

MONS 054893

PART I - SYNOPSIS OF PROCESS

Aroclore is a name used to designate chlorination products of diphenyl, diphenyl high boilers (from diphenyl process) or mixtures of these two. The physical properties vary from a light mobile oil to crystalline and non-crystalline solids depending upon the degree of chlorination and the composition of the raw materials. Straight diphenyl chlorinated yields a liquid product of increasing viscosity up to and including 63% chlorine. Above this the yield is a crystalline solid. Straight high boiler and mixtures of diphenyl and high boiler chlorinated yield products of increasing viscosity up to non-crystalline resins.

A numerical system of nomenclature consisting of four digits has been developed for identifying the various aroclors.

The first digit denotes the raw material used for the chlorination. The figure "one" indicates 100% technical diphenyl. The second digit denotes whether or not the product is distilled. The figure "one" indicating undistilled, the figure "two" indicating distilled. The last two digits denote the approximate percentage of chlorine contained in the finished product.

There are several arbitrary deviations from the above nomenclature as follows:

Aroclors 4065 and 4465. The former is the crude from which the latter is obtained by distillation. The starting raw material contains 40% distilled high boiler and 60% technical diphenyl. This is chlorinated to 65% chlorine.

Aroclore 5060 and 5460. The former is the crude from which the latter is distilled. The starting raw material is 100% distilled high boiler. This is chlorinated to 60%.

Aroclor 2565. This is an undistilled product. The starting raw material consists of 25% crude high boiler and 75% technical diphenyl. This is chlorinated to 65% chlorine.

For the sake of brevity, Aroclors 1242, 1248, 1254, 1260 and 1262 and their crude homologues will be referred to as "liquid aroclors", while Aroclors 1268, 1269, 1270, 1271, 2565, 4465 and 5460 and their crude homologues will be referred to as "solid Aroclors".

The chlorination consists of charging the raw material for the specified Aroclor to a chlorinator containing an iron catalyst. Chlorine gas is fed into it and the specified temperature maintained by means of cooling water on the jacket. After initial reaction, the charge is circulated until chlorination is complete. This is determined by specific gravity, hold point or softening point. The HCl evolved during the chlorination is passed through scrubbers and absorbed in water as crude muriatic acid.

The chlorinated batch except Aroclor 1168, 1169, 1170 and 1171 is then transferred to a buffer or blow tank and aerated with dry air to remove HCl. In the case of 1169, 1170 and 1171 the final chlorination takes place in a gas fired chlorinator with agitator where higher temperatures can be maintained.

The liquid Arcolors and solid Aroclors 4465, and 5460 after aerating the crude are distilled under vacuum. Solid aroclor 1268 is distilled without aerating the crude. Lime is added to the still charge to neutralize remaining acid and the mixture circulated through a gas fired furnace. The distillate is condensed in a monel condenser and collected in a monel receiver. The solid aroclors 1268, 4465, and 5460 are transferred directly from the receiver to packing containers. The liquid aroclors are treated with dry Attapalgus earth and filtered. Solid aroclors 1269, 1270 and 1271 are refined by atmospheric distillation in a retort, the distillate is flaked off a chilling drum.

Liquid aroclors are either used in making Pyranols or shipped in drums or tank cars. Solid Aroclors are shipped in barrels.

By-product Muriatic Acid is made by scrubbing the off gas free of Aroclor and absorbing the hydrogen chloride in water or the HCl gas may be transferred to other HCl consuming departments.

PART II

REAOTIONS AND STOICHIOMETRY

MONS 054896

PART II - Reactions and Stoichiometry

Aroclors are products of reaction between chlorine and diphenyl, high boiler (from diphenyl process) or a combination of these two. Hydrogen Chloride is produced as a by product. Products are mixtures of two or more compounds with equivalent formulas indicated below.

