge of circulating pump. Catch the sample in can lid or Pyrex beaker.

2. Heat ring and sample.

3. Place ring on can lid or metal plate and fill with sample until material stands slightly higher than edge of ring. Fill the ring from the large diameter side.

4. Cool the ring and lid from bottom of the side until sample sets up, being careful not to get any water on top of the sample.

5. Finish cooling by running water on top of the sample after it sets up.

6. Remove filled ring from lid and trim off any material that is on the outside.

7. Make slight indentation on top of the sample in the center of the ring with a heated wire to hold the ball in place.

8. Fill beaker with water or glycerin.

   a. Use water when expected softening point is under $80^{o}C$.

   b. Use glycerin when expected softening point is over $80^{o}C$.

9. Place the ring in the sample holder, place ball on sample, and put holder in the beaker.

10. Adjust the thermometer in the holder so that the tip of bulb protrudes 1/4" through the hole in the crossbar that holds sample.

11. Place the beaker on a stand with screen under it and set burner under the stand.

12. Light burner and adjust to give a temperature rise as shown on the thermometer of $5^{o}C.$ per minute.

13. Bring temperature up $5^{o}C.$ per minute until ball falls through the sample.

14. Record temperature at time ball falls to lower crossbar as the softening point.

TOWOLDMON0048477

APPENDIX III

ITEM 114: THERMINOL SURGE TANK
5'-0" OD X 5'-3" HIGH - DISHED ENDS

Level	Gallons	Level	Gallons	Level	Gallons
0"	78 (Dish)	2'-5"	430	4'-10"	788
1	90	-6	445	-11"	800
2	102	-7	457	5'- 0"	813
3	114	-8	470	- 1"	825
4	127	-9	482	- 2"	837
5	139	-10	494	- 3"	849
6	151	-11	506		
7	163	3'- 0"	519		
8	176	- 1	531		
9	188	- 2	543		
10	200	- 3	555		
11	212	- 4	568		
1'- 0"	225	- 5	580		
- 1	237	- 6	592		
- 2	249	- 7	604		
- 3	261	- 8	617		
- 4	274	- 9	629		
- 5	286	-10	641		
- 6	298	-11	653		
- 7	310	4'- 0"	666		
- 8	323	- 1	678		
- 9	335	- 2	690		
- 10	347	- 3	702		
- 11	359	- 4	715		
2'- 0"	372	- 5	727		
- 1	384	- 6	739		
- 2	396	- 7	751		
- 3	408	- 8	764		
- 4	421	- 9	776		

TOWOLDMON0048478

APPENDIX IV

ITEM 125: BLOWING TANK
10'-0" OD X 10'-0" HIGH - DISHED HEADS

% Scale	Gallons	Innage(Ins.)	% Scale	Gallons	Innage(Ins.)
0	611 (Dish)	0 (16.3")	52	2548	39.5
2	685	1.5"	54	2622	41.0
4	760	3"	56	2697	42.5
6	834	4.5"	58	2771	44.0
8	909	6.0"	60	2846	45.6
10	983	7.6"	62	2920	47.1
12	1058	9.1	64	2995	48.6
14	1132	10.6	66	3069	50.1
16	1207	12.1	68	3144	51.6
18	1281	13.6	70	3218	53.2
20	1356	15.2	72	3293	54.7
22	1430	16.7	74	3367	56.2
24	1505	18.2	76	3442	57.7
26	1579	19.7	78	3516	59.2
28	1654	21.2	80	3591	60.8
30	1728	22.8	82	3665	62.3
32	1803	24.3	84	3740	63.8
34	1877	25.8	86	3814	65.3
36	1952	27.3	88	3889	66.8
38	2026	28.8	90	3963	68.4
40	2101	30.4	92	4038	69.9
42	2175	31.9	94	4112	71.4
44	2250	33.4	96	4187	72.9
46	2324	34.9	98	4261	74.4
48	2399	36.4	100	4336	76.0
50	2473	38.0		4410	77.5
				4485	79.0
				4559	80.5
				4634	82.0
				4708	83.6
				4783	85.1
				4857	86.6
				4932	88.1
				5006	89.6
				5081	91.2
				5155	92.7
				5230	94.2
				5304	95.7
				5379	97.2
				5453	98.8
				5528	100.3
				5602	101.8
				5677	103.3
				5751	104.8
				5826	106.4
				5900	107.9
				5975	109.4
				6049	110.9
				6124	112.4

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TENTATIVE OPERATING INSTRUCTIONS
FOR
SOLID AROCLOR 5460

PROCESS FUNCTION OUTLINE

III. C. I. NO. 5 STILL SYSTEM

1.1 Scope

This covers the charging, start-up, shutdown, normal operation, and emergency situations involving the No. 5 Aroclor Still System.

1.2 Description of Process

Aerated crude Aroclor from a blowing tank is fed to the still tank. Hydrated lime is added to the crude Aroclor.

Vacuum is applied to the still and the Aroclor is circulated through the furnace coil and heated to the vaporization temperature. Vapors pass up an open column through a cyclone separator to the condenser. Distilled Aroclor is collected in a receiver. Quality of the distilled solid Aroclors is analyzed by the Lab, and if in specification, it is transferred to the flaker hold tank for flaking or drumming into suitable containers.

Still residue or bottoms from two distillations (four chlorinator batches) are drawn into containers and sold as Montars, or it is discarded in trash drums.

II. PROCESS DIAGRAM

Attached.

III. OPERATION OF PROCESS

3.1 Start-Up

A. Initial Start-Up

1. Therminol Cooling System for No. 5 Still Condenser

a. Charge system with Therminol FR-2 (Aroclor 1248):

(1) Use temporarily relocated Pyranol pump to charge Therminol surge tank (Item 139).

(2) Position 55 gallon drum next to the pump. Remove drum bung and vent cap.

(3) Connect flexible hose to pump suction and the stainless steel pipe to be inserted into the drum.

TOWOLDMON0048480

C. III. 3.1 A. 1. a. (4) Position discharge line from the pump into the tank.

(5) Open valve on pump suction; insert pipe into drum and start pump.

(6) Adjust the suction valve on the pump until the flow is steady.

(7) Continue till the surge tank until five drums or approximately 275 gallons total are in the surge tank (Item 139).

b. Therminol 1242 can be charged directly to the surge tank (Item 139) by the following procedure:

(1) Align valves in line from storage tank to surge tank (Item 139). Care must be taken to ensure that all valves to the other surge tanks are closed. They are also filled from this storage tank line.

(2) Check level gauge at surge tank.

(3) Start storage tank pump.

(4) Observe this level gauge at the surge tank and shut off pump when you have 275 gals.

(5) Close valves in line from storage tank to surge tank.

2. Still and Furnace Start-Up

a. Charge to the No. 5 Still

Under normal conditions, crude Aroclor is charged to the No. 5 still with the charge measured by the level indication (LIA-125-2)' on the No. 5 blow tank. The blow tank (Item 125) holds two chlorinator batches of 2,160 gals./batch. Two chlorinator batches are charged to the No. 5 still to make up one still batch.

b. Prepare No. 5 Blow Tank (Item 125) for transfer of charge:

(1) Check to be sure the steam heating system is on the transfer pump (Item 126) and the therminol on the charging lines. Material to be pumped must be hot. Cold lines can also cause plug-ups and failure to transfer material.

TOWOLDMON0048481

C. III. 3.1 A. 2. b. (2) Check temperature of material in blowing tank to be sure it is hot enough to transfer (230°C). See TIC-125-1.

(3) Check with the chlorinator operator to be sure crude Aroclor has been air-blown for one hour.

c. Prepare still to receive charge:

(1) Close valve at the bottom line under the still (Item 129).

(2) Set valves from the No. 5 blow tank to the No. 5 still. Be sure the therminol heating system is on all transfer lines.

(3) Close the main valve in the vacuum line to the still just above the receiver. Start steam to the vacuum jets. Put steam on stage 4, stage 3, stage 2, and stage 1, in that order. Stage 1 is the closest to the receiver. Adjust water to the after condensers on the last three stages. The jet on the No. 5 still should pull down to 2-3 mm Hg absolute on the receiver (Item 132). The steam to the jet on the No. 5 still should have a minimum of 90 psig supply pressure - operate at 110 psig. Normally, this unit will stay in continuous operation.

(4) Open vent valve on the still receiver.

d. Start up the Therminol Cooling System for the No. 5 Still Condenser (Item 131):

(1) Set TICA-141-1 at 70°C. with the controller in "Auto".

(2) Adjust the set point for the therminol low temperature alarm approximately 10°C. below the control point for TICA-141-1. Ex: 60°C.

(3) Set the valves in the therminol cooling system for the No. 5 still condenser (Item 131) to allow circulation from the surge tank through the condenser through the therminol cooler (Item 141) and back into the surge tank.

(4) Open the steam heating valve to the surge tank (Item 139). Wait until the temperature of the therminol cooling system is 70°C., then start the circulating pump (Item 140).

TOWOLDMON0048482

C. III. 3.1 A. 2. d. (5) Check the level in the surge tank (Item 139) to be sure the therminol level covers the heating coils in the surge tank.

(6) Do not permit distillation to start until the desired set point of 70°C. has been reached in the therminol cooling system.

(7) Set the temperature controller TRC-131-1 for the Aroclor condenser at 160°C.

(8) Check the following items on the therminol cooling system circulation:

(a) Therminol cooling system circulating pump (Item 140) discharge pressure should be 50 psig. Flow rate should be 245 GPM.

(b) TICA-131-1 (5460 Aroclor from product condenser) should be set at 160°C.

(c) TIC-141-1 (cooled therm. from therm. cooler) should be set at 70°C.

e. Charging the No. 5 still and start-up:

(1) Set valves in transfer line from No. 5 blow tank to the still.

(2) Start the blowing tank pump (Item 126) and transfer a full charge into the still tank. This is done by observing the before and after level in the blow tank (Item 125).

(3) Stop the No. 5 blow tank transfer pump when the charge is complete as noted on the No. 5 blow tank level gauge. Allow lines to drain and then close the charging lines to the still.

(4) Close the valve under the No. 5 blow tank.

(5) Set valves in the No. 5 still circulating line through the heater coil (Item 128) and back into the still tank.

(6) Start up preheat of the No. 5 still furnace (Item 128).

(7) Start the circulating pump (Item 134).

TOWOLDMON0048483

C. III. 3.1 A. 2. e. (8) Add hydrated lime through the chute provided for this purpose on the No. 5 still. Add 400 pounds (8 bags) of lime for each still batch.

(9) Swing the chute away and button down the wing nuts.

f. Furnace Start-Up for the First Time:

(1) Preliminary Procedure

(a) Open manual valves in the natural gas line to the furnace main and pilot gas lines.

(b) Open damper on the furnace stack.

(c) Turn on circuit No. 9 at the still panel and the breaker switch on the outside of the field control box to "ON". The "RED" light at the Honeywell Protectoglo unit will light up.

(d) Put fuel gas flow controller FRCA-128-1 in manual with output at 1 psig.

(e) Set high temperature switch at 425°C.

(f) At this stage the "RED" light on the "Protectoglo Relay" is on. The heater shutdown alarm is sounding and must be acknowledged.

(2) Start-Up Procedure

(a) Move red safety switch level on "Protectoglo" unit in the field control box to the right to reset. You must wait 10 seconds before the switch can be reset in case it has to be redone.

(b) At end of purge period (there is no air blower and hence no purge but purge timer introduces a time delay and natural convection will cause an upward draught) the green "pre-purge complete" light will light.

(c) Carry out a "sniff" test through one of the air inlets to the burner. If the test shows dangerous, stop and correct the cause of trouble before lighting the burner. When the heater is cold, there is no natural draft to carry away gas or fumes. After the unit gets hot, there will always be a natural draft provided the flue damper is open. If satisfactory, proceed.

TOWOLDMON0048484

C. III. 3.1 A. 2. f. (2) (d) Depress the ignition start button on the side of the field control box to actuate the pilot flame. Hold the button depressed for no more than 10 seconds. If all is well, the "white" light on the Protectoglo unit will come on and the "green" and "red" lights will go out. When this occurs, pull your finger away. The pilot is now properly lit. Pilot flame is detected by "purple peeper" and a steady audible clicking of checking relay will be heard.

(e) Manually open the two reset safety valves in the main gas line prior to the flow valve. The heater is now ready for operation.

(f) The main burner will not yet be lit because the fuel gas flow control valve FV-128-1 is closed.

(g) The still furnace coil can be preheated by using the pushbutton on the still control panel. This will allow by-passing the furnace interlocks to start gas into the furnace without starting the still pump.

It is desirable to fire the furnace for the purpose of either drying out the brickwork or to temper the coils before circulation begins when the unit is cold. This is to prevent plugging. For this reason, a tempering button is installed on the burner control panel which is mounted in the field. This button energizes a relay for one (1) minute only and tempering can proceed only by keeping the button manually depressed. This is a safety feature but requires two persons to fire the burner; one in the control room to operate fuel gas control valve FRCA-128-1, and one in the field to depress the tempering button.

(h) When preheating is required the tempering button is pushed and with the gas flow controller FRCA-128-1 in "manual". Slowly open the control valve and monitor stack temperature when the main burner has lit. Observe the temperature at point #8 on the multipoint recorder. Do not exceed 150°C. If preheating is not necessary, skip this step.

TOWOLDMON0048485

C. III. 3.1 A. 2. f. (2) (i) Start up the solid still circulating pump (Item 131). The circulating flow meter FIA-128-2 will now indicate a flow around 245 GPM. Flow below 125 GPM will cause the main burner to be shut off. If during preheat the temper button is not held down until the 125 GPM flow rate has been exceeded, the main burner will shut down.

(j) Place the gas flow controller, FRCA-128-1, on automatic. If there was no preheat the gas flow will be a zero. Gradually increase the set point to 1200 SCFH. Press the "acknowledge" button on main control panel. Alarm "Still #5 Fuel Gas Low Flow" should go out. Slowly increase the set point to 1500 SCFH. If the coil outlet temperature is too high the set point must be lowered.

Observe the coil outlet temperature on the multipoint temperature recorder. Do not exceed 50°C. increase for the first two hours. The natural gas flow controller should be in "auto". The distillation or "boiling" is considered to be started when the vapor temperature makes a sudden increase. Watch for this increase during initial heat-up of the furnace for the first time.

(k) Check the following items in the system to be sure operations are normal.

1) Natural gas flow to the furnace on FRCA-128-1.

2) No. 5 still circulating pump flow FIA-128-2.

3) Therminol cooling system temperature on TICA-141-1.

4) Check the coil temperature differential on the inlet and outlet of the furnace (Item 128).

g. Start-Up of Furnace after Temporary Shutdown:

(1) Prior to start-up, the still coil can be preheated before starting the circulating pump, if necessary. See Section f.(2)(g).

(2) Adjust natural gas flow controller to "auto" with the set point at 1 psig output pressure. This is FRCA-128-1.

TOWOLDMON0048486

C. III. 3.1 A. 2. g. (3) Start up the solid still circulating pump (Item 134). The Aroclor circulating flow meter FI-128-2 should now indicate a flow in excess of 240 GPM. Shutdown will occur at a flow below 125 GPM.

(4) Check that the vacuum is 2.3 mm Hg on the line above the catch tank (Item 135). Open the main valve in the vacuum line to the vacuum jets above the receiver. Vacuum at the still receiver should be approximately 2-3 mm Hg. The vacuum on the still should be 8-10 mm Hg.

(5) Gradually raise the set point of the natural gas flow controller FRCA-128-1 to 1500 SCFH.

3. Operation of the Still During Distillation

a. Check the multipoint temperature recording instrument for the temperature rise across the coil in the heater furnace points #8 and #9. In case this temperature chart is not indicating correctly, check for plugged lines or instrument problems. Check to be sure the pump flow is being measured correctly. If necessary, shut off the pump while at a low temperature to be sure the system is operating. Have the electrician check the temperature instruments if you do not get a rise.

b. A spread of 4-6°C. between the coil inlet and outlet is normal. A 15°C. temperature spread is the maximum difference allowable. The gas supply pressure will normally be approximately 4 psig.

c. Be sure the steam heating system is off the vacuum line to the jets during operation.

d. Check the therminol cooling system on the No. 5 still condenser (Item 131) to be sure the condenser does not plug up. If plugging begins to occur, raise the temperature in the therminol cooling circulation system. Use TICA-131-1 to accomplish this. There is no alarm on this controller, so it must be watched closely.

e. Vacuum problems on the stills are usually due to flashing of product over plugged vacuum lines, leaks in the still system, leaks at pump packing, or therminol flow problems on the condenser, water adjustment on the condensers, on the jets, changes in the steam pressure to the jets, or problems in the nozzles for the jet. Flashing can be stopped by lowering the temperature of the therminol cooling system for the No. 5 still condenser. Vacuum trouble must be traced systematically from the jet to the receiver and then to the still. To accomplish this, manometer pressure indicators have been placed in the system as follows:

TOWOLDMON0048487

C. III. 3.1 A. 3. e. (1) On top of the trap in front of the jet (Item 135).

(2) On the cyclone separator off-gas line (Item 130).

(3) On the still (Item 129).

f. The still receiver temperature indicating controller TIC-132-1 is set at 160°C. with the controller in "Auto".

g. A level indication gauge has been installed in the still receiver (Item 132) to allow indication of the level of material being distilled over. The level instrument is LI-132-2.1. This level indication can be used to determine when the distillation is near completion. This will aid the still operator along with his normal observation of coil temperature spread across the furnace.

h. Batch data sheets are filled out during each distillation. Information includes the still lot number, materials being distilled, start time, finish time, the temperature spread on the still coils, the vacuum, the end time for the distillation, etc.

i. As the distillation nears completion, temperature in the still pot will rise. Flow through the coil will remain steady. When the flow drops below 125 GPH, an alarm will sound and the main gas burner to the furnace will shut off. An additional aid is the level indicator in the still receiver LI-132-2.1.

j. At the end of the distillation, the batch is checked for color and softening point. This is done by setting the valves on the receiver lines for circulation. Circulate for 10 minutes then take the sample. Before transfer, check that space is available in the flaker hold tank and that the lines from the still receiver to the flaker hold tank are hot.

k. At the end of the distillation, shut off the furnace if it has not already been shut down automatically. Stop the circulating pump in the No. 5 still.

l. Close the main valve in the vacuum line on top of the receiver (Item 132). This is to isolate the jet from the still system and eliminate plugging of the jet.

m. Vent the furnace coil and allow it to suck dry slowly to prevent carryover to the still condenser.

TOWOLDMON0048488

C. III. 3.1 A. 3. n. Coil inlet and outlet temperature must be watched closely at the end of the distillation. Still bottoms are very viscous; therefore, if the circulating pump is in poor condition, or the distillation is carried too far, circulation may stop and the coil will become plugged or be burned. Heat from the furnace actually burns the Aroclor to carbon when overheated. If the coil outlet temperature jumps suddenly and the inlet temperature stays the same or falls, circulation is nearly stopped. In this case, shut off the furnace gas supply and suck the coil. If the coil cannot be sucked, it is plugged and will have to be replaced.

o. The distillation operating conditions are shown in Table II.

4. Pump Out Still Receiver

a. Transfer material from the still receiver (Item 132) to the flaker hold tank (Item 137).

b. Observe level of material in the still receiver by use of LI-132-2.1.

c. Check to be sure the heating system is on the jackets of the transfer lines.

d. Set valves in the line to transfer to the flaker hold tank.

e. When material is to be transferred to the flaker hold tank, start transfer pump (Item 133) under the receiver. Allow material to pump until the receiver is empty.

f. Close the valves and stop the transfer pump when the receiver is empty. This can be observed by checking level gauge LI-132-2.1.

g. Start agitator in flaker hold tank.

5. Operation for Drawing Bottoms into Drums:

a. Check to be sure that Therminol heat is on the draw-out line.

b. Place necessary drum near draw-out station approximately 30-35 drums.

c. Set valves in line to draw-out station.

TOWOLDMON0048489

TABLE II

DISTILLATION OPERATING CONDITIONS - SOLID 5460 AROCLOR	
Approximate Temperatures at which various Aroclors start distilling @ 10 mm Vacuum. At Still:	
Column	260°C.
Coil Inlet	280°C.
Coil Outlet	285°C.
Approximate Finishing Temperature when bottoms are not to be drawn:	
Column	
Coil Inlet	
Coil Outlet	
Approximate Finishing Temperature after which bottoms are to be drawn:	
Column	355°C.
Coil Inlet	375°C.
Coil Outlet	400°C.
Finishing Softening Point	98-105°C.

TOWOLDMON0048490

C. III. 3.1 A. 5. d. Check to be sure the exhaust fan is running.

e. Obtain assistance to draw bottoms.

NOTE: Fumes from this operation are toxic. If the exhaust fan should stop, discontinue drawing out and notify the Chief Operator.

The material to be drawn into drums is hot. Have the person filling the drums to put on face shield and gloves.

f. Place drum under valve at draw-out station. Open valve under still. Close draw-out valve.

g. If the bottoms being drawn out are for shipment, open the valve at draw-out station and allow approximately 25 to 30 gallons of material to flow through the line into the drum to flush out the line.

h. If the bottoms being drawn out are not for shipment, flush out of line is not necessary.

i. Continue drawing out until the still is empty. Fill drums to within 6" - 8" of top and place cover on drum. As the drums are filled move them on conveyor to east platform.

j. Close the valve under the still. Leave the valve at draw-out station open.

k. Allow drums to set on conveyor until they have cooled 6-10 hours, then palletize the drums to be transferred to warehouse. Drums to be discarded will be transferred to the dump by plant stake truck.

TOWOLDMON0048491

C. III. 3.1 B. Start-Up Following Temporary Shutdown

This start-up phase would normally be a situation where a previous distillation is complete and the still has been shut down for charging with a new batch.

1. Prepare No. 5 Blow Tank for Transfer Charge

   a. Check to be sure that the therminol heating system is on the transfer lines from the blow tank to the still pot.

   b. Check the temperature of the material in the blow tank. It should be 230°C.

   c. Check with the chlorinator operator to be sure that the crude Aroclor has been air-blown one hour.

   d. The No. 5 still vacuum system should be operating with the valve just above the No. 5 still receiver closed. Water should be on the condensers and steam on the jet stages. Vacuum on the trap (Item 135) in the vacuum pipe line should be indicating 1-3 mm Hg.