		Mol.Wt.
Aroclors 1142 & 1242	$C_{12}H_7Cl_3$	257.57
1148 & 1248	$C_{12}H_6Cl_4$	292.16
1184 & 1254	$C_{12}H_5Cl_5$	326.65
1160 & 1260	$C_{12}H_4Cl_6$ & $C_{12}H_3Cl_7$	361.14 & 395.63
1162 & 1262	$C_{12}H_3Cl_7$	395.63
1168 & 1268	$C_{12}H_2Cl_8$ & $C_{12}HCl_9$	430.12 & 464.60
1169 & 1269	$C_{12}HCl_9$	464.60
1171 & 1271	$C_{12}HCl_{10}$	499.12
4065 & 4465	$C_{12}H_2Cl_8$ & $C_{18}H_4Cl_{11}$	430.12 & 610.71
5060 & 5460	$C_{18}H_5Cl_{10}$	645.20

The reaction is of the replacement type as shown below.

$$\underset{154.20}{C_{12}H_{10}} + x\underset{70.99}{Cl_2} \longrightarrow \underset{}{C_{12}H_{10-x}Cl_x} + \underset{36.50}{xHCl}$$

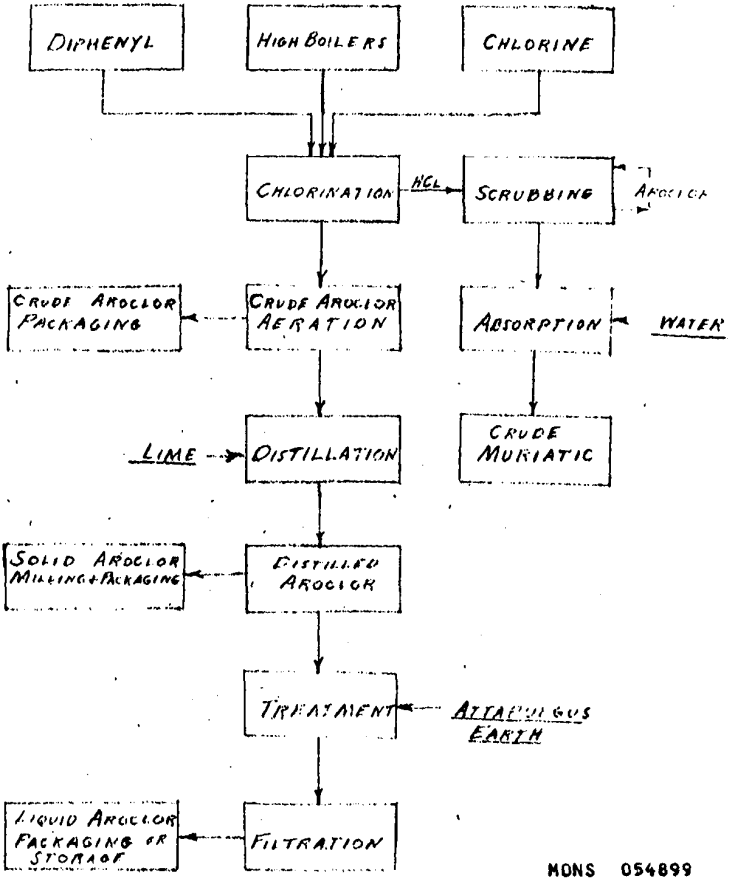
$$\underset{231.30}{C_{18}H_{15}} + x\underset{70.99}{Cl_2} \longrightarrow \underset{}{C_{18}H_{15-x}Cl_x} + \underset{36.50}{xHCl}$$