2. The No. 5 still receiver temperature controller TIC-132.1 should be in "Auto" with the set point at 160°C.

3. The therminol cooling system should be circulating through the No. 5 still condenser and back to the surge tank. The temperature controller TICA-131-1 should be in "Auto" with the set point at 160°C. Tower water should be on the therminol water cooled heat exchanger. The No. 5 still receiver temperature controller TIC-132-1 will be in "Auto" with the set point at 160°C.

4. The natural gas flow controller FRCA-128-1 will be in "Auto" with the set point below 2.5 psig output pressure.

5. The pilot flame for the No. 5 still furnace (Item 128) will be on as indicated by the Honeywell Protectoglo unit in the field panel. The "white" light on the Protectoglo unit will be on.

6. Set valves in the transfer line from the No. 5 blow tank to the No. 5 still.

7. Open the vent valve on the No. 5 still. Close the valve at the bottom of the still.

8. Start the No. 5 blow tank transfer pump and charge the No. 5 still. Observe level indication gauge in the No. 5 blow tank to measure the still charge.

TOWOLDMON0048492

C. III. 3.1 B. 9. Start up the solid still circulating pump. The Aroclor circulating flow meter FIA-128-2 will now record a flow in excess of 240 GPM.

10. Stop the No. 5 blow tank transfer pump as soon as the blow tank is empty. Close the valves at the bottom of the blow tank and at the discharge of the transfer pump.

11. Add 400 lbs. of lime to the still charge.

12.. Close the vent valve on the No. 5 still and receiver. Open the vacuum valve on the No. 5 still receiver and start the vacuum on the system.

13. Gradually raise the set point of the natural gas flow controller FRCA-128-1 to the desired set point. Watch the temperature rise across the furnace coil inlet and outlet as the temperature is raised. Normally, a 4-6°C. spread will be obtained across the furnace coil.

14. During normal operation of the still system, the following items will be observed.

a. Temperature spread across the still furnace.

b. Flow of the Aroclor through the furnace coil. See FIA-128-2.

c. Level indication in the No. 5 still receiver. See LI-132-2.1.

d. Natural gas flow control to the No. 5 still furnace. See FRCA-128-1.

e. Temperature in the Therminol circulating system. See TICA-141-1.

f. Temperature control in the No. 5 still condenser. See TRC-131-1.

g. Temperature control in the No. 5 still receiver. See TIC-132-1.

15. At the end of the distillation the batch is checked for color and softening point. As the distillation continues, the temperature in the still pot will rise; flow through the coil will remain steady. When the flow drops to 125 GPM, an alarm will sound and shut-off of the main gas to the still furnace will occur. An additional aid to finishing the batch is the level indication in the No. 5 still receiver LI-132-2.1.

TOWOLDMON0048493

C. III. 3.1 B. 16. Shut off the natural gas when the distillation is finished. Clear the coil by doing the following:

a. Close the vacuum valve on top of the No. 5 still receiver in the line to the jet.

b. Vent the still heater coil and suck the coil dry.

17. Set lines to transfer material to the flaker hold tank. When material is to be transferred to the flaker hold tank, be sure the heating system is on the pump suction and discharge line. Set the valves in the transfer line and start transfer pump to the flaker hold tank. When the No. 5 still receiver is empty, stop the circulating pump and close the valves in the transfer lines.

3.2 Routine Operations

When the No. 5 still system is operating normally, the following conditions will exist in the process:

A. No. 5 still pressure will be around 8-10 mm Hg.

B. No. 5 still circulating pump flow recorded on FIA-128-2 with flow above 125 GPM.

C. No. 5 still condenser temperature control TIC-131-1 set at 160°C.

D. Natural gas feed to the still furnace controller FRCA-128-1 set to give desired coil outlet temperature (about 1500 scfh).

E. Furnace high temperature alarm instrument set at 425°C.

F. Therminol cooling system circulating temperature controller TICA-141-1 set at 70°C.

G. No. 5 still receiver temperature control TIC-132-1 set at 160°C.

H. No. 5 still receiver level indication gauge LI-132-2.1 will indicate level.

I. Main natural gas pressure 40 psig.

J. Natural gas reduced pressure 4 psig.

TOWOLDMON0048494

C. III. 3.3 Safety Features

A. The Honeywell Protectoglo unit has the following safety features for the No. 5 still furnace (Item 128):

1. Ignition period 10 second delay between actuation periods for the warp switch to cool.

2. Heater coil high temperature outlet shutdown set at 425°C.

3. Natural gas high reduced pressure shutdown set at 25 psig.

4. Circulating pump low flow rate shutdown and alarm set at 125 GPM.

5. Pilot flame must be burning to start up the unit. This is indicated by 4 microamperes on the field control panel.

B. Therminol cooling system temperature control alarm set for low alarm at 60°C. and high alarm at 80°C.

3.4 Shutdown

A. Temporary Shutdown

Main gas burner on the furnace off with the pilot light on. The No. 5 still circulating pump running and the vacuum system on.

1. Adjust FRCA-128-1. Set point to 0. Instrument in "Auto".

2. Close the manual valve in the natural gas feed supply line to the main burner.

3. The vacuum may be cut off by closing the manual valve above the No. 5 still receiver. The still would then be vented and shut down systematically, if necessary.

B. Complete Shutdown

Main gas burner and pilot light shut off in the furnace. Still circulating pump off. The vacuum shut down and the Therminol cooling system shut off.

1. Push ignition stop button on side of the field control panel for the furnace control system. Hold it until the red lamp comes on.

TOWOLDMON0048495

C. III. 3.4 B. 2. After the furnace has cooled slightly, push the stop button for the No. 5 still circulating pump (Item 134).

3. Close manual valve above the No. 5 still receiver in the vacuum line.

4. Shut off steam to the vacuum jet by closing main valve in the steam supply line.

5. Close valve in the water line to the condensers on the No. 5 still jet.

6. Stop the Therminol cooling system circulating pump (Item 140). An alarm will sound.

7. Check the surge tank level to be sure the tank does not overflow after this pump is shut off.

8. Adjust TICA-141-1, TIC-131-1, and TIC-132-2 controller set point to 0.

9. Turn off the tower cooling water to the Therminol cooler (Item 141).

3.5 Control Loops, Interlocks, and Alarms

A. Control Loops

There are nine (9) major control loops in this system.

1. No. 5 Still Circulating Pump Low Flow Shutdown-FIA-128-2

The function of this loop is to measure the flow through the furnace heater coil on the No. 5 still. This is accomplished by measurement with a Ramapo Mark 5 Flow Meter that indicates the flow to a panel. Normal flow will be 240 GPM. A low flow alarm shutdown for the furnace (Item 128) main gas system will be actuated if the flow drops below 125 GPM. Complete shutdown of fuel gas to the main burner occurs.

2. Heater Fuel Gas Flow Control - FRCA-128-1

The function of this loop is to control the gas input to the No. 5 still furnace. This is accomplished by measurement of the natural gas through an orifice flow meter and throttling the control valve in the reduced gas line until 1500 SCFH is obtained. High coil temperature may require a lower flow rate.

TOWOLDMON0048496

C. III. 3.5 A. 3. No. 5 Still Furnace Controls - Item 128

The function of this control system is to control the natural gas feed pressure to the still furnace and assure a pilot light is always burning when natural gas is being fed to the furnace. This is accomplished with a Minneapolis-Honeywell Protectoglo pilot light control mechanism. There are six safety features in the furnace controls to shut the system down:

a. High furnace coil outlet temperature will shut down the furnace above 425°C.

b. Low reduced natural gas pressure 2-1/2 psig.

c. High reduced natural gas pressure 25 psig.

d. Failure of circuit No. 9 at the rear of the still panelboard, or electrical failure.

e. Failure of any component in the Honeywell pilot flame mechanism.

f. Low circulating of crude Aroclor flow below 125 GPM.

When any one of the six conditions occurs an alarm sounds in the main control room indicating furnace shutdown. If the shutdown is caused by a. or f. separate alarms also sound. If neither of these alarms sound then the cause of shutdown must be eliminated between b., c., d., or e.

4. No. 5 Still Receiver Temperature Control - TIC-132-1

The function of this loop is to control the temperature in the No. 5 still receiver to 160°C. This is accomplished by measuring the temperature in the receiver and throttling a control valve in 200# steam heating system inlet line on the coil to the No. 5 still receiver.

5. No. 5 Still Receiver Level Indication - LI-132-2.1

The function of this loop is to indicate the level of distilled product in the No. 5 still receiver. This is accomplished by a float level instrument which indicates the Aroclor level in the control room and in the field

6. No. 5 Still Condensate Temperature - TRC-131-1

The function of this loop is to indicate the temperature of the condensate from the No. 5 still condenser (Item 131). Normally, a temperature of 20-30°C. below the product temperature indicates the condenser is plugging up. There is no alarm for this controller.

TOWOLDMON0048497

C. III. 3.5 A. 7. Therminol Cooling System Flow Control - FICA-140-1

The function of this loop is to maintain a constant flow of 200 GPM. in the Therminol cooling system. This is accomplished by measurement of flow with an orifice flow meter and adjusting a control valve to by-pass the No. 5 still condenser heat exchanger (Item 131). Flow through the condenser is regulated by the temperature control valve TRC-131-1. As the condenser needs more cooling fluid the control valve reduces the by-pass quantity. Normal operation of the system is with the controller in "Auto" and the set point at 200 GPM. A low flow alarm will sound at 160 GPM.

8. Therminol Cooling System Temperature Control-TICA-141-1

The function of this loop is to control the temperature of the cooling therminol system at 70°C. This is accomplished by measurement of the discharge temperature from the therminol water cooler (Item 141) and automatically throttling the water flow on the shell side of the cooler. The low temperature alarm on this system is set at 60°C. The high temperature alarm is set at 80°C. There is no temperature controller on the surge tank (Item 139).

9. Still No. 5 Level System - LS-129-3 & 4

The function of this loop is to only give visual and audible indication of low level. High level will shut down the blow tank pump (Item 126). These will prevent over charging the still pot and alert operators that batch distillation has continued to a point that endangers the N.P.S.H. requirements of the still circulating pump. The level switches are both gamma type radiation detectors. The high level actuates when radiation is decreased and the low level when radiation increases sufficiently.

B. Interlocks

Interlocks in this system are as follows:

1. Start-Up of No. 5 Still Furnace (Item 128)

a. Actuation of the pilot ignition lever on the Honeywell Protectoglo unit has a 10 second delay before a second try can be made.

b. Before the ignition "start" button at the Protectoglo unit is pushed the red safety switch is moved to reset. It has a 3 minute purge delay. This is to allow for natural convection to purge the furnace before it lights up.

TOWOLDMON0048498

C. III. 3.5 B. 1. c. Complete shutdown of fuel gas to the main burner occurs if the circulating flow through the furnace drops below 125 GPM.

d. As stated in "A" Section (Control Loops), the furnace will shut down from six safety features. See Section "A".

2. Automatic No. 5 Still Furnace Shutdown with Alarms (Pilot and Main Gas Burner Off)

a. High furnace coil outlet temperature above 425°C.

b. Low reduced natural gas pressure 2-1/2 psig.

c. High reduced natural gas pressure 25 psig.

d. Low coil flow below 125 GPM. (Pilot light stays on)

e. Failure of circuit No. 9 at the rear of the still panel.

f. Failure of the switch at the side of the field control panel, or blowing the 115 volt fuse in the panel.

C. Alarms

1. All shutdown items under "Interlocks" (B.2. above) have alarms.

2. No. 5 still circulating pump low flow alarm below 125 GPM.

3. Therminol cooling system TICA-141-1 has a low temperature alarm at 60°C. and a high temperature alarm at 80°C.

4. There is a high-low temperature alarm on the No. 5 still pot that is detected by the multipoint recorder. It is set at 430°C. for the high alarm and at 200°C. for the low alarm.

5. There is a low pressure alarm on the No. 5 still circulating line.

IV. COMMENTS ON THE PROCESS

A. It is very important to be sure there is adequate fluid in the Therminol cooling system surge tank (Item 139). This assures the circulating pump has a positive suction and prevents surging in the heater coil. This will allow more uniform control of the temperature in the Therminol cooling system.

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TOWOLDMON0048499

C. IV. B. Care must be taken not to fill the surge tank (Item 139) too full during normal operation. This can cause the tank to run over when the circulating pump is stopped.

C. Be sure that chromel-alumel thermocouple extension lead wire is used to connect up the furnace natural gas high temperature coil outlet alarm. Type K wire is in the same conduit as Type J wire. If Type J wire is used by mistake, the indicator will read too high and cause furnace shutdowns.

D. After the first two or three still batches have been run so the natural gas heat input rate is known, adjust the linkage on the reduced gas pressure control valve so a 3-15 psig instrument signal will fully stroke the valve. Make the adjustment so that only 10-15% above the maximum needed gas pressure can be obtained. This will reduce charring of the coils in the still furnace (Item 128).

E. During distillation of Solid Aroclors, vacuum problems occur in the pipe line to the jet system and plugging of the jet nozzles occur due to flashing and normal vapor pressure carry-over. The vacuum line from the No. 5 still receiver (Item 132) has steam heat on the jacket of the pipe line up to the suction line on the jet (Item 136). The trap tank (Item 135) in the vacuum line has steam heat on the coils in the tank. It is very important that the steam heating system be cut off the jacketed lines and the coils in the trap tank during normal operation. If these lines are kept hot during normal operation, it will cause carry-over into the jet nozzles and cause more rapid plugging than in the past. When using the steam heating system to clean out the lines or drain the trap tank, the jet should be isolated from the No. 5 still system. This can be done by either shutting the steam off to the jets or closing the block valve in the pipe line at the suction of the jet.

F. The still pot No. 5 level system LS-129-3 & 4 requires special attention. There is a lock that maintains a safety shutter on the radiation source holder which must be unlocked to operate. The law requires the source holder will be periodically wipe tested by an approved representative to ensure that leakage of the radioactive source has occurred.

TOWOLDMON0048500

APPENDIX

ITEM 111 and 139: Therminol Surge Tank
3'-6" OD X 4'-3" High
Dished Ends

Level	Gallons	Level	Gallons
0"	24 (Dish)	2'-6"	204
1"	30	2'-7"	210
2"	36	2'-8"	216
3"	42	2'-9"	222
4"	48	2'-10"	228
5"	54	2'-11"	234
6"	60	3'-0"	240
7"	66	3'-1"	246
8"	72	3'-2"	252
9"	78	3'-3"	258
10"	84	3'-4"	264
11"	90	3'-5"	270
1'-0"	96	3'-6"	276
1'-1"	102	3'-7"	282
1'-2"	108	3'-8"	288
1'-3"	114	3'-9"	294
1'-4"	120	3'-10"	300
1'-5"	126	3'-11"	306
1'-6"	132	4'-0"	312
1'-7"	138	4'-1"	318
1'-8"	144	4'-2"	324
1'-9"	150	4'-3"	330
1'-10"	156		
1'-11"	162		
2'-0"	168		
2'-1"	174		
2'-2"	180		
2'-3"	186		
2'-4"	192		
2'-5"	198		

TOWOLDMON0048501

APPENDIX

ITEM 132: No. 5 Still Batch Receiver
8'-0" OD X 10'-0" High
Dished Heads

% Scale	Gallons	Innage "	% Scale	Gallons	Innage "
0	314 (Dish)	0 (13"	26	1,248	31.2
1	352	1.2	27	1,286	32.4
2	390	2.4	28	1,323	33.6
3	428	3.6	29	1,361	34.8
4	455	4.8	30	1,399	36"(3 ft.)
5	493	6'	31	1,437	37.2
6	531	7.2	32	1,474	38.4
7	569	8.4	33	1,512	39.6
8	606	9.6	34	1,550	40.8
9	644	10.8	35	1,588	42
10	682	12"(1 ft.)	36	1,625	43.2
11	720	13.2	37	1,663	44.4
12	757	14.4	38	1,701	45.6
13	795	15.6	39	1,739	46.8
14	833	16.8	40	1,776	48"(4 ft.)
15	871	18	41	1,814	49.2
16	908	19.2	42	1,852	50.4
17	946	20.4	43	1,890	51.6
18	984	21.6	44	1,927	52.8
19	1,022	22.8	45	1,965	54
20	1,059	24"(2 ft.)	46	2,003	55.2
21	1,097	25.2	47	2,041	56.4
22	1,135	26.4	48	2,078	57.6
23	1,173	27.6	49	2,116	58.8
24	1,210	28.8	50	2,154	60"(5 ft.)
25		30			

Aroclor 5460
Sp.Gr.: 1.5 @ 160°C.
Temperature: 160°C.
Inst. Range: 0-10 ft.
Inst. Scale: 0-100% Linear

TOWOLDMON0048502

APPENDIX

	% Scale	Gallons	Innage"	% Scale	Gallons	Innage"
	51	2,192	61.2	76	3,135	91.2
	52	2,229	62.4	77	3,173	92.4
	53	2,267	63.6	78	3,211	93.6
	54	2,305	64.8	79	3,249	94.8
	55	2,343	66	80	3,286	96 (8 ft.)
	56	2,380	67.2	81	3,324	97.2
	57	2,418	68.4	82	3,362	98.4
	58	2,456	69.6	83	3,400	99.6
	59	2,494	70.8	84	3,437	100.8
	60	2,531	72"(6 ft.)	85	3,475	102
	61	2,569	73.2	86	3,513	103.2
	62	2,607	74.4	87	3,551	104.4
	63	2,645	75.6	88	3,588	105.6
	64	2,682	76.8	89	3,625	106.8
	65	2,720	78	90	3,664	108 (9 ft.)
	66	2,758	79.2	91	3,702	109.2
	67	2,796	80.4	92	3,739	110.4
	68	2,833	81.6	93	3,777	111.6
	69	2,871	82.8	94	3,815	112.8
	70	2,909	84 (7 ft.)	95	3,853	114
	71	2,947	85.2	96	3,890	115.2
	72	2,984	86.4	97	3,928	116.4
*	73	3,022	87.6	98	3,966	117.6
	74	3,060	88.8	99	4,004	118.8
	75	3,098	90	100	4,041	120 (10 ft.)

*Operation Level

TOWOLDMON0048503

TENTATIVE OPERATING INSTRUCTIONS
FOR
SOLID AROCLOR 5460

PROCESS FUNCTION OUTLINE

III. C. I. SOLID HCl OFF-GAS CLEAN-UP

1.1 Scope

This covers the start-up, shutdown, and normal operation of the HCL Off-Gas Clean-Up System involving No. 10 (11) Chlorinator.

1.2 Description of Process

HCl gas produced on the No. 10 (11) chlorinator system passes through an off-gas condenser which cools the gas to knock out the Santowax and Aroclor vapors. The gas then flows through a catch tank, combines with the gas from the Liquid system and flows to the Muriatic Acid absorber.

A Therminol (1248 Aroclor) cooling system is circulated through the tube side of the off-gas condenser to cool the HCl gases. Material collected in the catch tank is returned to the weigh tank for other chlorinator charges. The off-gas storage tank (Item 109) has a holding capacity of 3-1/2 days accumulation.

II. PROCESS DIAGRAM

Attached.

III. OPERATION OF PROCESS

3.1 Charge Therminol Cooling System Surge Tank (Item 111)

A. Therminol 1242 can be charged directly to the surge tank by the following procedure:

1. Align valves in line from storage tank to surge tank. Care must be taken to ensure that all valves to the other surge tanks are closed. They are also filled from this storage tank line.

2. Check level gauge at surge tank.

3. Start storage tank pump.

4. Observe the level gauge at surge tank and shut off pump when you have 275 gals.

5. Close valves in line from storage tank to surge tank.

TOWOLDMON0048504

C. III. 3.1 B. Charge System with Therminol FR-2 (Aroclor 1248)

1. Use temporary relocated Pyranol pump to charge surge tank (Item 139).

2. Position 55 gal. drum next to the pump. Remove drum bung and vent cap.

3. Connect flexible hose to pump suction and the stainless steel pipe to be inserted into the drum.

4. Position discharge line from pump into the tank.

5. Open valve on pump suction; insert pipe into drum and start pump.

6. Adjust suction valve on pump until flow is steady.

7. Continue to fill the surge tank until five (5) drums or approximately 275 gallons total are in the surge tank (Item 111).

3.2 Start-Up

1. Set the panel mounted therminol temperature controller TIC-111-1 in automatic with the set point at 130°C.

2. Set the off-gas storage tank (Item 109) locally mounted temperature indicating controller, TIC 109-1, in automatic with the set point at 175°C.

3. Set valves to allow circulation of the therminol system from the therminol surge tank (Item 111) to the circulating pump (Item 112), through the tube side of the off-gas condenser (Item 108), through the air therminol cooler (Item 113), and back to the therminol surge tank.

4. Open manual valves to allow circulation of steam heat through the jacket on the off-gas storage tank (Item 109).

5. Check to be sure the valve on bottom of the off-gas storage tank is closed.

6. Set manual valves to allow HCl gas to flow through the off-gas condenser (Item 108) through the off-gas storage tank (Item 109) and to the Muriatic Acid absorber.

TOWOLDMON0048505

C. III. 3.2 7. This system should now be in automatic control. Checking of the pressure across the condenser will indicate plugging if if should occur.

8. Material accumulated in the off-gas storage tank will be recycled through the chlorinator system for reuse. A locally mounted gauge indicates the tank level.

3.3 Shutdown

1. It is necessary to shut down the No. 10 (11) chlorinator if work is to be done on the condenser (Item 108) or the off-gas storage tank (Item 109).

2. Close manual valve from the chlorinator and on the exit line after the storage tank.

3. The therminol heat system on the tube side of the off-gas condenser can be shut down by stopping the circulating pump (Item 112).

4. The system is now shut down and can be worked on if necessary.

3.4 Instruments

1. Therminol Circulating System Temperature Control-TIC-111-1

The temperature in the therminol circulating system for the off-gas condenser in the clean-up system is controlled by sensing the temperature in the surge tank and controlling the louvers on the air cooled therminol cooler and the control valve on the line to the coil in the surge tank. At 3 psig, the louvers are open giving maximum cooling; at 9 psig, the louvers are closed and the second positioner (which has been inoperative up to 9 psig) applies a 3 psig signal to the steam control valve on the coils causing it to open. At 15 psig., input into this positioner will cause a 15 psig signal to the valve to open it fully. The instrument will be in automatic with the set point at 130°C.

2. Off-Gas Storage Tank Temperature Controller - TIC-109-1

The temperature in the off-gas storage tank (Item 109) is controlled by sensing the temperature of the material in the tank and throttling the control valve on the input line on the tank's jacket. The controller is in automatic with the set point at 175°C.