PART III

AROCLOR MATERIALS FLOW SHEET

AROCLOR EQUIPMENT FLOW SHEET

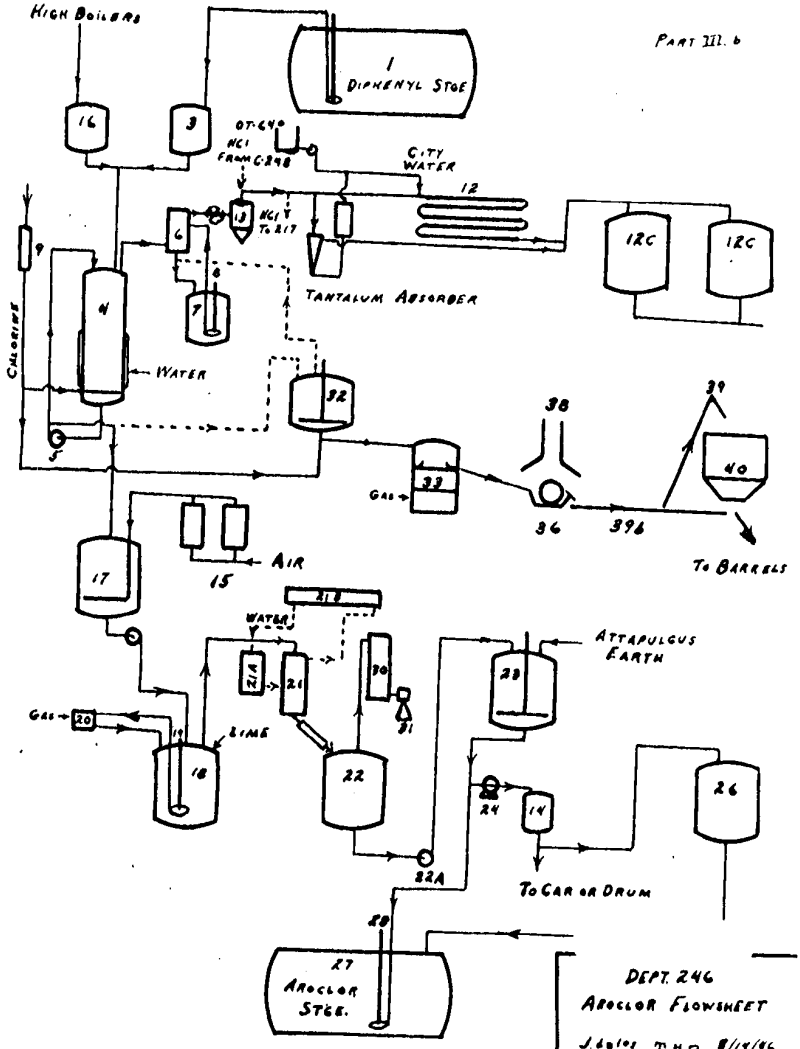
IIIA AROCLOR MATERIALS FLOWSHEET



MONS 054899

Dept. 296
AROCLOR MATERIALS
FLOWSHEET
8/11/46 T.H.E. JAN.

III.6 EQUIPMENT FLOWSHEET



DEPT. 246
AROCLOR FLOWSHEET
J. Taylor T.H.B. 8/14/46

MONS 054900

DEPT. 246
III-B AROCLOR FLOW SHEET
EQUIPMENT IDENTIFICATION

ITEM	1	3	16	4	6	7	13	17
Function	Storage	Meas.Tk.	Melter	Chlorinator	Scrubber	Pump Tank	Separator	Blow Tank
Equip.No.	CT-0748 CT-0749	CT-0767	CT-0763	CT-0744 " 0745 " 0833 " 01283	CT-0759 " 0760 " 0761 " 01014	CT-0754 " 0755 " 0756 " 0968	CT-01279 " 01280 " 01281 " 01282	CT-0750
No.Units	2	1	1	4	4	4	4	1
Size	10'φx26'	4'6"φx 5' 6"	4'6"φx 5'	3'φx16'	12"φx8'	4'6"φx 5'6"	2'φx6'7"	7'x7'
Material Heating	Steel 2"coils	Steel ⅛"jacket	Steel 2"coil	Steel 3/16" jacket	Steel	Steel 1½"coil	Steel	Steel 2"coil
Dwg.No.	C-609	C-799	C-810	E-880	-	C-800	C-798	E-863