TOWOLDMON0048506

C. III. 3.4 3. Solids Knock-Out Tank Level Indicator - LI-109-2

The off-gas storage tank has a sight feed bubbler system sensed by a D/P cell and is transmitted to a gauge graduated 0-100%. The signal is directly proportional to tank level. It is field mounted.

IV. COMMENTS

1. Plugging of the off-gas condenser in the clean-up system can occur. To unplug the off-gas condenser the temperature of the therminol system will be elevated as required. It will probably require a temperature of 160 - 170°C.

TOWOLDMON0048507

Aroclor - SOM
PFO

APPENDIX

Item 109: Off-Gas Surge Tank
6'-6" OD X 7'-9" High
Dished Heads

% Scale	Gallons	Innage "	% Scale	Gallons	Innage "
0	170 (dish)	0 (14"	72	1113	46.1
2	196	1.3	74	1139	47.4
4	222	2.6	76	1165	48.7
6	248	3.9	78	1191	50.0
8	274	5.2	80	1218	51.2
10	301	6.4	82	1244	52.5
12	327	7.7	84	1270	53.8
14	353	9.0	86	1296	55.1
16	379	10.3	88	1322	56.4
18	405	11.6	90	1349	57.6
20	432	12.8	92	1375	58.9
22	458	14.1	94	1401	60.2
24	484	15.4	96	1427	61.5
26	510	16.7	98	1453	62.8
28	536	18.0	100	1480	64.0
30	563	19.2		1506	65.3
32	589	20.5		1532	66.6
34	615	21.8		1558	67.9
36	641	23.1		1584	69.2
38	667	24.4		1611	70.4
40	694	25.6		1637	71.7
42	720	26.9		1663	73.0
44	746	28.2		1689	74.3
46	772	29.5		1715	75.6
48	798	30.8		1742	76.8
50	825	32.0		1768	78.1
52	851	33.3		1794	79.4
54	877	34.5		1820	80.7
56	903	35.9		1846	82.0
58	929	37.2		1873	83.2
60	956	38.4		1899	84.5
62	982	39.7		1925	85.8
64	1008	41.0		1951	87.1
66	1034	42.3		1977	88.4
68	1060	43.6		2004	89.6
70	1087	44.8		2030	90.9
				2056	92.2
				2082	93.5 Top

Sp.Gr.: 1.2
Inst. Range: 0-77" H_2O
Inst. Scale: 0-100% Linear

TOWOLDMON0048508

APPENDIX

ITEM 111 and 139: Therminol Surge Tank
3'-6" OD X 4'-3" High
Dished Ends

Level	Gallons	Level	Gallons
0"	24 (Dish)	2'-6"	204
1"	30	2'-7"	210
2"	36	2'-8"	216
3"	42	2'-9"	222
4"	48	2'-10"	228
5"	54	2'-11"	234
6"	60	3'-0"	240
7"	66	3'-1"	246
8"	72	3'-2"	252
9"	78	3'-3"	258
10"	84	3'-4"	264
11"	90	3'-5"	270
1'-0"	96	3'-6"	276
1'-1"	102	3'-7"	282
1'-2"	108	3'-8"	288
1'-3"	114	3'-9"	294
1'-4"	120	3'-10"	300
1'-5"	126	3'-11"	306
1'-6"	132	4'-0"	312
1'-7"	138	4'-1"	318
1'-8"	144	4'-2"	324
1'-9"	150	4'-3"	330
1'-10"	156		
1'-11"	162		
2'-0"	168		
2'-1"	174		
2'-2"	180		
2'-3"	186		
2'-4"	192		
2'-5"	198		

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D. EMERGENCY PROCEDURES

This is the plan for departmental action in the event a hazardous situation or injuries warrant emergency action either in the Aroclor Department or within the Anniston Plant.

1. Hazardous Situations which might occur are:

   a. Operational Accidents or difficulties, such as explosions, fires, release of toxic fumes, etc.

   b. Forces of Nature - hurricanes, tornadoes, floods, lightning, etc.

   c. Deliberate Damage - malicious actions, sabotage, direct enemy action.

2. The Primary considerations in the event of a disaster are:

   a. The care of injured individuals and evacuation of personnel to safe areas.

   b. Measures to prevent any, or further, property or equipment damage.

   c. Measures to provide accurate and thorough information so that other plant personnel and the community can be informed, if necessary.

   d. Prompt restoration of affected facilities and resumption of uninterrupted operations.

3. Responsibility

   The areas of responsibility and overall department organization for disaster control are as follows:

   a. Chief Operator:

      Responsible for continuing or closing down production facilities as conditions permit; for directing fire fighting and damage control activities in the department area; keeping department supervision fully informed of conditions within the department.

   b. Operators:

      Responsible for evacuation of all personnel from danger area; for directing and assisting in first aid and rescue missions; reporting to and keeping Chief Operator informed of conditions within his area of responsibility.

      NOTE: All actions of the Fire Brigade are coordinated with the Chief Operator.

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4. Detail of Plan:

a. In the event of an emergency, personnel must be accounted for. The first assembly area for the department is the open area south of the HB-40 plant near the ladder rack, the second or alternate assembly area is east of the Aroclor-Biphenyl building in the road.

It is very important to know where people are in an emergency or before action is taken to correct an emergency. If the alternate area has to be used, take whatever safety equipment you can from the department to the assembly area.

b. If assistance is needed, pertinent phone numbers of plant personnel to be contacted are as follows:

T. E. Lackey	358-4284 Munford
M. J. Williams	237-1952
R. A. Haydel	831-4924
H. L. Williams	236-3835
G. L. Jessee	
H. Schulte	
J. C. Landwehr	237-0546
J. G. Thorne	237-7652
T. D. Tucker	237-3927
P. K. Ward	831-4189
Dr. J. C. Francis	237-5612 (Home)
Main Gate	236-2961 (308 or 317)

c. In the event of a plant disaster, the Plant Manager's Office is the Control Center. The alternate Control Center is the Guard Room at the Service Building. The Medical Center is the Plant Dispensary. The alternate Medical Center is the Service Building.

d. If the emergency or disaster occurs before or after the day shift, or on a weekend, the department Chief Operator shall notify the Guard on duty and the Guard will be responsible for notifying plant supervision.

e. Immediately upon discovering a fire, or a current or imminent disaster condition, turn in an alarm. Dial 7-111 and leave the phone off the hook until the alarm has sounded five times. Use another phone to call operator.

f. On day shift, Monday through Friday, Dial operator - state location and type emergency and need for outside help.

g. On "off-shifts", contact Guard (317).

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4. Detail of Plan (Continued)

h. If the Guard cannot be contacted and the local Fire Department is needed, call them at 237-3541, giving them location, material burning, size of area involved, etc. Then call the department supervision.

NOTE: Chief Operator may designate this job to one of the operators.

i. The Plant Primary Assembly Area, should the emergency be so widespread that the major portion of the plant is affected, is West of HCl Neutralization Pit (Secondary is Guard Gate No. 4 West of Niran).

j. The Off-Side Primary Assembly Area, should complete plant evacuation be necessary, is REA Terminal, Highway 202 (Secondary is Rescue Squad Headquarters, 1313 Walnut Avenue, South side of Building). To signify complete evacuation, the plant fire alarm will be activated and the sound repeated two-second blasts at one-second intervals - for several minutes. At this signal, leave the plant by the most expedious means and route available and reassemble at the off-site assembly point and report to the Personnel Superintendent for head count.

5. Emergency Situations:

The following emergencies are possible at the Aroclor Department:

Emergency	Action
a. Fire Handling Biphenyl	a. Turn in alarm - Dial 7-111. b. Remove injured from fire area - take care of them. c. Proceed under Chief Operator to extinguish the fire: (1) Dry powder extinguisher. (2) Fire truck, dry powder, and water. (3) Water. d. Pull power on all motors. e. Cut off gas to Aroclor and Biphenyl stills at main cut-off at northwest corner of blowing tank area. f. Shut down Department.

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Emergency Situations (Continued)

Emergency	Action
b. Chlorine Release Tank Car	a. Obtain help and turn in alarm if necessary- Notify Chief Operator. b. Obtain gas mask or Scott Air Pak. c. Shut off source of Chlorine. d. Disconnect Cl_2 connection at car if necessary. e. If vaporizer is full of liquid chlorine, vent to the chlorine car, then shut off car. f. Notify Department Supervision as soon as possible.
c. HCl Release	a. Obtain help and turn in alarm if necessary-Notify Chief Operator. b. Obtain gas mask or Scott Air Pak. c. Shut off source of HCl gas. d. Notify Department Supervision as soon as possible.
d. Fire or explosion at HB-40, Santowax, or Biphenyl Depts.	a. Turn in alarm, shut down Aroclor Department. Obtain gas mask, go to an assembly point, be prepared to assist in stopping the fire as directed by Chief Operator.
e. Emergency in the Plant	a. Prepare to shut down on orders.
f. Equipment failure creating hazard.	a. Notify Chief Operator or Department Supervision. b. Take appropriate action.

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Emergency Situations (Contd.)

f. Injuries and Treatment

a. Obtain help.

b. Prevent further injuries to person involved.

c. Make comfortable.

d. Know your first aid:

(1) Mouth-to-mouth resuscitation.

(2) How to use a resuscitator.

(3) How to remove from electrical contact.

(4) Action for a heat stroke.

(5) Chest massage for heart failure.

(6) Emergency action in case of burns.

(7) Location of stretcher, blanket, oxygen.

(8) Know equipment available from the dispensary.

e. Contact Plant Physician as soon as possible, if necessary. Make contact through Plant Guard or Department Supervision.

TOWOLDMON0048514

AROCLOR DEPARTMENT
EMERGENCY PROCEDURE

ALARM METHODS

To Activate Plant Disaster System

1. Dial 7-111 - This alarms only and the phone must be left off the hook. Use another phone for contacting personnel.

2. On-Shifts - Dial "0" - State location and type emergency and need for outside aid.

   Off-Shifts - Dial 317 - State location and type emergency and need for outside aid.

3. If 317 does not answer - get outside aid directly.

Signal for Complete Plant Evacuation of "Off-Site" Assembly Area

Dial 7-555 - Evacuation will sound automatically

ASSEMBLY AREAS

1. Department

   a. Primary - Open area South of HB-40 Plant.

   b. Secondary - Road East of Biphenyl-Aroclor Building.

2. Plant

   a. Primary - West of HCl Neutralization Pit.

   b. Secondary - Guard Gate No. 4 (West of Niran).

3. Off-Site

   a. Primary - REA Terminal - Highway 202.

   b. Secondary - Rescue Squad Hdq., 1313 Walnut Avenue (South side of Bldg.).

PRIORITY OF ACTIONS

1. Care for injured.

2. Account for all personnel.

3. Property Safety.

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LOCATION OF EMERGENCY EQUIPMENT:

1. Stretcher - In Biphenyl-Aroclor Building North of old Biphenyl Control Room.
2. Blankets - In Tubular Unit Control Room.
3. Burn Treatment Equipment - Box north of old Santowax R Plant.
4. Gas Masks - East and West wall outside Aroclor Control Room.
5. Scott Air Paks - South of Air Blowers in Aroclor and old Biphenyl Control Room.
6. Emerson Resuscitator - In Dispensary.
7. Emergency Oxygen - In old Biphenyl Control Room.

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COLD WATER TREATMENT OF BURNS
(Thermal & Chemical)

Thermal Burn - The type of burn you would get by:

1. Direct exposure to flame.
2. Skin-make contact with hot surface.
3. Hot materials, such as molten Santowax, solidify when it touches the skin, thereby holding the heat in the skin.

Chemical Burn - The type of burn you would get by:

1. Contact with Muriatic or Sulfuric Acid.
2. Contact with Potassium or Sodium Hydroxide.
3. Contact with any acid or strong alkali material.

Treatment - Thermal Burns

If possible, submerge burn area in container of cold water (50°F). The container may be a drum, water pail, wash basin - anything that will hold the water. Follow these steps:

1. Put water in container to desired depth.
2. Try to obtain a water temperature of 50°F. by adding ice cubes.
3. Submerge burn area below the surface of the water.
4. Transport injured person to the doctor, keeping burned surface submerged in water.

If burn is in area that cannot be submerged in water, it is a good practice to take the cleanest cloth or toweling that you can obtain, soak it in cold water (wringing out excess water), and place on the burned area. This would be an area such as the back, shoulders, or stomach. UNDER NO CIRCUMSTANCES SHOULD A PERSON SUFFERING FROM THERMAL BURNS BE PLACED UNDER RUNNING WATER. There is a danger of the small droplets of water striking the burned area, causing pain to such an extent as to result in shock.

Treatment - Chemical Burns

1. Place injured person under safety shower or some other method of washing with large amounts of water.
2. Remove contaminated clothing while under the shower.
3. If goggles are worn, keep in place until all the chemical has been washed from the body.

General

In our dispensary, we have an ointment labeled Sulfathizole. This material is used in the treatment of burns, both thermal and chemical. It allows an injury to heal from the inside out, which is usually the situation with a burn injury.

TOWOLDMON0048517

SECTION IV - TRAINING PLAN

A. Overall Plan

Training will be organized by shift groups from the existing Aroclor operating personnel. In consideration of the fact that the expansion is essentially an improved copy of the present system, and that the personnel are already familiar with the present chemical process and system, the formal training will be limited to 12 hours. There will be 8 hours of class room training and 4 hours of field review and familiarization. Beginning with the Process Simulation and Check-Out Phase, four operators will be assigned to the expansion area until start-up is completed. This will provide for additional training and orientation.

The usual visual training aids consistent with good instruction practices will be made available during class room sessions. These will include flow diagrams, drawings, a model and other aids wherever applicable.

The instructors will include, but not be limited to, the following personnel:

W. E. Voss	M. D. Blair
R. A. Haydel	C. R. McIlwain
J. W. Mattern	Ron Mitchell

Areas to be covered during these training sessions will include the following general topics:

a. Equipment layout and operation.

b. Process control.

c. Instrumentation and instrument panel.

d. Review of present data sheets.

e. Discussion of differences between the old and new system.

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IV. B. Detailed Training Program

The twelve hour block (3 sections of 4 hours) of training to be given the experienced operators will be as follows:

Topics	Instructors	Time
I. Orientation and Indoctrination	W. E. Voss	25 Min.
Organization	R. A. Haydel	30 Min.
Training and Start-Up Schedule	R. A. Haydel	
Equipment Layout	J. W. Mattern	15 Min.
Chlorination & Auxiliary Equipment		
Equipment and Piping	M. D. Blair	45 Min.
Instrumentation	R. Mitchell	75 Min.
Field Review	J. Mattern & Instructors	60 Min.
II. Blow Tank and Main Therminol		
Equipment and Piping	C. R. McIlwain	30 Min.
Instrumentation	M. D. Blair	30 Min.
Distillation & Auxiliary Equipment		
Equipment and Piping	R. Mitchell	45 Min.
Instrumentation	C. R. McIlwain	75 Min.
Field Review	J. Mattern & Instructors	60 Min.
III. Operating Techniques		
Differences between old and new	R. A. Haydel	60 Min.
Operator Feedback	J. Mattern	60 Min.
Data Sheets		
Problem Areas		
Field Review	J. Mattern & R. A. Haydel	120 Min.
		12 Hours

Training will be conducted during the week of 12-17 January 1970. Each shift will have one 8 hour session and one 4 hour session.

Date	Time	Shift Chief Operator
Tuesday, January 13	7:00 AM - 3:00 PM	Adams
	3:00 PM - 7:00 PM	Gray
Wednesday, January 14	11:00 AM - 3:00 PM	Martin
	7:00 PM - 11:00 PM	Adams
Thursday, January 15	7:00 AM - 3:00 PM	Walker
Friday, January 16	7:00 AM - 3:00 PM	Gray
	3:00 PM - 7:00 PM	Walker
Saturday, January 17	7:00 AM - 3:00 PM	Martin

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SOLID AROCLOR EXPANSION

START-UP OPERATIONS MANUAL

SECTION V - OBJECTIVES - OPERATIONS PLAN AND PROCEDURES

GENERAL

Completion of construction of Project CEA-2080 - Solids Aroclor Expansion - is targeted for January 15, 1970. Actual production of Solid Aroclor in the new equipment is targeted for February 2, 1970. The period between these two dates will be one of Process Simulation, Instrumentation Calibration, and "wringing out" of electrical circuits.

Instrument calibration and check-out will be accomplished jointly by CED and plant personnel. Process simulation will not be of the traditional water batching variety, since water is detrimental to the Solid Aroclor process. Dry checks will be made instead.

After process simulation is completed, initial operations phase will begin. First few batches produced will be processed one step at a time with each step of the process thoroughly evaluated from an equipment performance, and product quality standpoint before batch is transferred to the next process step. During the initial operation period, the equipment must perform at design conditions. The process must be operated safely in accordance with the Tentative Operating Instructions, and must meet project premise quality and rate.

After the objectives of the initial operations are met, there will be a Project Demonstration phase. During this period, the equipment will be operated at maximum rates in order to further prove out design rates and quality, and to build up inventory of Solid Aroclor. Actual length of this phase will be dependent upon time required to achieve desired inventory levels.

TOWOLDMON0048520

V. OBJECTIVES - OPERATIONS PLAN AND PROCEDURES

A. PROCESS SIMULATION

The objectives of this phase are to (1) provide adequately trained personnel for start-up and (2) to uncover and correct potential problems and insure readisness of equipment and accessories prior to manufacturing product. To achieve these ends, the following activities will be performed.

1. Utilities

a. Steam

(1) Clean steam piping, coils, and tracing of weld slag and scale.

(2) Discharge condensate at all traps individually to check trap operability.

(3) Maintain regulated pressures to coils, tracing, and jet.

(4) Insure adequate freeze protection.

(5) Insure no steam leaks into steam jacketed lines.

b. Tower Water

(1) Clean piping of dirt, weld slag, and scale.

(2) Deliver tower water to chlorinator therminol coolers at 50 psig in quantities of 175 GPM (Item 141), 236 GPM (Item 116 & 123) to each cooler.

(3) Insure adequate freeze protection.

(4) Insure pressure gauges operability.

c. City Water

(1) Clean piping of dirt, weld slag, and scale.

(2) Deliver to users at 60 psig and design quantities up to 50 GPM.

(3) Insure adequate freeze protection.

d. Electricity

(1) Insure check-out of electrical circuits before they are required for simulation and operation.

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V. A. 1. d. (2) Supply power for motors totaling 245 HP at 440 volts.

(3) Check for adequate lighting.

e. Instrument Air

(1) Insure instrument air capacity and pressure is adequate for operation of automatic valves and instruments.

2. Auxiliaries

a. Therminol Systems

(1) Clean out tanks and distribution piping of four (4) Therminol systems - main system, chlorinator off-gas cooling system, chlorinator process cooling system, and still condenser cooling system.

(2) Record critical internal dimensions (dip lines, coils, etc.).

(3) Insure vents are open.

(4) Pressure test therminol piping systems with CO_2 to check for leaks.

(5) Check operability of pressure gauges during lead tests.

(6) Check pumps for operability and proper rotation.

(7) To drain used therminol from existing main system and replace with fresh therminol.

(8) To deliver therminol to users at following conditions:

	Flow Rate	Press. at Pump	Temp.
Main System (existing users)	1,000 GPM	40 psi	250-300°C
Main System (new users)	300 GPM	42 psi	250-300°C
Main System (to Furnace)	400 GPM	45 psi	250-300°C
Still Condenser Coolant	200 GPM	67 psi	75°C
Chlorinator Process Coolant	300 GPM	82 psi	76°C
Chlorinator Off-Gas Coolant	150 GPM	46 psi	132°C

b. Air Blower

(1) Clean out piping of dirt, slag and scale.

(2) Supply air to blow tank - 10 psig discharge pressure from blower in quantities of 150 CFM actual.

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V. A. 2. c. Instrumentation

(1) Insure instruments have been properly installed and calibrated (Plant & CED), and interlocks and alarms checked.

3. Chlorination System

a. Terphenyl Feed Tank (Weigh Tank)

(1) Clean Terphenyl tank of debris and dirt.

(2) Insure vent is clear.

(3) Record critical internal dimensions.

(4) Check Santowax charge pump for operability and rotation.

(5) Insure tank is suspended freely for proper weighing of charge.

(6) Insure proper rotation and operation of agitator.

(7) Insure proper operation of scale.

(8) Insure proper operation of Santowax charging valve.

(9) Check piping systems for leaks.

b. Chlorinators

(1) Clean of debris and dirt.

(2) Insure demister drain pipes and demisters are installed.

(3) Record critical internal dimensions.

(4) Insure proper rotation and operation of circulating pump.

(5) Pressure test piping systems.

(6) Insure correct rupture disc installed.

(7) Insure operability of pressure gauges.

c. Condensers (Product & Therminol)

(1) Insure tubes not obstructed.

(2) Insure no leaks.

(3) Insure relief valves operate properly.

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V. A. 3. d. Off-Gas System

(1) Clean trappings tank of debris and dirt.

(2) Measure and record critical internal dimensions.

(3) Insure correct rupture disc is installed.

(4) Insure proper rotation and operation of pump.

(5) Pressure test system.

(6) Insure proper rotation and operation of cooling fan.

(7) Insure condenser free of obstructions.

(8) Insure pressure gauge operability.

(9) Open line to HCl scrubber and note suction effect.

4. Blow Tank System

a. Clean tank of debris and dirt.

b. Measure and record critical internal dimensions..

c. Insure correct rupture disc is installed.

d. Insure proper rotation and operation of pump.

e. Pressure test piping system.

f. Pressure gauges operable.

g. Blow tank HCl scrubber

(1) Tight installation - free of HCl leaks.

(2) Sufficient suction.

5. Still System

a. Steam Ejector

(1) Insure no cracked components.

(2) Insure tails line from intercondensers unobstructed.

(3) Rotameters not damaged.

(4) Pressure gauges operable.

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V. A. 5. a. (5) Inspect trap and sump tank for debris.

(6) Observe and record vacuum on deadhead (each stage individually and collectively).

b. Still Pot

(1) Clean of debris and dirt.

(2) Measure critical internal dimensions.

(3) Check pump for proper rotation and operation.

(4) Insure correct rupture disc installed.

(5) Pressure test system, if necessary.

(6) Check pressure gauges for operability.

(7) Draw vacuum on entire system and isolate - check for leaks.

(8) Insure safe accessibility of coil "sucking" capability.

(9) Insure operability of lime conveyor.

c. Still Receiver

(1) Clean tank of debris and dirt.

(2) Record critical internal dimensions.

(3) Insure vent is unobstructed.