Item	18	21	22	30	23	14	26	27
Function	Still	Condonser	Receiver	Scrubber	Blend Tank	Filter	Receiver	Storage
Equip.No.	S-043 S-062	CT-0770 " 01378	CT-0771 " 01377	CT-01396	CT-0779 " 01399	F-0172	CT-0780 " 01400	CT-0768 " 0131C
No.Units	2	2	2			1		3
Size	5'φx5'6" 5'φx11'10"	12"φx5'	5'6" x 5'6"	3'φx10'	7'x7'	18"φ	7'x7'	10'φx26'
Material	Steel	Monel	Monel	Steel	Tin Lined	Bronze	Tin Lined	Tin Lined
Heating	Furnace	19-2" Tubes	2"coil		2"coil	jacket sparkler	2"coil	2"coil
Dwg.No.	A C-809 C-6944	B-651	C-795	C-807	E-862	-	E-862	C-609

Item	32	33	36	21-A	21-B	20	12	12-C
Function	Chlorinator	Retort	Flaker	Water Tank	Condenser	Furnace	Absorber	Receiver
Equip.No.	CT-0808	R-026 R-027	D-012	CT-0776	CT-0831 CT-01491		TW-0166 TW-0221	CT-0785 CT-0786
No.Units	1	2	1	2	2			2
Size	5'φx4'11	3'φx 3'8"	48"φx 30'	2'6"φx3'	6"φx10'	3'9"φx 4'10"		7'φx8'6"
Material	Cast Iron	Steel	Steel	Steel	Steel	Brick Lined	Fused Silica Tantalum	Rubber Lined
Heating	Direct Fire	Furnace		Coils	12-1" tubes	2"coil	jacket	
Dwg.No.	A-324	E-865	B-675	B-664	B-482	E-856	E-889 D-4200	C-822

MONS 054901

Item	2	5		19	22-A	24	28	8
Pump-No.	P-0585	P-0578	P-0629	P-0593	P-0565	P-0984	P-0583	P-0572
		0579						0574
	P-0592	0580			P-01037		P-0584	0575
		0907		P-0997			P-0582	0604
No.Units	2	4	1	2&2	2	1	2	4
GPM	50	80		75	50	15		75
Head	60			15		50		15
Motor HP	3	5	5	5			3	1
Make	Taber	Taber	Taber	Taber	Blackmer	Roper	Taber	Taber
Material	CI&Bz	Steel	Steel	Steel	Bronze	Iron	Bronze	Steel
	Sub.Cent.	Hor.Cent.		Sub. Cent.	Rotary		Sub.Cent.	Sub.Cent.

J. Lyles

lo

PART IV

EQUIPMENT LIST

15

CC - Mr. Barbre
Mr. Becker
Mr. Soffranko
Mr. E. Smith
Mr. N. Erd
(4) Extra

4/2/46

Dept. 246
Equipment List

Blowers

B-094 Blower from Am. Blower Corp. Serial #5364, Est. 2025, Item 37. Print G-46215. #30-OOW-BRD-FR Type E fan with LS wheel welded steel pedestal for motor. Drive thru couplings. Clockwise rotation, horiz. bottom discharge.
Order #B7377 on 4/14/36, Req. 69122 on 4/14/36.
Price $104.21 Driven by M-0832-3HP-1200 RPM
In lean-to on second level platform.

B-0105 Clarage Blower purchased from Anniston. Fan #47361, Type OI #7 with outboard sleeve bearing "V" belt drive to M-0904 used with cyclone OT-0852. On platform in lean-to. Driven by M-0904.

B-0148 Blower from Am. Blower Co. Est. 3090, Item 2. Size #1-3/4 Sirocco utility blower. Direct connected counter clockwise up blast discharge. Includes supports of steel.
Order B1776 on 1/22/40, Req. 5788 on 1/22/40.
Chg. out $154.55 on 3/29/40.
At OT-0763, Bldg. CR. Direct connected to M-01710.