(4) Insure correct rupture disc is installed.

(5) Insure proper rotation and operation of pump.

(6) Insure correct operation of relief valve on product line.

(7) Insure no leakage into tube side of product condenser and therminol coolant heat exchanger.

(8) Insure proper operation of relief valve on therminol cooler.

(9) Pressure test system, if necessary.

(10) Insure operation of pressure gauges.

(11) Vacuum test system.

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V. A. 5. d. Furnace

(1) Insure correct installation of burner.

(2) Blow out fuel lines to clean out scale.

(3) Check out automatic controls.

(4) Check actual damper position with indicated position.

(5) Insure no obstruction in furnace coil.

(6) Dry out furnace in accordance with procedures in the IFO and Alcorn.

6. Miscellaneous

a. Insure accessibility of valves.

b. Insure accessibility of sample ports.

c. Insure safe vent discharge direction for all vents.

d. Check entire system for correct installation of critical components (orifices, pressure gauges, etc.).

TOWOLDMON0048526

V. OBJECTIVES - OPERATIONS PLAN AND PROCEDURES

B. INITIAL OPERATIONS

The objective of this phase is to prove ability of the process, equipment and operators to produce quality product. Material will be processed one batch at a time through each step of the process. Each step will be thoroughly evaluated as to performance before moving on to next step. Specific activities will include:

1. Weigh Tank

Operate according to Tentative Operating Instructions noting specifically the following:

a. Check weigh tank alarms.

b. Check feed pump (to chlorinator) interlocks while charging.

c. Check agitator operation and alarm.

d. Measure and record charging time to weigh tank.

e. Check charge temperature control system.

f. Record time to transfer batch to chlorinator.

g. Check feed pump shut-off and alarm.

2. Chlorination

Operate according to Tentative Operating Instructions noting specifically the following:

a. Chlorine feed interlock operation.

b. Therminol coolant temperature and flow controls and alarms-record.

c. Programmed chlorine flow control - amount and time of sequence-step-ups.

d. Mass temperature control system - sequence step-ups.

e. Observe all temperature points for accuracy and record.

f. Observe and record all pressure readings for future reference.

g. Verify 80% chlorinated alarm setting.

h. Measure and record discharge time to blow tank.

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V. B. 3. Off-Gas System

Operate according to Tentative Operating Instructions noting specifically the following:

a. Verify ability to charge material from off-gas catch tank to weigh tank.

b. Verify temperature control system operation on therminol coolant tank.

c. Verify temperature control system operation on off-gas catch tank.

d. Observe all temperature points for accuracy and record.

e. Observe and record all pressure readings for future reference.

4. Blow Tank

Operate according to Tentative Operating Instructions noting specifically the following:

a. Verify temperature control system operation in blow tank.

b. Verify level indication operation.

c. Observe and record all pressure readings for future reference.

d. Verify operation of air blowing system.

e. Verify operation of scrubber system.

f. Record time required to charge still from blow tank.

5. Distillation

Operate according to Tentative Operating Instructions noting specifically the following:

a. Operation of interlocks and alarms on still furnace.

b. Vacuum profile across system.

c. Temperature and level alarms in still.

d. Temperature and flow controls and alarms on therminol coolant system.

e. Temperature control system operation in still receiver.

TOWOLDMON0048528

V. B. 5. f. Observe all temperature points for accuracy and record.

g. Observe and record all pressure readings for future reference.

h. Operation of lime conveyor.

i. Operation of level indicator in still receiver.

j. Temperature control system operation on product condenser.

k. Verify Montar draw-off system adequacy.

l. Temperature spread across furnace coil - record.

m. Pump-out time to transfer material from receiver to storage.

n. Quality of distilled material.

TOWOLDMON0048529

V. OBJECTIVES - OPERATIONS PLAN AND PROCEDURES

C. PERFORMANCE DEMONSTRATION

The objective of this phase is to show that the Solids Aroclor installation can be operated routinely and consistently at design rates in a safe manner to produce quality material at standard yields and cost. To show this, the following will be done:

1. Operate at 100% of design rate for one or two consecutive weeks or until inventory is up to acceptable level. (Equivalent of 9.6 M lbs./year on old Solids Aroclor line and 20 M lbs./year on new facilities will be operating rate during this period.)

2. Produce material which meets quality specs (2 NPA Max. color, 98-105°C softening point, solubility greater than 3 hours) during the run.

3. Operate according to Tentative Operating Instructions (as amended).

4. Demonstrate standard 5460 yeilds (80% on Santowax R) and costs.

TOWOLDMON0048530

SOLID AROCLOR EXPANSION

START-UP OPERATIONS MANUAL

SECTION VI - OPERATIONS PLAN AND PROCEDURES DETAILS

A. PROCESS SIMULATION

The objectives of this phase as stated in Section V are:

1. Provide adequately trained personnel for start-up.

2. To uncover and correct potential problems and insure readiness of equipment and accessories prior to manufacturing product.

Before individual items of equipment are considered there are some general things that need to be checked out as a unit or grouping. These are:

1. Trace all pipe lines and check for:

   a. Compliance with drawings (P series). As part of this check insure the accessibility of all valves.

   b. All connections have been made except shutdown tie-ins; to include steam and therminol tracers.

   c. All pressure, temperature etc., tap points are being utilized or capped off.

   d. Check flow orifices for direction of flow and for being in the proper place. See Section VII for list.

   e. Close all manual valves. They will be opened during individual item check-out.

   f. Inspect all tank vents for safety of discharge direction.

2. Check for installation and tag number for:

   a. Thermowells.

   b. Thermocouple assemblies.

   c. Local pressure gauges.

   d. Level gauges.

   e. Relief valves.

   f. Rupture discs.

   g. U-type absolute pressure gauges.

   h. Pressure switches.

   i. Dial Thermometers.

TOWOLDMON0048531

VI. OPERATIONS PLAN AND PROCEDURES DETAILS

A. PROCESS SIMULATION

. The listings can be found in the miscellaneous part - Section VII.

For detailed item check-out it will be assumed the foregoing has been done; however, it will not preclude a duplication where necessary or desirable.

1. Utilities

a. Steam

The steam system should be given a systematic check-out for leaks in welds, fittings, and traps and to insure the right steam pressure is in the right place. The method of approach is to take the supply lines (Item or tracing) one at a time, turn on the steam, check for leaks, and see that the trap operates. The 100# (SL1-1) and 200# (SM1-1) supply headers and condensate (CL1-1) header are on the North side of the expansion. Since there are so many separate connections, each item will be marked with a small piece of colored tape after being checked so no line or trap will be missed.

(1) 200# Steam

(a) The off-gas storage tank (Item 109) and still receiver (Item 132) are heated by this steam. These lines will be checked out with the item.

(b) There are three (3) multi-tapped supply tracing headers, SM 1-3, SM 1-4, SM 1-6 (See Drawing P-144). Each tracing line should be checked (See Drawings P-142, P-144). Make sure all spare taps are shut off.

(c) There are two traps on the main line SM 1-1. They also should be checked.

(2) 100# Steam

(a) Items 101, 111, 114, 128, 135, 136, 139, and 149 use this steam. These lines will be checked out with the item.

(b) There are five (5) multi-tapped supply tracing headers SL 1-18, SL 1-19, and SL 1-17 (3 headers). The first two branch off of SL 1-3. (See Drawing P-143) These lines should all be checked (Drawing P-145). Make sure all spare taps are shut off.

TOWOLDMON0048532

VI. A. 1. a. (2) (c) There are five (5) steam-City Water supply "Take-Offs". The steam trap at these points should be checked. They are on lines:

SL 1-14
SL 1-13
SL 1-3
SL 1-8
SL 1-2

b. Tower Water

Tower water is supplied to three therminol coolers (Items 116, 123, 141), the three therminol pumps on the main therminol heating system (Items 150, 158, 159) and the #5 still pot vertical circulating pump (Item 134). Details for the tower water system can best be covered with the individual item. It is sufficient to say here that the TW to the new area comes from and returns to a common header.

c. City Water

City water is used in the No. 5 still ejector system (Item 136), the blow tank scrubber (Item 127), and the vacuum catch tank (Item 135). The use of city water will be covered in each individual item's section.

d. Electricity

All power lines to pumps and agitators will be checked for continuity.

e. Instrument Air

As each instrument is started up the air will be turned on to it. The existing compressor which is close to capacity will be checked periodically for overloading. An additional compressor is currently being rebuilt to supplement the present supply.

2. Auxiliaries

a. Therminol Cooling Systems

(1) Chlorinator Process Cooling System

(a) Open manway and inspect inside of tank (Item 114).

(b) Take appropriate measures to clean out if necessary, i.e., wipe, vacuum clean, etc.

TOWOLDMON0048533

VI. A. 2. a. (1) (c) Insure vent is open by pulling air from tank with vacuum cleaner.

(d) Record the dimensions of the steam coil and length of dip lines.

(e) Pressure test piping system for leaks.

e-1) Blank off pump discharge and suction line at pump (Item 115 (122)) and vent line on surge tank (Item 114).

e-2) Set TRCA-106-1 (119-1) at 0°C.

e-3) Place 20 psig CO_2 pressure on the system.

e-4) Soap flanges, gauge connections, valve packing and welds to be sure there are no leaks. Hold for 20 mins. minimum.

e-5) Check pump discharge pressure gauge.

e-6) Remove blanks.

e-7) Remove the relief valve PSV-106-2 (119-2) from the exchanger (Item 106 (119)). Bench test it to operate at 150 psig.

(f) Check out the tower water therminol coolers (Item 116 (123)).

f-1) Remove the relief valve PSV-116-2 (123-2) from the exchanger (Item 116 (123)). Bench test it to operate at 150 psig.

f-2) Set TICA-116-1 (123-1) to 0°C.

f-3) Keep the manual valve on the exit line closed.

f-4) Slowly open TW supply valve to fill lines.

f-5) Observe water pressure on local gauges, 50-60 psig.

Be sure TW return line valves on Item 141 and the other chlorinator cooler are closed.

f-6) Open existing tower water return valve and allow water to flow through the cooler. Pressure drop across the exchanger (Item 116 (123)) should be 2-3 psig.

f-7) Check for external leaks. Internal leaks should have been detected by the pressure test above.

TOWOLDMON0048534

VI. A. 2. a. (1) (g) Jog pump (Item 115 (122) starting switch to check for clockwise (right hand) rotation. Coupling should be disconnected for this check.

(h) Turn on steam to coils in surge tank. Observe for leaks.

(i) Insert a screen in the pump suction line. After several days of operation the screen can be removed.

(j) Fill tank with 700 gals. of therminol.

(k) Set FICA-115-1 (122-1) to alarm at 250 GPM.

(l) Open all manual valves in circulating line.

(m) Start pump (Item 115 (122). Observe pressure 80 psig. Flow rate is shown on FICA-115-1 (122-1) and should be 300 GPM. FV-115-1 (122-1) should be closed.

(n) Set TRCA-106-1 (119-1) above ambient temperature. TV-106-1 (119-1) should close and FV-115-1 (122-1) should open proportionally.

(o) Throttle valve on pump discharge until flow rate is below 250 GPM. Alarm should sound in control room. Open valve.

(p) Observe circulating temperature and set TICA-116-1 (123-1) below this point. TV-116-1 (123-1) should open.

(q) Check the high and low temperature alarm on TICA-116-1 (123-1).

This can be done by temporarily over riding the indicating arm. TRCA-106-1 (119-1) high and low temperature alarm can be checked by introducing a false signal at the control panel.

(2) Still Condenser Cooling System

(a) Open manway and inspect inside of tank (Item 139).

(b) Take appropriate measures to clean out, if necessary, i.e., wipe, vacuum clean, etc.

(c) Insure vent is open by pulling air from tank with vacuum cleaner.

(d) Record the dimensions of the steam coil and length of dip lines.

TOWOLDMON0048535

VI. A. 2. a. (2) (e) Pressure test piping system for leaks.

e-1) Blank off pump discharge and suction line at pump (Item 140) and vent line on surge tank (Item 139).

e-2) Set TRC-131-1 at 0°C.

e-3) Place 20 psig CO_2 pressure on the system.

e-4) Soap flanges, gauge connections, valve packing and welds to be sure there are no leaks. Hold for 20 mins. minimum.

e-5) Check pump discharge pressure gauge.

e-6) Remove blanks.

(f) Check out the tower water therminol cooler (Item 141).

f-1) Remove the relief valve, PSV-141-2, from the exchanger (Item 141) and bench test it to operate at 150 psig.

f-2) Set TICA-141-1 at 0°C.

f-3) Keep the manual valve on the exit line closed.

f-4) Slowly open TW supply valve.

f-5) Observe water pressure on local gauges, 50-60 psig. Be sure other tower water return line valves are closed or have water pressure.

f-6) Open the valves to allow water to flow through the cooler. Pressure drop across the exchanger (Item 141) should be 2-3 psig.

f-7) Check for external leaks. Internal leaks should have been detected by the pressure test above.

(g) Jog pump (Item 140) starting switch to check for clockwise (right hand) rotation. Coupling should be disconnected for this check.

(h) Turn on steam to coils in surge tank. Observe for leaks.

(i) Insert a screen in the pump suction line. After several days of operation the screen can be removed.

(j) Fill tank with 275 Gals. of therminol.

(k) Set FICA-140-1 to alarm at 160 GPM.

TOWOLDMON0048536

VI. A. 2. a. (2) (l) Open all manual valves in circulating line.

(m) Start pump (Item 140). Observe pressure 60-65 psig. Flow rate is shown on FICA-140-1 and should be 200 GPM. FV-140-1 should be closed.

(n) Set TRC-131-1 above ambient temperature. TV-131-1 should close and FV-140-1 should open proportionally.

(o) Throttle valve on pump discharge until flow rate is below 160 GPM. Alarm should sound in control room. Open valve.

(p) Observe the circulating temperature, and set TICA-141-1 below this point. TV-141-1 should open.

(q) Check the high-low temperature alarm on TICA-141-1 by temporarily overriding the indicating arm.

(3) Off-Gas Cooling System

(a) Open manway and inspect inside of tank (Item 111).

(b) Take necessary measures to clean out if necessary, i.e., wipe, vacuum clean, etc.

(c) Insure vent is open by pulling air from tank with vacuum cleaner.

(d) Record the dimensions of the steam coil and length of dip lines.

(e) Pressure test piping system for leaks.

e-1) Blank off pump discharge and suction line at pump (Item 112) and vent line on surge tank (Item 111).

e-2) Place 20 psig CO_2 pressure on the system.

e-3) Soap flanges, gauge connections, valve packing and welds to be sure there are no leaks. Hold for 20 mins. minimum.

e-4) Check pump discharge pressure gauge.

e-5) Remove blanks.

(f) Jog pump (Item 112) starting switch to check for clockwise (right hand) rotation. Coupling should be disconnected for this check.

(g) Turn on steam to coils in surge tank - observe for leaks.

TOWOLDMON0048537

VI. A. 2. a. (3) (h) Insert a screen in the pump suction line. After several days of operation the screen can be removed.

(i) Fill tank with 275 gals. of therminol.

(j) Start circulation pump (Item 112). Observe the pressure to be 45-50 psig.

(k) Turn on the cooling fan and observe for vibration and that the fan blows air across the tubes and out the louvers.

(l) Set TIC-111-1 to 130°C. TV-111-1.1 (steam valve) should open. Instrument air signal should be 15 psig. Once this temperature is reached, change set point to 110°C. TV-111-1.2 (air louvers) should open full. Instrument air signal should be 3 psig.

(m) Slowly close off the pump discharge valve. An alarm should sound at 20 psig.

(4) Main Therminol Heating System

(a) Open manway and inspect inside of surge tank (Item 149).

(b) Take appropriate measures to clean out, if necessary, i.e., wipe, vacuum clean, etc.

(c) Insure vent is open by pulling air from tank with vacuum cleaner.

(d) Record the dimensions of the steam coil and length of all dip lines.

(e) Pressure test the new area(CEA-2080 users) therminol lines.

e-1) The heating therminol is distributed from a common pump (Item 158) and returns to the tank at one place. There are several branch supply headers that feed the following individual loops: (The numbers refer to Item numbers)

Supply	To	Return
103		101 (bottom)
105		104 (bottom)
118		117 (bottom)
126		125 (bottom)
103		104 & 117 (tee in line)
104		117
104		106
117		119
126		129

TOWOLDMON0048538

VI. A. 2. a. (4) (e)

Supply	To	Return
Tie-in on Montar Line		129 (bottom)
104		106
Jacket on blow tank (Item 125)		Return line
125 (Lines:1-118-3/1-118-2)		Sample point at 101
125 (Lines:1-105-3/1-105-2)		Sample point at 101
Junction Lines 1-105-3/1-105-2		106
Junction Lines 1-118-3/1-118-2		119
105		Tee before 106
118		Tee before 119

1) Blank off the discharge side of the circulating pump (Item 158).
2) Place a 20 psig CO_2 pressure on the system.

3) Each individual heating loop and header connections (supply and return) should be tested with a soap solution for leaks. Be sure to open valves, since there is no pressure gauge at each loop. Hold entire system for 20 mins. minimum.
4) Check pump discharge pressure gauge.

5) Remove the blank.

(f) Tie-ins are required to place the new surge tank (Item 149) in service. This means a shutdown of the furnace and the existing heating system. During this phase the old therminol will be drained out.

f-1) Shut down the furnace (See Section III).

f-2) Drain off as much of the therminol as possible and complete tie-ins.

f-3) Check out the therminol pumps (Items: 150, 159, 158) and their seal gruad system. These three pumps all rotate in a counter clockwise (left handed) direction. The Dean Brothers Pump Representative has requested that he be present for start-up of these pumps.

f-4) Add 3,550 gals. of therminol to the surge tank (Item 149).

f-5) Start the 400 GPM pump to the furnace. Pressure should be 45 psig.

f-6) Start the 1,000 GPM pump to the existing users area. Pressure should be 40 psig.

f-7) Start the 300 GPM pump to the new area. Pressure should be 42 psig.

TOWOLDMON0048539

VI. A. 2. a. (4) (f) f-8) Turn on the steam to the tank coils. Heat up to 100°C. Check the tank level.

f-9) Start the furnace up. The therminol system should be heated up slowly. Start the furnace at 100°C and raise it 50°C. each hour until the desired 250°C is reached.

f-10) Tie-in and start-up should be made in the minimum time to reduce downtime.as much as possible.

b. Air Blower

The blower's(Item 124) distributor will be check out during inspection of the blow tank (Item 125). At that time the blower will be turned on and checked for a 10 psig discharge pressure.

c. Instrumentation

Instruments will be checked for operation as they apply to each item of equipment. Plant instrument people have already benched checked the instruments out for operation and calibration. In addition, CED personnel will be down during the checking start-up phase to further assist.

3. Chlorination System

a. Terphenyl Feed Tank (Item 101)

(1) Open manway and inspect inside of tank.

(2) Take appropriate measures to clean out if necessary, i.e., wipe, vacuum clean.

(3) Record the dimensions of steam coil, dip pipes, baffles and agitator shaft inside the tank.

(4) Pull air from tank through vent with vacuum cleaner.

(5) Jog pump (Item 103) starting switch to check for clockwise (right hand) rotation. Coupling should be disconnected for this check.

(6) Blank off pump discharge and suction line at pump (Item 103). Pressurize line 1-101-1 on bottom of tank to 20 psig with CO_2. Hold for a minimum of 20 minutes. Soap flanges to check for leaks. Do not remove the blanks at this time. The feed line will be tested with the chlorinators.

(7) Open manual and automatic valve (TV-101.1) on the steam line to the coils. Check for leaks. Turn off steam.

TOWOLDMON0048540

VI. A. 3. a. (8) Turn on tracing steam to the jacketed vent line and to the jacketed Santowax feed line. Check for leaks. Turn off steam.

(9) Operation of the feed tank can be checked out by water batching.

(a) Blank off the Santowax charge line up stream of the shut-off valve WV-101-2, if tie-in has already been made.

(b) Close manual valve on feed line, 1-101-3-X1-2, on tailings line, 1-110-1-F11-2P-3", and below tank.

(c) Set the first reed switch to shut off at 11,200#, the second one at 15,000#, and the third one at 100#.

(d) Push the button to open the Santowax R charge valve.

(e) Use a water hose to start filling the tank.

(f) Push the start button to terphenyl pump (Item 103). Nothing should happen since the charge valve is open.

(g) When the weight reaches 11,200# the scale switch should close the charge valve. An alarm "Charge complete Terphenyl Feed Tank" should sound in control room.

(h) Push charge valve open button. It should not work.

(i) Continue to fill tank until 15,000#. A high level alarm should sound in the control room. Turn off water.

(j) Start agitator and check for rotation.

(k) Set steam controller, TIC-101-1, at 40°C., open manual valve and observe the operation. Check tank temperature on panel for agreement with field indication. Turn off steam.

(l) Turn off agitator, alarm should sound in control room.

(m) Drain tank.

(n) As weight falls to 100# the low weight pump shutdown should sound an alarm in the control room.

(o) Allow tank to drip dry and finish up drying with nitrogen.

(p) Remove blank in pump suction line and on Santowax charge line.

TOWOLDMON0048541

VI. A. 3. b. Chlorinators

(1) Open manway and inspect inside of the chlorinator.

(2) Take appropriate measures to clean out if necessary.

(3) Record the dimensions of the dip line, demister drain pipe, and sparger pipes. The demister drain pipe should be no higher than 11'-3" from the bottom tangent line.

(4) Spargers should be checked to insure the holes face downward.

(5) Jog pump (Item 105, 118) starting switch to check for counter clockwise (left handed) rotation. Coupling should be disconnected for this check.

(6) Pressurize the following lines to 20 psig. with CO_2:

(a) New chlorine lines.

(b) Terphenyl feed line.

(c) Circulating lines to include the line to the blow tank and sample lines.

Hold for a minimum of 20 minutes. Soap flanges, gague connections, valve packing and welds to be sure there are no leaks.

(7) Check the local pressure gauge above the circulating pump to insure operability.

(8) Check the rupture disc on the chlorinators to insure the proper one is installed. Rating pressure is 50 psig.

(9) Remove flange on top of chlorinators to inspect installation of the demisters. Insure that the seal gasket is installed.

(10) Check out the high and low temperature alarm (TJRSI-104-3 (117-3)) by interjecting a false signal at the temperature recorder. Verify that the high alarm activates SV-104-1 to shut down the chlorine flow valve FV-104-1.

c. Condensers (Product and Therminol)

These have been checked out during start-up of the Therminol Systems.

d. Off-Gas System

(1) Inspect rupture disc to insure it is tagged PSE-109-4 rated at 50 psig.