MONS 054904

Dept. 246
Equipment List Continued

D-012 Flaker, Devine. 48" dia. x 30" lg. drum 5/8" thick, rolled steel machined and polished. Housing to be of #16 ga. monel.
Order B7378 on 4/14/36, Req. 69124 on 4/14/36.
Price $1668.00 quot. 3/17/36.
In lean-to on floor on found. of concrete.
Driven by M-0827 - 3 HP Wagner motor thru MSC-0639 Jones Speed Reducer.

Dept. 246
Equipment List Continued

Filters

F-0106 Steel filter purchased from Nooter. Dwg. 0-3775, Est. 1849, Item 9, Size 12" dia. x 3'10-3/4" high. Leg supports, glass wool packing.
Order B3511 on 2/19/36, Req. 67729 on 2/14/36.
Price $56.00 quot. 2/5/36.

F-0172 Sparkler filter. Serial 484, Est. 3479, Item 14. Model 18-d12 all bronze construction with improved Scavenger plate, plates to be arranged so entire set can be removed. Steel legs and floor flanges for bolting to floor.
Order B10302 on 4/2/41, Req. 20430 on 4/30/41.
Price $830.00 per quot. 3/19/41.
On ground floor center of Bldg. OR.

Dept. 246
Equipment List Continued

Furnaces

FO-045 Gas heater, Est. 2025, Item 20. Steel shell 3/16" x 3'9" dia. x 4'10½" lg. lined with insulating fire brick, etc. 1 coil 2" xHy pipe, 12 turns formed into a 2' dia. coil with spare blocks and legs. Dwg. E-886. Req. 69859 on 5/14/36, Order B9665 on 5/29/36. Used to heat material in S-043, pumped thru coil by P-0593.

FO-046 Elect. Air Drying Furnace purchased from Lectrodryer Corp. Serial 270, Est. 2025, Item 15. Size BWC-250 dual-absorber type. 40# pressure. 440 volts, single phase, 60 cy.
Order B7403 on 4/14/36, Req. 69119 on 4/14/36.
Price $1350.00 on 6/30/36.

FO-066 Steel Heater Furnace. Dwg. 3479, Item 5. Brick lining, coil, burners and stuck. S.W. one of three 20'6" level platform, Bldg. CR.

MONS 054907

Dept. 246
Equipment List Continued

Instruments

I-0108 Rotameter Instrument purchased from Economy Equip. Co. Serial #10166, Est. 2439-3. For scrubbing TW-0182. No. 6, Fig. 25 bronze with stainless steel float calibrated for max. cap. of 300 gph water. Order B19959 on 11/10/37, Req. 83079. Price.$66.70.

I-0381 Palmer Supercar Dial Thermometer, 8" cone Mercury actuated. Range 0-150°0, 25' stainless steel connecting tubing with adj. clamp, flg. to be located 9' from end of bulb. Order B18385 on 8/23/40, Req. 12533 on 8/23/40. On 1269 stg. tk. OT-01310. Price $56.50.

I-0398 Fulton Sulphon Temperature Regulator #931 with 6A bulb and 20' of capillary - Bronze body stainless steel trim, to be used on steam at 65# persaura. Range No. 76K-190F to 250°F. Size 1, press N.O. on OT-0748 diphenyl stg. tk. Order B23310 on 10/28/40, Req. 14583 on 10/28/40. Price $69.05.

I-0441 L&N 6 point temp. recorder. Serial #389329, Item 23 #40352N, Model S, micromax strip chart temp. recorder, Type DO potentiometer - multi point curve printing, record numbered and color dot for each thermocouple. Trino cycle - 30 sec. normal for each point. Order B13260 on 6/18/41, Req. 21072 on 6/17/41. Price $395.00. In second floor control room, Bldg. OR.