(2) Open manway and inspect inside of tank (Item 109).

TOWOLDMON0048542

VI. A. 3. d. (3) Clean out as necessary, i.e., wipe, vacuum clean, etc.

(4) Record the dimensions of the level gauge and thermowell.

(5) Jog pump (Item 110) starting switch to check for clockwise (right hand) rotation. Coupling should be disconnected for this check.

(6) Pressurize the pump (Item 110) suction and discharge lines to 20 psig. with CO_2. Soap flanges, gauge connections, valve packing and welds to be sure there are no leaks.

(7) Check pump discharge pressure gauge.

(8) Turn on the steam to the tank jacket. Set TIC-109-1 at 100°C. Compare the indicated temperature with the temperature shown in the control room.

(9) Remove the 0-15 psig pressure gauge on the condenser (Item 108) off line. Slowly open the line to the HCl scrubber. Observe for a suction effect caused by the HCl scrubber.

4. Blow Tank System

a. Open manway and inspect inside of tank (Item 125).

b. Take appropriate measures to clean out if necessary, i.e., wipe, vacuum clean, etc.

c. Check the rupture disc to insure it is the proper one. It should be tagged PSE-125-3 rated at 50 psig.

d. Measure the dimensions of the air distributor, inlet lines and level gauge lines.

e. Check to insure distributor holes are facing downward.

f. Jog pump (Item 126) starting switch to check for clockwise (right hand) rotation. Coupling should be disconnected for this check.

g. Pressure test to 20 psig. with CO_2 the charge line to the #5 still pot. Hold for a minimum of 20 minutes. Soap flanges, gauge connections and welds to be sure there are no leaks. Remove the blanks.

h. Turn on water to the blow tank scrubber (Item 127). Water pressure should be 40 psig. A slight draft should be observed at the blow tank.

TOWOLDMON0048543

VI. A. 4. i. Start air blower (Item 124). Discharge pressure should be 10 psig.

j. Shut off the blower and verify the alarm works.

k. Put shaving cream on the flanges in the 6" inlet scrubber line to check for leaks.

l. While in the tank, increase the resistance to air flow through the bottom tube of LI-125-2. This will simulate a high level. It should activate an alarm.

5. Still System

a. Steam Ejector System

(1) Remove blind flange on 10" hand hole and inspect inside of ejector sump tank (Item 142). Clean out debris.

(2) Record the distance dip pipes are from the bottom of the tank.

(3) Inspect the outside of the ejectors for signs of cracks.

(4) Inspect the inter-condensers for section alignment.

(5) Inspect all flange connections for gaskets.

(6) Turn water on to first inter-condenser and observe drain overflow at sump tank. Do the same to the second inter-condenser and the after-condenser. This will insure unobstructed flow. Inspect the rotameters at this time too.

(7) Blank off drain lines from inter-condensers and steam line into ejector and vent line from last stage. Put 15 lbs. of water pressure on the ejector system and test for leaks. Remove blanks.

(8) Insert a blank between the second inter-condenser and 4th stage ejector. Close the 6" valve above the catch tank (Item 135).

(9) Turn on water to the 1st and 2nd condensers. Turn the steam on to the 3rd stage ejector. Record the vacuum. Turn off steam to 3rd stage and turn on 2nd stage steam. Record the vacuum. Do the 1st stage next.

(10) Remove the blank and turn on all four stages. Record the vacuum. It should be 2.63 mm Hg. If not, check for leaks. Shaving lotion cream is very good for checking for vacuum leaks.

(11) Open hand hole in the catch tank (Item 135).

(12) Inspect and remove debris.

TOWOLDMON0048544

VI. A. 5. a. (13) Turn on city water supply and check for leaks in tank jacket.

(14) Turn off water and turn on steam - be sure steam trap works.

(15) Remove the relief valve, PSV-135-2, from the steam line and bench test it to operate at 200 psig.

b. No. 5 Still Pot

(1) Insure that power is switched off to each level switch. Insure the safety shutter in the radiation source holder is closed and padlocked in position. Tank is now safe to enter.

(2) Open manway and inspect inside of tank (Item 129) for debris.

(3) Clean out as appropriate, i.e., wipe, vacuum clean, etc.

(4) Record the measurement and location of the submerged vertical Taber pump and dip lines.

(5) Insure that the tower cooling water is supplied to the pump. Jog the starting button and insure pump rotation is in a counter-clockwise (left handed) direction.

(6) Check the rupture disc. It should be tagged PSE-129-4 rated at 50 psig. pressure and for 0.193 psia vacuum.

(7) The still will not be pressurized unless it becomes necessary to check for vacuum leaks. The method used last time was to pressurize with air and ammonia fumes and spray the connections with HCl.

(8) Make sure the coil "sucking" valve is in a safe and accessible place.

(9) Turn on the lime conveyor and trouble shoot.

(10) The tank will be vacuum tested after the receiver is checked out. This will consist of drawing a vacuum on the entire system. Then the system will be isolated to see if it will hold a vacuum. Check for leaks with shaving cream.

(11) Suck the coil. This will give an indication if the coil is plugged up.

TOWOLDMON0048545

VI. A. 5. b. (12) In close supervision with the instrument people the No. 5 still level system will be checked out.

(a) Switch power on to the level switches. Be sure cooling water is on coils around switch.

(b) The high level switch should now be activated since it is receiving no radiation. Push start button on blow tank pump (Item 126). It should not start.

(c) Open the safety shutter. The low level switch should sound an alarm. Jog the start button to blow tank pump. It should now respond.

(13). Check out the high-low temperature alarm on TJRS1-129-2 by interjecting a false signal at the temperature recorder.

c. Still Receiver

(1) Open manway and inspect inside of the tank (Item 132).

(2) Clean out as appropriate, i.e., wipe, vacuum clean, remove debris, etc.

(3) Record the dimensions of the steam coil, dip pipes, thermowells, and level indicator. Use a vacuum cleaner to pull air from the tank vent to insure it is open.

(4) Check the rupture disc to insure for correctness. It should be tagged PSE-132-3 and be rated for 50 psig. pressure and 0.096 psia vacuum.

(5) Jog pump (Item 133) start switch to check for clockwise (right hand) rotation. The coupling should be disconnected for this check.

(6) Remove relief valve, PSV-131-3, from the cyclone discharge line and bench test it to operate at 150 psig.

(7) Open a drain on the 5460 condenser (Item 131) and check for any sign of therminol leakage.

(8) Blank off pump discharge and suction line at pump (Item 133). Pressurize to 20 psig. with CO_2. This should include the following lines: 1-133-3, 1-133-1, and 1-132-1. Soap flanges, gauge connections, valve packing and welds to be sure there are no leaks. Check pump discharge pressure gauge.

(9) Turn on the steam to the heating coils. Observe for any leaking. Change the set point of TIC-132-1 up and down several times and observe the response on the steam valve (TV-132-1). Compare the temperature indication on the controller with the reading in the control room.

TOWOLDMON0048546

VI. A. 5. c. (10) Draw a vacuum on the system (still pot and receiver). It should be between 2-3 mm Hg in the receiver. Shut off the line to the ejectors. Observe the vacuum on the U-type mercury and pressure indicators. Isolate the system and see if it will hold vacuum.

d. Furnace

CED people will be present for visual check-out and to advise on initial drying out period. There are several preliminary things to check.

(1) Check the actual position of the damper with the indicated position.

(a) Unscrew the two sample connection taps on the stack.

(b) Shine a flashlight in one while someone else looks in the other.

(c) If this doesn't work, then someone will have to observe up through the furnace or from the top of the stack.

(2) Blow down fuel lines.

(a) The most desired approach to blowing out the 2" supply line with CO_2 is to do it before tie-in. Failing to do this the next approach given below can be used.

(b) Since there are no provisions for isolation of the 2" supply line from an existing 1-1/2" line, the line must be blown with gas.

b-1) Remove the 100# pressure gauge on the pilot supply line. This tap point is prior to the fuel gas controls.

b-2) Connect a hose and burner assembly.

b-3) Slowly open the 2" supply valve and light the tip.

b-4) Blow line for 15 minutes. Shut off gas.

b-5) Replace the gauge.

(c) Blow down pilot flame line.

c-1) Remove the 15# pressure gauge after SV-128-18.

c-2) Blow out with low pressure (5 psig) CO_2.

c-3) Replace the gauge.

TOWOLDMON0048547

VI. A. 5. d. (2) (d) Blow main fuel line.

d-1) Shut off manual gas valve.

d-2) Remove the 100# pressure gauge on the pilot flame line.

d-3) Run a temporary instrument air line to FV-128-1. to open it.

d-4) Cap off bleed line from SV-128-14.

d-5) Pressurize to 30 psig. with CO_2 and hold open SV-128-13 and SV-128-15. CO_2 will blow through the burner.

(3) By "sucking" the heater coil as explained in the still pot section (5.b.), a check has been for obstructions.

(4) In accordance with the advise given by the CED representative, the instrument function outline (BCA-128-9), and the instructions in this start-up manual, the automatic controls will be checked.out and the initial drying out cycle will be performed.

(5) While operating at a low temperature point, check out of the automatic shutdown controls should include five shutdowns.

(a) Interject a 810°F false signal to TSU1-128-6.

(b) Turn down the gas supply to give a 2# inlet pressure or open PS-128-10 to simulate a low pressure.

(c) Open pressure switch PS-128-11. This simulates a high gas pressure.

(d) Turn off circuit No. 9 at main panel board.

(e) Test stop button on "Protectoglo" unit.

TOWOLDMON0048548

SECTION VI. OPERATIONS PLAN AND PROCEDURE DETAILS

B. INITIAL OPERATIONS

This section concerns the initial use of the actual manufacturing material in the system. The operation will be in accordance with the Tentative Operating Instructions contained in Section III. There are some specific checks, notations, and procedureal operations that need to be made during start-up. See Section VII - Miscellaneous for Batch Data Sheets.

1. Weigh Tank (Item 101)

   a. Record the charging time to weigh tank.

   b. During filling, try to start transfer pump (Item 103). It should not start.

   c. After filling to 11,200# an alarm should sound and charge valve WV-101-2 closes.

   d. Try to open charge valve. It should not open.

   e. Open nozzle. Measure free board and record.

   f. Control tank temperature at 150°C. Check temperature on multipoint indicator Point #1 and record.

   g. Turn off agitator. Check for alarm.

   h. Record time to transfer batch to chlorinator.

   i. Try to open charge valve during pump-out.

   j. Observe pump shutdown and alarm when tank is empty.

2. Chlorination #10 and (11)

   a. The cooling therminol system is in operation and the alarms have already been checked out (See A this Section). This includes the flow controller FICA-115-1 (122-1), circulation cooler controller TRCA-106-1 (119-1), and therminol cooler controller TICA-116-1 (123-1).

   b. The high and low temperature alarm on the body of the chlorinator (TJRS1-104-3) has been checked and the interlocking shutdown on high alarm has been verified.

TOWOLDMON0048549

VI. B. 2. c. Once circulation and chlorine flow of 3,000 lbs/hr. is established, temporarily stop the circulating pump (Item 105 (118)). An alarm should sound and the chlorine flow valve FV-104-1 should close. After verification, re-start pump.

d. Observe and record the amount of time between the programmed sequence chlorine flow steps.

e. Observe and record every hour the programmed sequence temperature steps and the time between the steps.

f. At least once an hour observe and record points 1 and 2 (3 and 7) on the multipoint temperature recorder and points 2, 3, 4, and 5 (7, 8, 9, and 10) on the multipoint temperature indicator.

g. Verify that the 80% chlorination point alarm sound when it should. Note the per cent of chlorination determined from the sample.

h. Observe and record the pressure of circulation pump (Item 105 (118)) and therminol pump (Item 115 (122)) and the TW pressure across the therminol cooler (Item 116 (123)).

i. Observe and record the control set point for chlorine flow, PI-104-6 through 104-8 (PI-117-6 through 117-8), and temperature set points, PI-106-5 through 106-12 (PI-119-5 through 119-12). This will be used for future reference.

j. Record time to transfer batch to blow tank.

3. Off-Gas System (Item 109)

a. Verify that the therminol cooling system is operating at 130°C. by observing TIC-111-1 and point #5 on the multipoint recorder and point #24 on the temperature indicator. Record the readings every two hours during chlorination.

b. Record the discharge pump pressure (Item 112).

c. Record the pressure of the condenser off-gas line (#1-108-1) during operation with 1,500 lbs/hr., 2,000 lbs/hr, and each hour with 3,000 lbs/hr. chlorine flow.

d. Verify that the material in the off-gas tank is being held at the set point. Compare the readings on TIC-109-1 and point #6 on the multipoint indicator.

e. Record the level in the off-gas tank (Item 109) and the time it takes to charge the tailings from the tank to the weigh tank (Item 101). Record pump (Item 110) pressure.

TOWOLDMON0048550

VI. B. 4. Blow Tank (Item 125)

a. Observe that TIC-125-1 controls the tank temperature at 240°C. Verify this by comparing TIC-125-1 with point #12 on the multipoint indicator.

b. Measure the free board and record it and the indication on LI-125-2.1. Do this for both chlorinator batches (1 blow tank batch).

c. Record the pressure reading on the air blowing line (1-124-1) and the water pressure to the scrubber (Item 127). Verify that the air pressure is 10 psig. and water pressure is 40 psig.

d. Record the time required to transfer the blow tank charge to the still. Record pump (Item 126) discharge pressure.

e. After pump-out verify that tank is empty as indicated on LI-125-2.

5. Distillation

a. The interlocks and alarms on the furnace system have already been checked out except the low flow shutdown. Throttle the pump discharge line until the flow is below 125 GPM. The alarm should sound and the burner should shut down; however, the pilot light should remain on.

b. Record the temperature spread across the furnace coils every hour (see the multipoint recorder points 8 and 9), and the stack temperature, multipoint indicator point #25.

c. The high/low temperature alarms on the still pot have already been checked out.

d. The low level alarm and high level interlock with the charging pump (Item 126) have already been checked out.

e. Observe and record the pressure of the furnace circulating line every two hours.

f. Observe and record every hour the vacuum profile across the cyclone separator and prior to the ejector system (Item 136). Also observe the still pressure recorder, PR-129-1.

g. Observe and record the temperature profile across the cyclone separator. Multipoint indicator points 13 and 14, and temperature in the catch tank (Item 135) multipoint indicator #15.

TOWOLDMON0048551

VI. B. 5. h. The alarms and flow control on the still condenser (Item 131) have already been checked out. Observe and record the therminol temperature profile in the system. Multipoint recorder point #12 and multipoint indicator points #16, 17 and 18 (#17 is TW return).

i. Verify that the lime conveyor works satisfactory.

j. Observe that the receiver's temperature controller (TIC-132-1) works. Compare reading with point #11 on the multipoint recorder.

k. Compare the level indicator, LI-132-2, with the expected quantity and verify free board before pump-out to storage.

l. Determine if the Montar draw-off system is adequate and record the number of drums filled. Because of our one step at a time check-out, the still bottoms may be drawn after one batch instead of two as in normal operation.

m. Record pump-out time from receiver to storage.

n. Trust that if all above goes well, in spec material will be produced.

TOWOLDMON0048552

SECTION VI - OPERATIONS PLAN AND PROCEDURE DETAILS

C. PERFORMANCE DEMONSTRATION

There are no special details for this section. Operation will be under normal procedures. Data taking beyond the data sheets or recorder information will be decided upon at this time.

TOWOLDMON0048553

EQUIPMENT PERFORMANCE CRITERIA

ITEM NO. _____

FUNCTION:

DESCRIPTION:

CAPACITY:

PERFORMANCE CRITERIA:

COMMENTS ON PERFORMANCE:

ITEMS TO BE CORRECTED:

CHECKED BY:_____
Signature

TOWOLDMON0048554

APPENDIX

Item 109: Off-Gas Surge Tank
6'-6" OD X 7'-9" High
Dished Heads

% Scale	Gallons	Innage "	% Scale	Gallons	Innage "
0	170 (dish)	0 (14"	72	1113	46.1
2	196	1.3	74	1139	47.4
4	222	2.6	76	1165	48.7
6	248	3.9	78	1191	50.0
8	274	5.2	80	1218	51.2
10	301	6.4	82	1244	52.5
12	327	7.7	84	1270	53.8
14	353	9.0	86	1296	55.1
16	379	10.3	88	1322	56.4
18	405	11.6	90	1349	57.6
20	432	12.8	92	1375	58.9
22	458	14.1	94	1401	60.2
24	484	15.4	96	1427	61.5
26	510	16.7	98	1453	62.8
28	536	18.0	100	1480	64.0
30	563	19.2		1506	65.3
32	589	20.5		1532	66.6
34	615	21.8		1558	67.9
36	641	23.1		1584	69.2
38	667	24.4		1611	70.4
40	694	25.6		1637	71.7
42	720	26.9		1663	73.0
44	746	28.2		1689	74.3
46	772	29.5		1715	75.6
48	798	30.8		1742	76.8
50	825	32.0		1768	78.1
52	851	33.3		1794	79.4
54	877	34.5		1820	80.7
56	903	35.9		1846	82.0
58	929	37.2		1873	83.2
60	956	38.4		1899	84.5
62	982	39.7		1925	85.8
64	1008	41.0		1951	87.1
66	1034	42.3		1977	88.4
68	1060	43.6		2004	89.6
70	1087	44.8		2030	90.9
				2056	92.2
				2082	93.5 Top

Sp.Gr.: 1.2
Inst. Range: 0-77" H_2O
Inst. Scale: 0-100% Linear

TOWOLDMON0048555

Aroclor - SOM
PFO

APPENDIX

ITEM 111 and 139: Therminol Surge Tank
3'-6" OD X 4'-3" High
Dished Ends

Level	Gallons	Level	Gallons
0"	24 (Dish)	2'-6"	204
1"	30	2'-7"	210
2"	36	2'-8"	216
3"	42	2'-9"	222
4"	48	2'-10"	228
5"	54	2'-11"	234
6"	60	3'-0"	240
7"	66	3'-1"	246
8"	72	3'-2"	252
9"	78	3'-3"	258
10"	84	3'-4"	264
11"	90	3'-5"	270
1'-0"	96	3'-6"	276
1'-1"	102	3'-7"	282
1'-2"	108	3'-8"	288
1'-3"	114	3'-9"	294
1'-4"	120	3'-10"	300
1'-5"	126	3'-11"	306
1'-6"	132	4'-0"	312
1'-7"	138	4'-1"	318
1'-8"	144	4'-2"	324
1'-9"	150	4'-3"	330
1'-10"	156		
1'-11"	162		
2'-0"	168		
2'-1"	174		
2'-2"	180		
2'-3"	186		
2'-4"	192		
2'-5"	198		

TOWOLDMON0048556

APPENDIX III

ITEM 114: THERMINOL SURGE TANK
5'-0" OD X 5'-3" HIGH - DISHED ENDS

Level	Gallons	Level	Gallons	Level	Gallons
0"	78 (Dish)	2'-5"	433	4'-10"	788
1	90	-6	445	-11"	800
2	102	-7	457	5'- 0"	813
3	114	-8	470	- 1"	825
4	127	-9	482	- 2"	837
5	139	-10	494	- 3"	849
6	151	-11	506		
7	163	3'- 0"	519		
8	176	- 1	531		
9	188	- 2	543		
10	200	- 3	555		
11	212	- 4	568		
1'- 0"	225	- 5	580		
- 1	237	- 6	592		
- 2	249	- 7	604		
- 3	261	- 8	617		
- 4	274	- 9	629		
- 5	286	-10	641		
- 6	298	-11	653		
- 7	310	4'- 0"	666		
- 8	323	- 1	678		
- 9	335	- 2	690		
- 10	347	- 3	702		
- 11	359	- 4	715		
2'- 0"	372	- 5	727		
- 1	384	- 6	739		
- 2	396	- 7	751		
- 3	408	- 8	764		
- 4	421	- 9	776		

TOWOLDMON0048557

APPENDIX IV

ITEM 125: BLOWING TANK
10'-0" OD X 10'-0" HIGH - DISHED HEADS

% Scale	Gallons	Innage(Ins.)	% Scale	Gallons	Innage(Ins.)
0	611 (Dish)	0 (16.3")	52	2548	39.5
2	685	1.5"	54	2622	41.0
4	760	3"	56	2697	42.5
6	834	4.5"	58	2771	44.0
8	909	6.0"	60	2846	45.6
10	983	7.6"	62	2920	47.1
12	1058	9.1	64	2995	48.6
14	1132	10.6	66	3069	50.1
16	1207	12.1	68	3144	51.6
18	1281	13.6	70	3218	53.2
20	1356	15.2	72	3293	54.7
22	1430	16.7	74	3367	56.2
24	1505	18.2	76	3442	57.7
26	1579	19.7	78	3516	59.2
28	1654	21.2	80	3591	60.8
30	1728	22.8	82	3665	62.3
32	1803	24.3	84	3740	63.8
34	1877	25.8	86	3814	65.3
36	1952	27.3	88	3889	66.8
38	2026	28.8	90	3963	68.4
40	2101	30.4	92	4038	69.9
42	2175	31.9	94	4112	71.4
44	2250	33.4	96	4187	72.9
46	2324	34.9	98	4261	74.4
48	2399	36.4	100	4336	76.0
50	2473	38.0		4410	77.5
				4485	79.0
				4559	80.5
				4634	82.0
				4708	83.6
				4783	85.1
				4857	86.6
				4932	88.1
				5006	89.6
				5081	91.2
				5155	92.7
				5230	94.2
				5304	95.7
				5379	97.2
				5453	98.8
				5528	100.3
				5602	101.8
				5677	103.3
				5751	104.8
				5826	106.4
				5900	107.9
				5975	109.4
				6049	110.9
				6124	112.4

0360487

TOWOLDMON0048558

Aroclor - SOM
PFO

APPENDIX

ITEM 132: No. 5 Still Batch Receiver
8'-0" OD X 10'-0" High
Dished Heads

% Scale	Gallons	Innage "	% Scale	Gallons	Innage "
0	314 (Dish)	0 (13"	26	1,248	31.2
1	352	1.2	27	1,286	32.4
2	390	2.4	28	1,323	33.6
3	428	3.6	29	1,361	34.8
4	455	4.8	30	1,399	36"(3 ft.)
5	493	6'	31	1,437	37.2
6	531	7.2	32	1,474	38.4
7	569	8.4	33	1,512	39.6
8	606	9.6	34	1,550	40.8
9	644	10.8	35	1,588	42
10	682	12"(1 ft.)	36	1,625	43.2
11	720	13.2	37	1,663	44.4
12	757	14.4	38	1,701	45.6
13	795	15.6	39	1,739	46.8
14	833	16.8	40	1,776	48"(4 ft.)
15	871	18	41	1,814	49.2
16	908	19.2	42	1,852	50.4
17	946	20.4	43	1,890	51.6
18	984	21.6	44	1,927	52.8
19	1,022	22.8	45	1,965	54
20	1,059	24"(2 ft.)	46	2,003	55.2
21	1,097	25.2	47	2,041	56.4
22	1,135	26.4	48	2,078	57.6
23	1,173	27.6	49	2,116	58.8
24	1,210	28.8	50	2,154	60"(5 ft.)
25		30			

Aroclor 5460
Sp.Gr.: 1.5 @ 160°C.
Temperature: 160°C.
Inst. Range: 0-10 ft.
Inst. Scale: 0-100% Linear

TOWOLDMON0048559

APPENDIX

	% Scale	Gallons	Innage"	% Scale	Gallons	Innage"
	51	2,192	61.2	76	3,135	91.2
	52	2,229	62.4	77	3,173	92.4
	53	2,267	63.6	78	3,211	93.6
	54	2,305	64.8	79	3,249	94.8
	55	2,343	66	80	3,286	96 (8 ft.)
	56	2,380	67.2	81	3,324	97.2
	57	2,418	68.4	82	3,362	98.4
	58	2,456	69.6	83	3,400	99.6
	59	2,494	70.8	84	3,437	100.8
	60	2,531	72"(6 ft.)	85	3,475	102
	61	2,569	73.2	86	3,513	103.2
	62	2,607	74.4	87	3,551	104.4
	63	2,645	75.6	88	3,588	105.6
	64	2,682	76.8	89	3,625	106.8
	65	2,720	78	90	3,664	108 (9 ft.)
	66	2,758	79.2	91	3,702	109.2
	67	2,796	80.4	92	3,739	110.4
	68	2,833	81.6	93	3,777	111.6
	69	2,871	82.8	94	3,815	112.8
	70	2,909	84 (7 ft.)	95	3,853	114
	71	2,947	85.2	96	3,890	115.2
	72	2,984	86.4	97	3,928	116.4
*	73	3,022	87.6	98	3,966	117.6
	74	3,060	88.8	99	4,004	118.8
	75	3,098	90	100	4,041	120 (10 ft.)

*Operation Level

TOWOLDMON0048560

APPENDIX I

Item 149, Main Therminol Surge Tank

90" OD X 134" Long
Dished Heads

Depth (In.)	Contents (Cal.)	Depth (In.)	Contents (Cal.)
0	0	46	2148.3
1	7.4	47	2210.0
2	21.7	48	2271.7
3	39.4	49	2332.3
4	60.4	50	2392.8
5	84.1	51	2452.1
6	111.1	52	2512.3
7	139.7	53	2572.3
8	170.7	54	2631.0
9	203.1	55	2689.5
10	248.1	56	2747.8
11	273.9	57	2805.7
12	312.0	58	2862.3
13	348.0	59	2918.5
14	385.1	60	2975.4
15	433.3	61	2030.8
16	472.5	62	2085.7
17	512.7	63	3141.2
18	568.6	64	3195.1
19	610.8	65	3248.5
20	652.4	66	3300.3
21	712.0	67	3340.5
22	763.3	68	3397.9
23	815.2	69	3445.5
24	865.7	70	3494.7
25	922.9	71	3530.9
26	970.7	72	3592.3
27	1024.8	73	3637.8
28	1079.6	74	3682.3
29	1135.9	75	3724.8
30	1191.4	76	3765.2
31	1248.5	77	3804.5
32	1306.0	78	3843.5
33	1363.9	79	3880.3
34	1422.0	80	3915.6
35	1480.5	81	3948.4
36	1541.0	82	3979.7
37	1600.1	83	4010.1
38	1659.2	84	4036.6
39	1719.5	85	4059.9
40	1709.9	86	4081.7
41	1840.5	87	4100.7
42	1901.2	88	4115.1
43	1962.9	89	4125.6
44	2024.7		
45	2086.5		

0360490

TOWOLDMON0048561

AROCLOR 5460

ITEM 810

% Scale	Gal.	Inch.	% Scale	Gal.	Inch.	% Scale	Gal.	Inch.
0	480	9	35	1889	49	70	3298	90
1	520	10	36	1929	50	71	3338	91
2	561	11	37	1969	52	72	3378	92
3	601	12	38	2010	53	73	3418	93
4	641	14	39	2050	54	74	3459	94
5	681	15	40	2090	55	75	3499	95
6	722	16	41	2130	56	76	3539	96
7	762	17	42	2171	57	77	3579	98
8	802	18	43	2211	58	78	3620	99
9	842	19	44	2251	60	79	3660	100
10	883	21	45	2291	61	80	3700	101
11	923	22	46	2332	62	81	3740	102
12	963	23	47	2372	63	82	3781	103
13	1003	24	48	2412	64	83	3821	104
14	1044	25	49	2452	65	84	3861	106
15	1084	26	50	2493	67	85	3901	107
16	1124	27	51	2533	68	86	3942	108
17	1164	29	52	2573	69	87	3982	109
18	1205	30	53	2613	70	88	4022	110
19	1245	31	54	2654	71	89	4062	111
20	1285	32	55	2694	72	90	4103	113
21	1325	33	56	2734	73	91	4143	114
22	1366	34	57	2774	75	92	4183	115
23	1406	35	58	2815	76	93	4223	116
24	1446	37	59	2855	77	94	4264	117
25	1486	38	60	2895	78	95	4304	118
26	1527	39	61	2935	79	96	4344	119
27	1567	40	62	2976	80	97	4384	121
28	1607	41	63	3016	81	98	4425	122
29	1647	42	64	3056	83	99	4465	123
30	1688	44	65	3096	84	100	4505	124
31	1728	45	66	3137	85			
32	1768	46	67	3177	86			
33	1808	47	68	3217	87			
34	1849	48	69	3257	88			

Range - 0-172" W.C.

Sp.Gr. 1.49
For 5460 @ 240°C

0360491

TOWOLDMON0048562

SOLID AROCLOR FLAKER FEED TANK

ITEM 811

Inches	Gallons	Inches	Gallons	Inches	Gallons
1	8	36	1715	71	4138
2	23	37	1783	72	4196
3	40	38	1853	73	4260
4	64	39	1928	74	4323
5	90	40	1994	75	4385
6	119	41	2060	76	4444
7	152	42	2128	77	4502
8	187	43	2198	78	4563
9	223	44	2266	79	4620
10	262	45	2342	80	4678
11	302	46	2408	81	4734
12	345	47	2478	82	4789
13	389	48	2545	83	4841
14	433	49	2621	84	4894
15	480	50	2695	85	4945
16	528	51	2762	86	4995
17	578	52	2829	87	5043
18	629	53	2903	88	5090
19	682	54	2979	89	5134
20	735	55	3046	90	5178
21	790	56	3116	91	5221
22	846	57	3182	92	5261
23	904	58	3258	93	5300
24	961	59	3326		
25	1022	60	3396		
26	1080	61	3464		
27	1139	62	3530		
28	1201	63	3596		
29	1264	64	3671		
30	1328	65	3741		
31	1386	66	3809		
32	1454	67	3874		
33	1521	68	3938		
34	1586	69	4003		
35	1650	70	4070		

Sp. Gr. 1.49

For 5460 @ 240°C

TOWOLDMON0048563

Section VII - Miscellaneous

3. Sequence of Operating Steps

A. Charging Weigh Tank (Item 101)

1. Check temperature control set at 150°C (steam)
2. Check that scale switch is set at 11,200 lbs
   Annunciator = Charge complete
3. Open charge valve - field button
4. Start Santowax charge pump - field button
   Annunciator = Full - valve closes
5. Stop Santowax charge pump - field button
6. Start agitator
7. Obtain catalyst - catch sample - SWR
8. Open charge valve on top of tank
9. Add catalyst
10. Close valve
11. Take sample to lab

B. Charging No. 10 or 11 Chlorinator

1. Open valve under weigh tank (ground level)
2. Open valve above pump (ground level)
3. Check that valve on top No. 10 open (closed) (2nd level)
4. Check that valve on top No. 11 closed (open) (2nd level)
5. Valve on bottom of No. 10 (11) closed (ground level)
6. Check that valve to blow tank on circulating line is closed (1st level)
7. Check that chlorine block valves closed (ground level)
8. Check that chlorine control valve closed and control point set at 0
9. Start transfer pump (Item 103). Pump out should take around 12 minutes.
10. Pump out shutdown and alarm when tank empty
11. Shut off agitator (1st level)
12. Close valve on bottom of weight tank (ground level)
13. Close valve above pump (ground level)
14. Close charge valve on top of chlorinator (2nd level)

C. Chlorinator Cycle

1. Open valve on bottom of chlorinator (ground level) and on pump discharge.
2. Recheck that valve to blow tank on circulating line is closed (1st level)
3. Open Cl_2 block valves (ground level)
4. Start circulating pump (Item 105 (118)) (ground level)

TOWOLDMON0048564

Section VII - Miscellaneous

C. Chlorinator Cycle (Continued)

5. Start chlorination program (control room)
6. Run softening point after 4 hours (control room)
7. Run softening point at 80% point (control room)
8. Record S.P. and % Q_4. Determine additional Chlorine to add.
9. Stop Cl_2 flow at this point (control room)
10. Shut Cl_2 block valves (ground level)
11. Wait 10 minutes and sample chlorinator (1st level)
12. Run softening point. If O.K. prepare to pump to blow tank (Item 125) (control room)
13. Note and record level in blow tank (control room)
14. Stop circulating pump (ground level)
15. Check to ensure valve at bottom of blow tank closed (ground level)
16. Open valve in line to blow tank (1st level)
17. Close valve to chlorinator on circulating line (2nd level)
18. Start circulating pump (ground level)
19. When level in blow tank stops rising, stop pump (ground level)
20. Close valve on bottom of chlorinator and on pump discharge (ground level)
21. Close valve from circulating line to blow tank (1st level)
22. Open valve to chlorinator on circulating line (2nd level)
23. Record level in blow tank. Determine that complete batch was transferred

D. Distillation Cycle (still and receiver empty)

1. Verify still and receiver empty (control room)
2. Record level in blow tank (control room)
3. Close bottom valve on still (Item 129) (ground level)
4. Open charge valve on still (1st level)
5. Open bottom valve on blow tank and on pump discharge (ground level)
6. Start blow tank pump (Item 126) (ground level)
7. Observe level falling in blow tank. When empty shut off pump (ground level)
8. Close bottom valve on blow tank and on pump discharge (ground level)
9. Close valve on charge line to still (1st level)
10. Open discharge valve on circulating line (1st level)
11. Open return valve on circulating line (1st level)
12. Preheat coil (requires two men) - temper button (1st level)
13. Start circulation pump (1st level)
14. Check flow (control room)
15. Bring up lime in elevator (ground - 1st level)
16. Open lime charge flange (1st level)
17. Add 400 lbs. lime (8 bags) (1st level)
18. Close flange (1st level)
19. Check that vacuum on line is 4 mm or less (1st level)
20. Open valve in vacuum line (1st level)
21. Adjust temperature by gas flow control (control room)

TOWOLDMON0048565

Section VII - Miscellaneous

D. Distillation Cycle (continued)

22. Monitor the operation for the 10 hours and record the following:

    a. vacuum
    b. temperature across coil
    c. receiver level
    d. temperature in still
    e. flow rate

23. Circulate receiver to sample (Item 132)
    a. Open bottom valve (ground level)
    b. Close valve to surge tank (1st level)
    c. Open valve back to receiver (1st level)
    d. Start pump - circulate 10 minutes (ground level)
    e. Sample

24. Run softening point (control room)
25. Record level of receiver (control room)
26. Shut off gas to furnace (control room)
27. Close valve in vacuum line (1st level)
28. Stop pump (ground level)
29. Suck coil (1st level)
30. Open valve to surge tank (1st level)
31. Close valve back to receiver (1st level)
32. Start transfer pump (Item 133) (ground level)
33. Empty receiver (field or control room indication)
34. Stop pump (ground level)
35. Close valve to surge tank (1st level)
36. Close valve at bottom of tank and on pump discharge (ground level)
37. Still is ready to receive the next batch
38. After two batches, still bottoms are dropped into drums. Open valve at bottom of still (ground level)
39. Fill drums (ground level)
40. Close bottom valve on still (ground level)

TOWOLDMON0048566

Section VII - Miscellaneous

4. One Time Recorded Data (Per Batch)

A. Weigh Tank (Item 101)

1. Charging Time: _____ min.
2. Tank Freeboard: _____ inches
3. Tank Temperature: ____ °C
4. Pump-out Time: ____ min.

B. Chlorinator #10 (11)

1. 80% Chlorination Alarm: ____ lbs. chlorine
2. Circulation pump pressure, Item 105 (118): ____ psig
3. Therminol pump pressure, Item 115 (122): ____ psig
4. TW pressure (Item 116 (123)): in ____ psig; out ____ psig
5. Chlorine flow set points:

(a) PI - 104-6 (117-6) _____
(b) PI - 104-7 (117-7) _____
(c) PI - 104-8 (117-8) _____

6. Temperature set points:

(a) PI - 106-5 (119-5) _____
(b) PI - 106-6 (119-6) _____
(c) PI - 106-7 (119-7) _____
(d) PI - 106-8 (119-8) _____
(e) PI - 106-9 (119-9) _____
(f) PI - 106-10 (119-10) _____
(g) PI - 106-11 (119-11) _____
(h) PI - 106-12 (119-12) _____

7. Pump-out time (Item 105 (118)): _____ min.

8. Pump-out pressure: _____ psig

C. Off-Gas System

1. Therminol pump pressure (Item 112): ___ psig
2. Tank level (Item 109): _____%
3. Time to charge tailings (not done each batch) _____ min.
4. Pump (Item 110) pressure when performing (3) _____ psig

TOWOLDMON0048567

Section VII - Miscellaneous

4. One Time Recorded Data (Continued)

D. Blow Tank

1. Free board after 1 Cl_2 batch: _____ inches
   gauge: _____ %
2. Free board after 2 Cl_2 batches: _____ inches
   gauge: _____ %
3. Air blowing pressure: _____ psig
4. Water pressure to scrubber: _____ psig
5. Pump out time: _____ min.
6. Pump-out (Item 126) pressure: _____ psig

E. Distillation

1. Free board in receiver: _____ inches
   gauge: _____ %
2. Pump-out time to storage: _____ min.
3. Pump-out (Item 133) pressure: _____ psig
4. Therminol pump pressure (Item 140): _____ psig
5. TW pressure (Item 141) In _____ psig; out _____ psig

TOWOLDMON0048568

Section VII - Miscellaneous

5. Continuous Data Recording (Per Batch)

A. Chlorinator #10 (11)

1. Chlorine flow steps (batch data sheet)
2. Temperature steps (batch data sheet)
3. Temperature points: Chlorinator #10 (11) - each hour

		Recorder Points		Digital Indicator Points			
	Time	1 (3)	2 (7)	2 (7)	3 (8)	4 (9)	5 (10)
1st							
2nd							
3rd							
4th							
5th							
6th							
7th							
8th							
9th							
10th							
11th							
12th							

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TOWOLDMON0048569

Section VII - Miscellaneous

5. Continuous Data Recording (Per Batch)

B. Off-Gas System

1. Temperature points: Once each first 3 hours then every two hours

	Recorder Points			Digital Indicator Points	
Time	4	5	6	6	24
1st					
2nd					
3rd					
5th					
7th					
9th					
11th					

2. Condenser off gas pressure: field gauge PI - 7T - 15#

	1	2	3	4	5	6	7	8
Time								
Reading: psig								

	9	10	11	12
Time				
Reading: psig				

TOWOLDMON0048570

Section VII - Miscellaneous

5. Continuous Data Recording (Per Batch)

C. Distillation

1. Circulating line pressure: Once each first 3 hours then every two hours

	1	2	3	5	7	9	11
Time							
psig							

2. Furnace temperature profile: stack and coil inlet-outlet, °C (Batch Data Sheet).

3. Vacuum pressure profile: (Batch Data Sheet).

4. Temperature points °C (each hour).

	Recorder Points		Digital Indicator Points					
Time	10	12	13	14	15	16	17	18
1st								
2nd								
3rd								
4th								
5th								
6th								
7th								
8th								
9th								
10th								
11th								
12th								

TOWOLDMON0048571

SHEET 1 OF 2

Monsanto

INSTRUMENT ACCESSORIES	AUTH NO.	SPEC NO.
PROJ/DEPT SOLID AROCLOR EXPAN	CEA-2080	1XC1-CP1 & 1XC2-CP
PLANT ANNISTON, ALABAMA	ISSUED BY * J.W. MATTEN	DATE / APPD / REV NO. / DATE 1-2-7

LOCATION PANEL

DIGITAL SET PROGRAMMERS

TIME CYCLE PROGRAM

CHLORINATION

NUMBERS IN ○ REFER TO ITEM NUMBER ON SHEET #2

PROCESS →	23	22	21	20	19	18	17	14	16	13	15	12
REFERENCE	SV-104-9	SV-106-12	SV-106-11	SV-106-10	SV-106-9	SV-106-8	SV-106-7	SV-104-8	SV-106-6	SV-104-7	SV-106-5	SV-104-6
TYPE OF FUNCT	ms	ms	ms	ms	ms	ms	ms	ms	ms	ms	ms	ms
POSITION	12	11	10	9	8	7	6	5	4	3	2	1

													TIME			INTERNAL SWITCHES	
													STEP PERIOD	ACCUM CYCLE		C-T	A
0		HOME-POSITION BETWEEN CYCLES											MINUTES			X	X
1											X	X	60	60		X	
2									X	X			60	120		X	
3							X	X					60	180		X	
4						X		X					60	240		X	
5					X			X					60	300		X	
6				X				X					60	360		X	
7				X				X					60	420		X	
8			X					X					60	480		X	
9			X					X					60	540		X	
10		X						X					60	600		X	
11		X						X					60	660		X	
12	X	X											0.1	660.1		X	
13		X											60			X	
14-29		X											—				

C & T SWITCHES MECHANICALLY INTERLOCKED TO OPERATE SIMULTANEOUSLY

"X" INDICATES FUNCTION IS OPERATED

BLANK INDICATES FUNCTION NOT OPERATED

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* THIS IS AN ABSTRACT OF M. KAYE'S REV NO. 1 FOR PLANT USE

STEPS 6, 7 & 8 HAVE BEEN EXPANDED TO REPRESENT ACTUAL

FS 140 (12/68)

TOWOLDMON0048572

Monsanto

INSTRUMENT ACCESSORIES

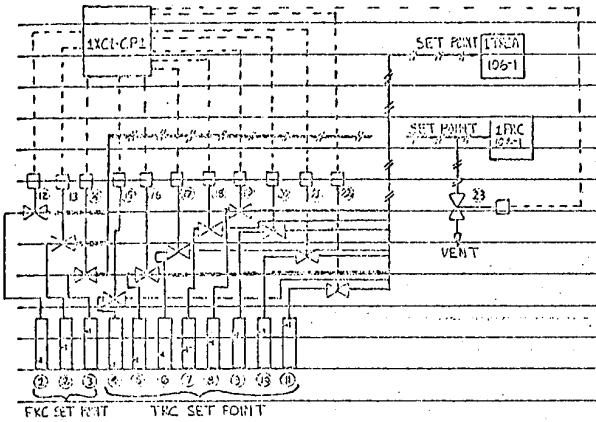
PROJ/DEPT SALID AEROLOX EXPANSION

PLANT ANNISTON, ALA.

LOCATION PANEL

AUTH NO.	SPEC NO.			
CEA-2080	1XC1-CP1 & 1XC2-CP1			
ISSUED BY	DATE	APPD	REV NO.	DATE
M. KAYE			1	5-21-

CHLORINATOR #10 FLOW AND TEMPERATURE CONTROL POINT SCHEME



ITEMS #1, 2 & 3 : SET POINT INDICATORS FOR FLOW CONTROLLER 1FRC-104-1 TAG: PI-104-6 THRU 8

ITEMS 4 THRU 11 : " " " " TEMP " 1TRCA-106-1 TAG: PI-106-5 THRU 12

ITEMS #1 THRU #11 WILL BE FURNISHED BY OTHERS AND PIPED & MOUNTED BY PANEL FABRICATOR

ITEMS #12 THRU #23 : SKINNER SOLENOID VALVES MOUNTED ON REAR OF THE PROGRAMMER AND

: ELECTRICALLY WIRED THERETO BY TAYLOR INSTRUMENT Co. ALL PNEUMATIC PIPING

: WILL BE PERFORMED BY PANEL FABRICATOR. TAG Nos. SV-104-6 THRU 8; SV-104-9; SV-106-5 THRU 12

MOORE MODEL 41-15 PRECISION PRESSURE REGULATORS WILL BE MOUNTED BY PANEL FABRICATOR AND OUTPUT PIPED TO SET POINT INDICATORS. THESE REGULATORS EACH GENERATE ONE SET POINT FOR EACH INDICATOR. TAG Nos. PC-104-6 THRU 8 AND PC-106-5 THRU 12.

NOTE: AN IDENTICAL CONTROL SET POINT SCHEME WILL BE USED FOR CHLORINATOR #11

PROGRAMMER TAG No.	: 1XC2-CP1
FLOW CONTROLLER TAG No.	: 1FRC-117-1
" " SET POINT REGULATORS TAG Nos.	: 1PC-117-6 THRU 1PC-117-9
" " " " INDICATORS TAG Nos.	: 1PI-117-6 THRU 1PI-117-9
TEMP " TAG No.	: 1TRCA-119-1
" " SET POINT REGULATORS TAG Nos.	: 1PC-119-5 THRU 1PC-119-[illegible]
" " " " INDICATORS TAG Nos.	: 1PI-119-5 THRU 1PI-119-[illegible]
FLOW " SOLENOID VALVES TAG Nos.	: 1SV-117-6 THRU 1SV-117-[illegible]
TEMP " " " " "	: 1SV-119-5 THRU 1SV-119-[illegible]

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Section VII - Miscellaneous

7. Control Loop

	Item No.		A	I	Location
1)	TIC-101-1	Terphenyl Feed Tank - Temp	-	N	Field
2)	WV-101-2	Terphenyl Feed Tank - Weight	3	Y	Field
3)	TRCA-106-1	Chlorinator Cooler #10	2	N	Panel
4)	FRC-104-1	Chlorine Flow Control #10	-	N	Panel
5)	FQS-104-2	Totalizing #10	1	N	Panel
6)	FICA-115-1	Therminol Flow #10	1	N	Panel
7)	TICA-116-1	Therminol Cooler #10	2	N	Field
8)	TRCA-119-1	Chlorinator Cooler #11	2	N	Panel
9)	FRC-117-1	Chlorine Flow Control #11	-	N	Panel
10)	FQS-117-2	Totalizing #11	1	N	Panel
11)	FICA-122-1	Therminol Flow #11	1	N	Panel
12)	TICA-123-1	Therminol Cooler #11	2	N	Field
13)	TIC-109-1	Off-Gas Storage Tank	-	N	Field
14)	TIC-111-1	Therminol Off-Gas Condenser	-	N	Panel
15)	TIC-125-1	Blow Tank Temperature	-	N	Field
16)	FRCA-128-1	Gas Flow to Furnace	1	Y	Panel
17)	TIC-132-1	#5 Still Receiver	-	N	Field
18)	TICA-141-1	Therminol Cooler	2	N	Field
19)	TRCA-131-1	Condenser Cooler	-	N	Panel
20)	FICA-140-1	Therminol Flow to Condenser	1	N	Panel
21)	BCA-128-9	Furnace Heat Control	4	Y	Field

TOWOLDMON0048574

Section VII - Miscellaneous

8. Indicating Loops

	Item No.		A	I	Location
1)	LI-109-2	Off-Gas Storage Tank	-	N	Field
2)	DR-104-4	Circulation Density #10	-	N	Panel
3)	DR-117-4	Circulation Density #11	-	N	Panel
4)	FIA-128-2	#5 Still Flow	1	Y	Panel
5)	LS-129-3	#5 Still Low Level	1	N	Panel
6)	LS-129-4	#5 Still High Level	-	Y	Field
7)	PR-129-1	#5 Still Pressure	-	N	Panel
8)	LI-132-2	Receiver Level	-	N	P&F
9)	DR-133-1	Product Density	-	N	Panel
10)	LIA-125-2	Blow Tank Level	-	N	P&F

TOWOLDMON0048575

Section VII - Miscellaneous

9. Active Interlocks

1) Weight Tank

A. 1st high weight shut-off WS-101-2
B. 2nd high weight shut-off WS-101-3
C. Low weight shut-off WS-101-6
D. Charge valve-transfer pump ES-103-1

2) Chlorine Shut Down to Chlorinators 10 (11)

A. Pump shut-off ES-105-1 (118-1)
B. High body temperature TJRS-104-3 (117-3)

3) #5 Still High Level

A. Charge pump shut down LS-129-4

4) Furnace - Shut Downs

A.	Low Aroclor Flow	FIA-128-2
B.	High Temperature	TS-128-6
C.	Pilot Flame Failure	"Purple Peeper"
D.	Low Gas Pressure	PS-128-10
E.	High Gas Pressure	PS-128-11
F.	Electrical Failure	Checking Relay

TOWOLDMON0048576

Section VII - Miscellaneous

10. Systems in Continuous Operation

1) Therminol Heater System (Item 149)
2) Therminol Cooling System For the No. 10 (11) Chlorinator (Item 106 (119))
3) Therminol Cooling System for HCL Off Gas (Item 108)
4) Therminol Cooling System for Still Condenser (Item 131)
5) Blow Tank Drowning Jet (Item 127)
6) No. 5 Still Furnace (Item 128)
7) Four Stage Ejector System (Item 136)
8) Instrument Air Supply
9) Chlorine Vaporizer System

TOWOLDMON0048577

Section VII - Miscellaneous

11. Operating Batch Data Sheet (Chlorinator)

The data sheet will be reviewed during training for final composition. Therefore, it will be inserted later.

TOWOLDMON0048578

Section VII - Miscellaneous

12. Operating Batch Data Sheet (Still)

The data sheet will be reviewed during training for final composition. Therefore, it will be inserted later.

TOWOLDMON0048579

Monsanto

INSTRUMENT ACCESSORIES	AUTH NO.	SPEC NO.				
	CEA-2080	101-1 CP 1				#1
PROJ/DEPT SOLID AROCLOR EXP.	ISSUED BY	DATE	APPD	REV NO.	DATE	
PLANT ANNISTON, ALABAMA	M. Kaye	6.13.69		1		

LOCATION 2ND FLOOR

nnunciator 101-CP1 Alarm Nameplate Wording

( ) POINT #	FIRST LINE	SECOND LINE	Third Line	(ITEM NO
1-1	Charge Complete	Terphenyl Feed	Tank	101
1-2	High Level	Terphenyl Feed	Tank	101
1-3	Terphenyl Feed	Pump Shutdown		103
1-4	Air Blower	Shutdown		124
1-5	Blowing Tank	High Level		125
1-6	Terphenyl Feed	Tank Agitator	Shutdown	101
1-7	Therminol Pump	Off Gas Cond.	Low Pressure	112
1-8	Therminol Pump	CEA-2080	Circulation	159
2-1	Chlorinator #11	Circulating	Pump Shutdown	119
2-2	Chlorinator #11	High/Low (Body)	Temperature	117
2-3	Chlorinator #11	High/Low Circ.	Temperature	119
2-4	Chlorinator #11	Cooler Low Flow	Therminol	122
2-5	Chlorinator #10	Circulating	Pump Shutdown	105
2-6	Chlorinator #10	High/Low (Body)	Temperature	104
2-7	Chlorinator #10	High/Low Circ.	Temperature	106
2-8	Chlorinator #10	Cooler Low Flow	Therminol	115
3-1	Chlorinator #11	Therminol Cooler	High/Low Temp.	123
3-2	Chlorinator #11	80% Chlorination		117
3-3	Therminal Pump	Heater Feed	Circulation	159
3-4	Therminol Pump	Existing Users	Circulation	150
3-5	Chlorinator #10	Therminol Cooler	High/Low Temp.	116
3-6	Chlorinator #10	80% Chlorination		104
1 3-7	~~Therminol Cooler~~ STILL No.5	~~Fan Excess~~ LOW LEVEL	~~Vibration~~	129
3-8	Safety Shower	In Operation		—
4-1	Still #5 Circ.	High Temperature		128
4-2	Still #5 Receiver	Therminol Cooler	High/Low Temp.	141
4-3	Still #5	High/Low	Temperature	129
4-4	Still #5	Circulation	Low Flow	129
4-5	Still #5	Fuel Gas	Low Flow	128
4-6	Still #5 Heater	Shutdown		128
4-7	Still #5 Circ.	Low Pressure		129
4-8	Still #5 Receiver	Cooler Low Flow	Therminol	140

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TOWOLDMON0048580

Monsanto

INSTRUMENT ACCESSORIES

AUTH NO.	SPEC NO.
CEA-2030	1 TJR1-CP1

PROJ/DEPT	ISSUED BY	DATE	APPD	REV NO.	DATE
SOLID CHLOR EXPANSION	M. KAYE			1	5-15-69

LOCATION CONTROL PANEL CP-1 PLANT ANNISTON, ALABAMA

MULTIPOINT TEMPERATURE RECORDER

ITEM No. 1-TJR1-CP1 No. REQ'D. ONE (1)

ONE HONEYWELL ELECTRONIK 15 STRIP CHART RECORDER MODEL No. 153038 FOR USE WITH 120 VAC 60 CYCLE SUPPLY. RECORDER IS TO HAVE 12 POINTS, CYCLIC TYPE PRINTING & A PRINT SPEED OF 15 SECONDS PER POINT. ACTUATION IS TO BE TYPE "J" IRON-CONSTANTAN THERMOCOUPLE. CHART SPEED IS TO BE TWO (2) INCHES PER HOUR AND CHART AND SCALE RANGE IS TO BE 0 - 500°C. UNIT WILL BE FLUSH MOUNTED ON CONTROL PANEL. MULTIPLE COLOR (WITH PLUS SIGN AND CORRESPONDING NUMERAL) MARKING IS REQ'D. UPSCALE DRIVE ON THERMOCOUPLE BURNOUT IS REQUIRED.

TWO SELECTIVE ALARMS, ONE HIGH (N.C. SWITCH) AND ONE LOW (NORMALLY OPEN SWITCH) ARE REQUIRED ON EACH OF THE FOLLOWING POINTS: POINT #1, #7 & #10. THESE POINTS CAN ONLY ALARM WHEN THE TEMPERATURE IS ACTUALLY BEING MEASURED.

COLOR OF BEZEL & DOOR IS TO BE VISTA GREEN.

ENGRAVED NAMEPLATE INTERNAL (ON BEZEL BEHIND GLASS) IS REQUIRED. ENGRAVING TO BE AS FOLLOWS:

#1 #10 CHLORINATOR	#7 #11 CHLORINATOR
#2 THERMINOL TO CHLORINATOR #10 COOLER	#8 STILL #5 HEATER OUTLET
#3 THERMINOL TO CHLORINATOR #11 COOLER	#9 STILL #5 HEATER INLET
#4 OUTLET-OFF GAS CONDENSER	#10 STILL POT #5
#5 THERMINOL OUTLET-OFF GAS CONDENSER	#11 STILL #5 RECEIVER
#6 OUTLET-OFF GAS CONDENSER	#12 THERMINOL TO STILL #5 CONDENSER

HIGH TEMPERATURE ALARM TO BE SET AT 275°/260°C FOR POINTS #1 & #7

LOW " " " " " " 120°/110°C " " #1 & #7

HIGH " " " " " " 430°C " " #10

LOW " " " " " " 400°C " " #10

1 TAG HIGH TEMPERATURE SWITCH ON POINT #1; TJRS1-104-3.2

1 " " " " " #7; TJRS1-117-3.2

1 " " " " " #10; TJRS1-129-3.2

" LOW " " " " #1; TJRS1-104-3.1

1 " " " " " #7; TJRS1-117-3.1

1 " " " " " #10; TJRS1-129-3.1

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Monsanto

INSTRUMENT ACCESSORIES	AUTH NO.		SPEC NO.	
	CEA-7090		1TJI1-CP1	
PROJ/DEPT SOLID ARACLOR EXPANSION	ISSUED BY	DATE	APPD	REV NO. / DATE
LOCATION PANEL — PLANT ANNISTON, ALABAMA	M. KAYE			0

MULTIPOINT TEMPERATURE INDICATOR NAMEPLATES

VENDOR IS TO SUPPLY TYPED TEMPERATURE POINT DESCRIPTIONS FOR INSERTION IN NUMBERED SLOTS ON INDICATOR AND SWITCHING MODULE

	1	TERPHENYL FEED TANK	6	OFF GAS STORAGE TANK	
	2	CHLORINATOR #10 CIRCULATION	7	CHLORINATOR #11 CIRCULATION	
MODEL 610 DS-10	3	CHLORINATOR #10 COOLER THERMINOL OUTLET	8	CHLORINATOR #11 COOLER THERMINOL OUTLET	
	4	CHLOR #10 THERMINOL COOLER WATER OUTLET	9	CHLOR #11 THERMINOL COOLER WATER OUTLET	
	5	CHLOR #10 THERMINOL COOLER THERMINOL INLET	10	CHLOR #11 THERMINOL COOLER THERMINOL INLET	
	11	TOWER COOLING WATER SUPPLY	16	STILL #5 THERMINOL CYCLES THERMINOL WASTE	
	12	BLOWING TANK	17	STILL #5 THERMINOL COOLES WATER OUTLET	
	13	CYCLONE SEPERATOR INLET	18	STILL #5 CONDENSER THERMINOL OUTLET	
	14	CYCLONE SEPERATOR OUTLET	19	THERMINOL SURGE TANK	
MODEL 610 S-30	15	CATCH TANK	20	THERMINOL RETURN FROM EXISTING HEATER	
	21	THERMINOL FROM EXISTING HEATER	26		
	22	THERMINOL RETURN FROM CEA-2090	27		
	23	THERMINOL TO EXISTING HEATER	28		
	24	AIR COOLER THERMINOL OUTLET	29		
	25	FURNACE STACK	30		

NOTE 2.: POINTS No. 25 THRU 30 ARE TO BE BLANK.

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TOWOLDMON0048582

Monsanto

LOCATION FIELD

INSTRUMENT ACCESSORIES

PROJ/DEPT SOLID APOCLOR EXPANSION

PLANT ANNISTON, ALABAMA

AUTH NO.	SPEC NO.			
CEA-2080	1 PSE-VARIOUS			
ISSUED BY	DATE	APPD	REV NO.	DATE
M. KAYE	5-24-69	-	0	

RUPTURE DISCS

GENERAL SPECIFICATIONS: BLACK, SIVALLS & BRYSON TYPE D & WHERE SPECIFIED, TYPE DV RUPTURE DISCS. FLANGE MATERIAL TO BE CARBON STEEL FOR INSTALLATION BETWEEN 3" 150# RF FLANGES IN ALL CASES.

REV. No.	ITEM No.	TAG No.	OPER. PRESS. PSIA	OPER. TEMP. °F	SEAL MATL.	DISC MATL.	ASSEMBLY MODEL NO.	SET PRESSURE PSIG	VACUUM SUPPORT	SERVICE
0	1	PSE-104-5	19.7	491	7X TEFLON	INCONEL	QUICK-SEC #7R	50	NO	CHLORINATOR #10 1-104
	2	PSE-103-4	19.7	400	"	INCONEL	"	50	NO	OFF GAS STORAGE TANK 1-109
	3	PSE-117-5	19.7	491	"	INCONEL	"	50	NO	CHLORINATOR #11 1-117
	4	PSE-125-3	19.7	450	"	316 STN.STL	"	50	NO	BLOWING TANK 1-125
	5	PSE-129-4	0.193	716	316 STN.STL	316 STN.STL	"	50	18-8 STN STL-DV	STILL POT No. 5 1-129
	6	PSE-132-3	0.096	320	7X TEFLON	"	"	50	13-8 STN STL-DV	STILL No. 5 RECEIVER 1-132

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Monsanto

INSTRUMENT ACCESSORIES

PROJ/DEPT SOLID AROCLOR EXPANSION

PLANT ANNISTON, ALA.

LOCATION FIELD

AUTH NO.	SPEC NO.			
CEA-2080	1 PS-VARIOUS			
ISSUED BY	DATE	APPD	REV NO.	DATE
M. KAYE	3-25-68		0	

PRESSURE SWITCHES

GENERAL SPECIFICATIONS: MERCOID WEATHER RESISTANT WITH TILTING TYPE SEALED MERCURY SWITCH (GENERAL PURPOSE ENCLOSURE WHERE SPECIFIED). 1/4" NPT PROCESS CONNECTION. 1/2" CONDUIT CONNECTION. ALL SWITCHES ARE TO BE S.P.D.T. DIFFERENTIAL IS ADJUSTABLE. ELECTRICAL RATING: 115 VAC; 10 AMPS NEMA TYPE 3. BRASS BOURDON TUBE EXCEPT AS NOTED

REV. No.	ITEM No.	TAG No.	OPER. PRESS.	SET POINT ACTUATION	DIFFER. MINIMUM	RANGE No.	MODEL No.	SERVICE	NOTE
0	1	PSU1-112-1	PSIG 46	20 PSIG OPENS ON DEC.	PSIG 7	R6E	DAW-43-153	THERMINOL PUMP DISCHARGE 1-112	1
	2	PSU1-128-2 PF-4TFH	50	20 PSIG OPENS ON DEC.	3 3/4	6	DAW-33-153	STILL #5 POT HEATER OUTLET 1-129	1
	3	PS-128-10	20	2.5 PSIG OPENS ON DEC.	1	3A	DAW-33-153	MAIN BURNER FUEL GAS 1-129	
	4	PS-128-11	20	2.5 PSIG OPENS ON INC.	1 3/4	4	DAW-33-153	" " " " "	
	5	PS-128-12	20	2 PSIG CLOSES ON INC.	1	3A	DAW-33-153	" " " " "	
	6	PS-128-13	3-15	2.5 PSIG CLOSES ON DEC.	1	3A	DAW-33-153	CONTROL AIR TO FV-129-1	
	7	PSU1-128-1	3-15	5.2 PSIG OPENS ON DEC.	1	3A	DAW-33-153	LOW FLOW TO STILL #5 HEATER SHUTDOWN.	

NOTE 1: 316 STN. STL. BOURDON TUBE REQ'D.

NOTE 2: FURNISH VANSFIELD & GREEN DIAPHRAGM SEAL WITH 2"-150# RF FLANGE CONNECTION (TYPE SO). HIGH TEMPERATURE SILICONE FILL (TO 650°F). SEAL TO BE ASSEMBLED TO SWITCH, FILLED AND CALIBRATED. LOWER FOWL IS TO BE CARBON STEEL WITH TYPE 316 STN. STL. DIAPHRAGM.

0360513

TOWOLDMON0048584

Monsanto

INSTRUMENT ACCESSORIES

AUTH NO.	SPEC NO.
CEA-2080	1PSV-VARIOUS

PROJ/DEPT SOLID ARCLOR EXPANSION

LOCATION FIELD PLANT ANNISTON, ALA.

ISSUED BY	DATE	APPD	REV NO.	DATE
M. KAYE	6-7-60		1	

RELIEF VALVES

GENERAL SPECIFICATIONS: LONERGAN MODEL T BRONZE THERMAL RELIEF VALVE, 3/4" MNPT INLET X 3/4" FEMALE NPT OUTLET

FLUID IS WATER

REV. No.	ITEM No.	TAG No.	OPER. TEMP. °F	OPER. PRESS. PSIG	SET PRESS. PSIG	SERVICE
0	1	PSV-116-2	92	90	150	THERMINOL COOLER 1-116
↓	2	PSV-123-2	"	"	"	" " 1-123
↓	3	PSV-141-2	"	"	"	" " 1-141

GENERAL SPECIFICATIONS: LONERGAN MODEL LCT-11 THERMAL RELIEF VALVE 3/4" MNPT INLET X 1" FEMALE NPT OUTLET

FLUID IS THERMINOL

REV. No.	ITEM No.	TAG No.	OPER. TEMP. °F	OPER. PRESS. PSIG.	SET PRESS. PSIG.	SERVICE
0	4	PSV-106-2	182	50	150	CHLORINATOR # 10 COOLER 1-106
↓	5	PSV-119-2	182	50	150	" # 11 " 1-119
1	6	PSV-131-2	645	FULL VAC	150	STILL # 5 CONDENSER 1-131
1	7	PSV-135-2	388	40	200	PLATE COIL CATCH TANK 1-135 (FLUID IS ALTERNATELY WATER AND STEAM)

1 1

1 ADDED PROCESS DATA FOR ITEM # 6

" : " ITEM # 7

0360514

TOWOLDMON0048585

Monsanto

INSTRUMENT ACCESSORIES

AUTH NO.	SPEC NO.
CEA-2030	1 PI-254

LOCATION FIELD

PROJ/DEPT SOLID ARACLOR EXPANSION

PLANT ANNISTON, ALABAMA

ISSUED BY	DATE	APPD	REV NO.	DATE
M.VAYE	7-7-65		0	

U-TYPE ABSOLUTE PRESSURE GAUGES

GENERAL SPECIFICATIONS: MERIAM MODEL 11AA10 WM WITH SEMI-STEEL HEAD ½" NPT SIDE PROCESS CONNECTION. FILL FLUID IS TO BE MERCURY.

SCALE IS TO READ IN CENTIMETERS & MILLIMETERS (SCALE E)

GAUGE RANGE IS TO BE 10 INCHES. (127-0-127 MM H_g)

REV. No.	ITEM No.	GAUGE TAG	OPER. PRESS.	SERVICE
0	1.	PI-254 MM H_g		STILL POT No. 5 I-129
	2.	PI-254 MM H_g		CYCLONE SEPARATOR OUTLET I-130
	3.	PI-254 MM H_g		CATCH TANK I-135

NOTE TO FIELD: MOUNT GAUGE VERTICALLY & THEN REMOVE SPECIAL SHIPPING RIGHT TUBE SEAL PRIOR PLACING GAUGE IN SERVICE.

0360515

TOWOLDMON0048586

Monsanto	INSTRUMENT ACCESSORIES	AUTH NO.	SPEC NO.			
	PROJ/DEPT SOLID AROCLOR EXPANSION	CEA-2080	1-LG-VARIOUS			
LOCATION FIELD	PLANT ANNISTON, ALA.	ISSUED BY M. KAYE	DATE 3-24-69	APPD	REV NO. 0	DATE

LEVEL GAUGES & VALVES

GENERAL SPECIFICATIONS: JERGUSON SERIES R-12 (REFLEX) LIQUID LEVEL GAUGE. STEEL CHAMBER WITH ALLOY STEEL COVER. 1/2" NPT END CONNECTED. EACH GAUGE TO BE FURNISHED ASSEMBLED WITH TWO JERGUSON No. 64 STEEL VALVES WITH 316 S.S. TRIM. VALVE IS TO BE PLAIN CLOSING TYPE, UNION GAUGE CONNECTION WITH BACKSEATING STEM. 1/2" NPT GAUGE & DRAIN CONNECTION & 3/4" MALE NPT VESSEL CONNECTION.

REV. No.	ITEM No.	TAG No.	VISIBLE LENGTH	CENTER DIMENSION	OPER PRESS. PSIG	OPER TEMP °F	MODEL No.	SERVICE	NOTE
0	1	LG114-1	40 3/4"	48"	0	150	313-R-12	THERMINOL TANK 1-114	
	2	LG111-2	37 3/4"	45"	"	"	312-R-12	" " 1-111	
	3	LG139-1	"	"	"	"	"	" " 1-139	
	4	LG149-1	30 3/4"	38"	ATMOS.	572	215-R-12	" SURGE TANK 1-149	1,2

NOTE 1: USE SUITABLE HIGH TEMPERATURE PACKING & GASKETS.

NOTE 2: TWO GAUGE GLASSES REQ'D.

0360516

Monsanto

LOCATION FIELD

INSTRUMENT ACCESSORIES

PROJ/DEPT SOLID APOCLOR EXPANSION

PLANT ANNISTON ALABAMA

AUTH NO.	SPEC NO.			
CEA-2080	LSV-VARIOUS			
ISSUED BY	DATE	APPD	REV NO.	DATE
M.KAYE	6-6-67		0	

SOLENOID VALVES

GENERAL SPECIFICATIONS: ASCO 2 WAY CONTINUOUSLY ENERGIZED (NO VOLTAGE RELEASE) NEMA 4 ENCLOSURE SOLENOID VALVES. 1/2" THREADED CONDUIT CONNECTION. CLASS A COIL & BRONZE BODY (OR FORGED BRASS) FOR USE WITH 115 VAC. 60 CYCLES

REV. No.	ITEM No.	TAG No.	BODY SIZE	MODEL No.	N.O. N.C.	OPER. PRESS. PSIG.	SERVICE	NOTE
0	1	SV-128-13	3/4"	WP8025A16	N.C.	20	STILL #5 HEATER MAIN BURNER 1-128	1
	2	SV-128-14	3/4"	WP8210A35	N.O.	20	" " " " " VENT "	
	3	SV-128-15	3/4"	WP8025A16	N.C.	20	" " " " " "	1
	4	SV-128-18	1/4"	WP8262A211	N.C.	4	" " " PILOT FLAME "	
	5	SV-128-19	1/4"	WP8262B35	N.O.	4	" " " " " VENT "	
	6	SV-128-20	1/4"	WP8262A211	N.C.	4	" " " " " "	

NOTE 1: MANUAL RESET FEATURE REQ'D. LATCHED OPEN BY SOLENOID

0360517

ES 140 (12/68)

TOWOLDMON0048588

Monsanto	INSTRUMENT ACCESSORIES	AUTH NO. CEA-2080	SPEC NO. 1 TI-46-10 TO 80°C
LOCATION FIELD	PROJ/DEPT SOLID ABSOLUTE EXPANSION PLANT ANNISTON, ALABAMA	ISSUED BY M. KAYE / DATE 9-12-69	APPD / REV NO. 2 / DATE

DIAL THERMOMETERS

GENERAL SPECIFICATIONS: PALMER MODEL 50A DIAL THERMOMETERS WITH SEPARABLE SOCKETS (WELLS).

ALL WELLS TO BE TYPE 304 STN. STL.

TAG EACH THERMOMETER & WELL AS DESCRIBED BELOW.

NOTE	REV. No.	ITEM No.	THERM. TAG	STEM LENGTH	RANGE	WELL TAG	WELL No.	LENGTH UNDERPOINT	WELL CONN.	SERVICE
	0	1	TI-46 -10 TO 80°C	6"	-10-80°C	TW-R5 1" NPT	3	6"	1" NPT	BAROMETRIC LEG STILL #5 EJECTOR 1-136
1	0	2 THRU 17	TI-46 0-320°C	6"	0-320°C	TW-R5 1" NPT	3	6"	1" NPT	THERMINOL JACKET TEMPERATURES
2	0	18 & 19	TI-46 0-240°F	6"	0-240°F	TW-R5 1" NPT	3	6"	1" NPT	FLAKER COOLING WATER (IN AND OUT)

REV 1: ADDED ITEMS #2 THRU #17

REV. 2: " " #18 & #19

0360518

FS 140 (12/62)

TOWOLDMON0048589

Section VII - Miscellaneous

23. Flow Orifice

Number	Location
FE-128-1	Furnace Fuel Gas Line
FE-140-1	Therminol to #5 Still Condenser
FE-115-1	Therminol to #10 Chlorinator Cooler
FE-122-1	Therminol to #11 Chlorinator Cooler
FE-104-1	Chlorine Flow to #10 Chlorinator
FE-117-1	Chlorine Flow to #11 Chlorinator

TOWOLDMON0048590

[illegible]	INSTRUMENT ACCESSORIES	AUTH NO. CEA-2080	SPEC NO. 4PI-VARIOUS			
LOCATION FIELD	PROJ/DEPT SOLID APOCLOR EXPANSION PLANT ANNISTON, ALABAMA	ISSUED BY M. KAYE	DATE 3-6-69	APPD	REV NO. 0	DATE

LOCAL PRESSURE GAUGES

GENERAL SPECIFICATIONS: STANDARD SELECT SERIES 1020 ASHCROFT GAUGE WITH ½" N.P.T. BOTTOM CONNECTION & STAINLESS STEEL MOVEMENT. GAUGE IS INDICATED AS PI-.

DIAPHRAGM SEALS, WHERE SPECIFIED, SHALL BE MANSFIELD & GREENE 2"-150# RF FLANGE ATTACHED (TYPE SC) EXCEPT AS REQ'D BY NOTE #.

HIGH TEMPERATURE SILICONE FILL FLUID (TO 650°F) IS REQUIRED.

SEALS ARE TO BE ASSEMBLED TO THEIR RESPECTIVE GAUGES & FILLED.

ASSEMBLY IS TO BE CALIBRATED, TAGGED & SHIPPED AS A UNIT.

SEAL IS INDICATED AS PE-.

EACH GAUGE IS TO BE TAGGED WITH ITS ITEM No., THE SYMBOLS THAT APPEAR IN "GAUGE" COLUMN & GAUGE RANGE

NOTE	REV. No.	ITEM No.	GAUGE	RANGE PSIG	OPER. PRESS PSIG.	GAUGE MATERIAL	SEAL WATER BOWL	SEAL DIAPHRAGM	SERVICE
	0	1	PI-7BX PE-4TFH	0-30		1020A	C. STEEL	316 STN.STL	TERPHENYL PUMP DISCHARGE 1-103
		2	PI-7M	0-60	30	1020B	-	-	CHLORINE HEADER PRESSURE
		3	PI-7BX PE-4MTH	0-100		1020A	316 STN.STL	MONEL	CHLORINATOR # 10 PUMP DISCHARGE 1-105
		4	PI-7B	0-100		1020A	-	-	TOWER COOLING WATER INLET TO THERMINOL COOLER 1-1[illegible]
		5	PI-7B	0-100		1020A	-	-	" " " OUTLET FROM " " "
1		6	PI-7TM	0-160	100	1020B	-	-	STEAM TO THERMINOL TANK 1-114
		7	PI-7T	0-100		1020B	-	-	THERMINOL PUMP DISCHARGE 1-115
		8	PI-7T	0-100		1020B	-	-	" " " 1-122
3		9	PI-7BX PE-4TFH	0-30		1020A	C. STEEL	316 STN.STL	TAILINGS PUMP DISCHARGE 1-110
		10	PI-7T	0-15		1020B	-	-	OFF GAS STORAGE TANK 1-109
		11	PI-7T	0-100		1020B	-	-	THERMINOL PUMP DISCHARGE 1-112
		12	PI-7BX PE-4MTH	0-100		1020A	316 STN.STL	MONEL	CHLORINATOR # 11 PUMP DISCHARGE 1-113
		13	PI-7B	0-100		1020A	-	-	TOWER COOLING WATER INLET TO THERMINOL COOLER 1-123
		14	PI-7B	0-100		1020A	-	-	" " " OUTLET FROM " " "
		15	PI-7T	0-15		1020B	-	-	AIR BLOWER DISCHARGE 1-124
		16	PI-7BX PE-4TFH	0-60		1020A	C. STEEL	316 STN.STL	FLOW TANK PUMP DISCHARGE 1-126
3		17	PI-7BX PE-4TFH	0-30" Hg VAC.		1020A	C. STEEL	316 STN.STL	INLET TO CYCLONE SEPARATOR 1-130
3		18	PI-7BX PE-4TFH	0-100		1020A	C. STEEL	316 STN.STL	STILL RECEIVER TRANSFER PUMP DISCHARGE 1-135
1		19	PI-7TM	0-160	100	1020B	-	-	STEAM TO STILL # 5 EJECTORS 1-136
		20	PI-7T	0-100		1020B	-	-	THERMINOL PUMP DISCHARGE 1-140
1		21	PI-7TM	0-160	100	1020B	-	-	STEAM TO THERMINOL TANK 1-139
		22	PI-7B	0-100		1020A	-	-	TOWER COOLING WATER INLET TO THERMINOL COOLER 1-1[illegible]
		23	PI-7B	0-100		1020A	-	-	" " " OUTLET FROM " " "

NOTE 1: SUPPLY ASHCROFT ½" 1008.4 COIL PIPE SIPHON

0360520

TOWOLDMON0048591

Monsanto

INSTRUMENT ACCESSORIES

AUTH NO.	SPEC NO.
CEA-2080	1LT-VARIOUS 1ET-VARIOUS

PROJ/DEPT SOLID CHOCLOR EXPANSION

LOCATION FIELD & PANEL

PLANT ANNISTON, ALABAMA

ISSUED BY	DATE	APPD	REV NO.	DAT
M. KAYE	9-17-69		3	

NOTE	REV No.	ITEM No.	GAUGE	RANGE PSIG	OPER. PRESS. PSIG	GAUGE [illegible]	SEAL [illegible]	SEAL [illegible]	SERVICE
3	0	28	PI-7[illegible] PI-[illegible]	0-100	40	1020A	C.STEEL	[illegible] STL	THERMIDOL PUMP DISCHARGE 1-150
3	0	29	PI-7[illegible] PI-[illegible]	0-100	42	1020A	C.STEEL	[illegible] STL	" " " 1-158
3	0	30	PI-7[illegible] PI-[illegible]	0-100	45	1020A	C.STEEL	[illegible] STL	" " " 1-159
	0	31	PI-7[illegible] PI-[illegible]	0-100	40	1020A	C.STEEL	[illegible] STL	HEATER COIL OUTLET 1-128
	0	32	PI-7B	0-100	40	1020A	-	-	CITY WATER TO SCRUBBER 1-127
	0	33	PI-7T	0-15	5	1020A	-	-	BLOWING TANK 1-125
	0	34	PI-7B	0-100	40	1020A	-	-	CITY WATER TO STILL #5 EJECTORS 1-136
	0	35	PI-7T	0-15	4	1020A	-	-	FUEL GAS TO PILOT - STILL No.5 HEATER 1-128
	0	36	PI-7T	0-30	20	1020A	-	-	" " " MAIN BURNER " " "
	0	37	PI-7T	0-100	45	1020A	-	-	FUEL GAS HEADER
	0	38	PI-7T	0-30	20	1020A	-	-	FUEL GAS TO MAIN BURNER (DOWNSTREAM FV-128-1)
	0	39	PI-7T	0-15	4	1020A	-	-	" " " PILOT (DOWNSTREAM OF SOLENOIDS)
2 1	0	40	PI-7[illegible] PI-[illegible]	0-60	205	1020A	C.STEEL	[illegible] STL	FLAKER PUMP DISCHARGE 1-162
2	0	42	PI-7B	0-60	-	1020A	-	-	FLAKER DRUM WATER INLET 1-151
2	0	43	PI-7B	0-60	-	1020A	-	-	" " " OUTLET 1-151
	0	44	PI-7B	0-60	-	1020A	-	-	WATER INLET PRIMARY SCRUBBER 1-144
	0	45	PI-7B	0-60	-	1020A	-	-	" " SECONDARY " 1-146

PANEL RECEIVER GAUGES

GENERAL SPECIFICATIONS: STANDARD ASHCROFT CATALOG No. 1223UG SINGLE RECEIVER GAUGE FOR FLUSH MOUNTING. INPUT PRESSURE WILL BE 3-15 P.S.I.G. EACH GAUGE IS TO BE TAGGED WITH ITS ITEM No. & THE SYMBOLS THAT APPEAR IN "GAUGE" COLUMN.

NOTE	REV No.	ITEM No.	GAUGE	DIAL FACE	SERVICE
2	0	24	[illegible]	LINEAR 0-100	OFF GAS STORAGE TANK 1-109
		25	[illegible]	LINEAR 0-100	BLOWING TANK 1-125
					[illegible]
		26	[illegible]	LINEAR 0-100	STILL No.5 RECEIVER 1-132
2		27	[illegible]	LINEAR 0-100	BLOWING TANK 1-125
2		40	[illegible]	LINEAR 0-100	STILL No.5 RECEIVER 1-132
2		46	[illegible]	LINEAR 0-100	FLAKER FEED TANK 1-152

0360521

NOTE 2: FURNISH ASHCROFT MODEL 1320A-NPR STAINLESS STEEL, 4½" DIAL SIZE, FOR WALL MOUNTING.

2 NOTE 3: 1"-150# ASA RF FLANGE REQ'D.

REV 2: INVOICED ITEM 2, ADDED ITEMS 42, 43; RE-ACTIVATED NOTE 3. REV 3: ADDED ITEMS 44, 45, 46.

ES 140 (12/66)

TOWOLDMON0048592

Monsanto	INSTRUMENT ACCESSORIES	AUTH NO. CFA-2080	SPEC NO. [illegible]
LOCATION	PROJ/DEPT SOLID AROCLOR EXPANSION PLANT ANNISTON, ALABAMA.	ISSUED BY M. KAYE / DATE 3-19-[illegible] / APPD	REV NO. 0

THERMOCOUPLE ASSEMBLIES - GENERAL SPECIFICATIONS

THERMO-ELECTRIC THERMOCOUPLES WITH CAST ALUMINUM HEAD AND TERMINAL BLOCK FOR SINGLE T/C. (TYPE C). HEAD, NIPPLE, UNION & NIPPLE REQ'D (TYPE #4). CONDUIT CONNECTION IS TO BE 3/4" NPT AND T/C CONNECTION IS TO BE 1/2" N.P.T. T/C'S ARE TO BE IRON/CONSTANTAN, #14 GAUGE.

ALL THERMOWELLS ARE TO BE ALLOY ENGINEERING CO. INC. TYPE 304 STN. STL. EXCEPT AS NOTED ON SHEET-2.

THERMOCOUPLES ARE TO BE ASSEMBLED IN THEIR RESPECTIVE WELLS AND SHIPPED AS A UNIT

EQUIVALENT T/C ASSEMBLY MAY BE FURNISHED.

T/C CONNECTION 1/2" NPT SCREWED ASSEMBLIES PROCESS CONNECTION 1" NPT

REV. No.	ITEM No.	T/C TAG No.	T/C ASSEMBLY MODEL No.	THERMOWELL MODEL No.	T/W TAG No.	"U" DIMENSION INCHES	SERVICE	NOTE
0	1	TE-106-4	41-4C46-B14J14	1-395S-U4½	TW-106-4	4½	CHLORINATOR COOLER COOLANT OUTLET 1-106	
	2	TE-116-4	-B14J14	-U4½	TW-116-4	4½	THERMINOL " WATER " 1-116	
	3	TE-115-2	-B14J14	-U4½	TW-115-2	4½	" PUMP DISCHARGE 1-115	
	4	TE-122-2	-B14J14	-U4½	TW-122-2	4½	" " " 1-122	
	5	TE-116-3	-B14J14	-U4½	TW-116-3	4½	" COOLER THERMINOL INLET 1-116	
	6	TE-108-1	-B14J14	-U4½	TW-108-1	4½	OFF GAS CONDENSER THERMINOL OUTLET 1-108	
	7	TE-108-2	-B14J14	-U4½	TW-108-2	4½	" " " TAILINGS " 1-108	
	8	TE-108-3	-B14J14	-U4½	TW-108-3	4½	" " " " INLET 1-108	
	9	TE-113-1	-B14J14	-U4½	TW-113-1	4½	THERMINOL COOLER OUTLET 1-113	
	10	TE-119-4	-B14J14	-U4½	TW-119-4	4½	CHLORINATOR COOLER THERMINOL OUTLET 1-119	
	11	TE-123-3	-B14J14	-U4½	TW-123-3	4½	THERMINOL COOLER THERMINOL INLET 1-123	
	12	TE-123-4	-B14J14	-U4½	TW-123-4	4½	" " WATER OUTLET 1-123	
	13	TE-123-5	-B14J14	-U4½	TW-123-5	4½	TOWER WATER SUPPLY TO THERMINOL COOLERS	
	14	TE-130-1	-B14J20	-U4½	TW-130-1	10½	INLET CYCLONE SEPARATOR 1-130	
	15	TE-130-2	-B14J20	-U4½	TW-130-2	10½	OUTLET " " 1-130	
	16	TE-131-1	-B14J14	-U4½	TW-131-1	4½	STILL No. 5 CONDENSER PRODUCT OUTLET 1-131	
	17	TE-131-2	-B14J14	-U4½	TW-131-2	4½	" " " THERMINOL " 1-131	
	18	TE-140-2	-B14J14	-U4½	TW-140-2	4½	THERMINOL PUMP DISCHARGE 1-140	
	19	TE-141-3	-B14J14	-U4½	TW-141-3	4½	THERMINOL COOLER THERMINOL INLET 1-141	
	20	TE-141-4	-B14J14	-U4½	TW-141-4	4½	" " WATER OUTLET 1-141	
	21	TE-149-3	-B14J14	-U4½	TW-149-3	4½	THERMINOL RETURN FROM HOISTING USERS	
	22	TE-149-4	-B14J14	-U4½	TW-149-4	4½	" " " " HEATER	
	23	TE-149-5	-B14J14	-U4½	TW-149-5	4½	" " " CFA-2080 [illegible]	
7	24	TE-159-1	-B14J14	-U4½	TW-159-1	4½	" PUMP DISCHARGE 1-159	

0360522

TOWOLDMON0048593

MONSANTO

INSTRUMENT ACCESSORIES

LOCATION

PROJ/DEPT SOLID AROCLOR EXPANSION

PLANT ANNISTON, ALABAMA

AUTH NO. ACPA-10-70

ISSUED BY M. KAYE

DATE 3-19-69

APP'D

DWG. 63A-P1

REV 0

T/C CONNECTION 1/2" FPT FLANGED ASSEMBLIES

FLV. NO.	TE/T NO.	T/C TAG No.	T/C ASSEMBLY MODEL No.	THERMOWELL MODEL No.	T.W. TAG No.	"U" INSERT LENGTH INCHES	FLG. SIZE & RATING	FLG. MATL.	SERVICE	
0	26	TE-104-4	A6-GC46-B14EZ6	385F-U16	TW-104-4	16	1½"-150# RF	C.STEEL	TERPHENYL FEED TANK 1-101	
	26	TE-104-3	-B14TJ26	-U16	TW-104-3	16	1½"-150# RF	"	CHLORINATOR No. 10 1-104	2
	27	TE-106-1	-B14TJ19	-U9	TW-106-1	9	1½"-150# RF	316 STN. STL	" COOLED PRODUCT OUTLET	2
	28	TE-106-2	-B14TJ19	-U9	TW-106-2	9	1½"-150# RF	"	" " " INLET	2
	29	TE-109-5	-B14TJ26	-U16	TW-109-5	16	1½"-150# RF	C.STEEL	OFF-GAS STORAGE TANK 1-109	
	30	TE-117-3	-B14TJ26	-U16	TW-117-3	16	1½"-150# RF	"	CHLORINATOR No. 11 1-117	2
	31	TE-119-1	-B14TJ19	-U9	TW-119-1	9	1½"-150# RF	316 STN. STL	CHLORINATOR COOLED PRODUCT OUTLET	2
	32	TE-119-2	-B14TJ19	-U9	TW-119-2	9	1½"-150# RF	"	" " " INLET	2
	33	TE-125-4	-B14TJ26	-U16	TW-125-4	16	1½"-150# RF	C.STEEL	BLOWING TANK 1-125	
	34	TE-129-3 TE-129-6	-E14TJ19	-U9	TW-129-3	9	1½"-150# RF	C.STEEL	HEATER OUTLET 1-129	2
	35	TE-129-4	-B14TJ19	-U9	TW-129-4	9	1½"-150# RF	C.STEEL	" INLET 1-129	
	36	TE-132-2	B14TJ32	-22	TW-132-2	22	1½"-150# RF	C.STEEL	STILL POT No. 5	
	37	TE-132-4	-B14TJ26	-U16	TW-132-4	16	1½"-150# RF	C.STEEL	" N.S RECEIVER 1-132	
	38	TE-135-1	-B14TJ26	-16	TW-135-1	16	1½"-150# RF	C.STEEL	CATCH TANK 1-135	
V	39	TE-149-2	V B14TJ26	V -U16	TW-149-2	16	1½"-150# RF	C.STEEL	THERMINOL SURGE TANK 1-149	

NOTE 1: TYPE 316 STN. STL. WELL REQ'D.

NOTE 2: DUPLEX THERMOCOUPLE ONLY ONE THERMOWELL REQ'D. BOTH T/C'S ARE TYPE "J"

0360523

FS 150 (12-68)

TOWOLDMON0048594

MONSANTO

LOCATION FIELD

ACCESSORIES

PROJ/DEPT SOLID ARACLOR EXPANSION

PLANT ANNISTON, ALABAMA

CFA-2080 — 1 TW-VARIOUS

ISSUED BY	DATE	APPD	REV NO.	DATE
M. KAYE	6-6-69		1	

THERMOWELLS - GENERAL SPECIFICATIONS

THERMOWELLS ARE TO BE ALLOY ENGINEERING Co. & TYPE 304 STN. STL. ELEMENT

CONNECTION TO BE 3/4" NPT. FLANGES, WHERE SPECIFIED, ARE TO BE CARBON STEEL, EXCEPT AS NOTE 1

REV. No.	ITEM No.	TW TAG No.	PROCESS CONNECTION	"U" DIMENSION INCHES	THERMOWELL MODEL No.	SERVICE
0	1	TW-101-1	1½"-150# RF	10 8	510F-U108	TERPHENYL FEED TANK I-101
	2	TW-116-1	1" N.P.T.	4½	1"-7075-U4½	THERMINOL COOLER THERMINOL OUTLET I-116
	3	TW-109-1	1½"-150# RF	10 8	510F-U108	OFF GAS STORAGE TANK I-109
	4	TW-111-1	1½"-150# RF	54	510F-U54	THERMINOL TANK I-111
	5	TW-123-1	1" NPT	4½	1"-7075-U4½	THERMINOL COOLER THERMINOL OUTLET I-123
	6	TW-125-1	1½"-150# RF	120	510F-U120	BLOWING TANK I-125
	7	TW-132-1	1½"-150# RF	16	510F-U16	STILL No.5 RECEIVER I-132
1	8	TW-141-1	1" NPT	4½	1"-7075-U4½	THERMINOL COOLER THERMINOL OUTLET I-141
1	9	TW-104-1	1½"-150# RF	9	510F-U9	CHLORINATOR #10 COOLER OUTLET (DENSITY TEMP. COMP FUTURE)
	10	TW-117-1	1½"-150# RF	9	510F-U9	" " " " " " " " " "
1	11	TW-133-1	1" NPT	7½	1"-510S-U4½	TRANSFER PUMP DISCHARGE I-133 (DENSITY TEMP. COMPEN. FUTURE)

1 NOTE 1: 316 STN. STL. THERMOWELL & 316 STN. STL. FLANGE REQUIRED.

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ES 140 (12/69)

TOWOLDMON0048595