I-0443 Watt hour meter instrument purchased from Gen. Elec. Serial 21-220-743, Est. 3479, Item 20.- #85 x 905 Type V3A, 220 to 5 OT use. Order B9118 on 4/15/41, Req. 20313 on 4/14/41. Chg. out $51.40 on 6/30/41. In cabinet outside E wall Bldg. OR.

I-0835 Bailey Intrograting and Recording Flow Steam Flowmeter. Serial #13996R, Est. 5426, Item 2. Order B11589 on 9/29/45, Req. 67905 on 5/11/45. Price $348.00. In control room E wall.

Dept. 246
Equipment List Continued

L-031 Bucket elevator from Genl. Conveyor & Mfg. Co.
Dwg. B870, Est. 2025, Item 39.
Lg. to be 22'4-11/16" OA c to c take up shafts and 20'6" casing and head section 3/16" & boot 1/4".
6" belting, 4 ply R covered pinched 10-7/32" for buckets of 4½" x 3" chrome steel.
Order B10455 on 5/15/36, Req. 70140 on 5/25/36.
Price $491.20. Driven by M-0834.

Dept. 246
Equipment List Continued

Motors

M-0827 Motor 3 HP 1200 RPM from Wagner Elec. Serial #1718199, Est. 2025, horiz. induction motor, totally enclosed, fan cooled, ball bearing, 3 ph., 60 cy., 220/440 volts, 8.2/4.1 amp., type CPI, frame 254, model W425198. Order B8184 on 4/23/36, Req. 69376 on 4/23/36. Chg. out $94.16. Also drives V-046 thru second chain on link belt; drives D-012 flaker thru MSC-0639 speed reducer & chain.

M-0830 Motor 2 HP 1800 purchased from Genl. Elec. Serial HK-1407, Est. 2025, Item 22B. Horiz. induction, totally encl. fan cooled ball bearing, frame 225, 2 HP 1740 RPM, 220/440 volts, 5.61/2.81 amp., type K, 3 ph., 60 cy., model 5K-225-A715. Order B8169 on 4/23/36, Req. 69377 on 4/23/36. Chg. out $73.84 on 6/30/36. Drives P-0565.

M-0832 Motor 3 HP 1200 RPM purchased from Wagner Elec. Serial 1714954, Est. 2025, horiz. induction, totally enclosed, fan cooled, ball bearing, 220/440 volts, frame 254, 3 ph., 60 cy., type CPI, model W42J198, 8.2/4.1 amp. Order B8178 on 4/23/36, Req. 69378 on 4/23/36. Chg. out $94.16 on 6/30/36. On blower B-094.

M-0834 Geared head motor 2 HP 1200 RPM purchased from Master Elec. Co. Serial HE-975, Est. 2025. Air jacketed, totally enclosed, fan cooled, 1140 to 220 RPM single reduction parallel geared head, 220/440 volts, 3 ph., frame 254, type PA, style 47476, 55° cont. rating, 6.2/3.1 amp. Drives L-031 Order B8156 on 4/24/36, Req. 69373. Chg. out $109.14.

M-0835 Reeves vertical motodrive 1½ HP 1800 RPM purchased from Bates Co. Motor serial 1914691, motodrive unit serial MD-1136. Est. 2025, Item 40A. Size 4253-E-18, model V34J223, 3 ph., 60 cy., 1.9 amp., frame 224, 4 to 1 speed variation & 50 to 1 gear reduction, hand chain control & chain in place of std. hand wheel. Order B7376 on 4/14/36, Req. 69123. Chg. out $300.96. Drives V-044.

M-0836 Reeves vertical motodrive same as M-0835. Drives V-045.

M-0841 Geared head vertical mounted motor 5 HP purchased from Master Elec. Serial HE-988. Est. 2025, Item 23, 220/440 volts, 3 ph., 60 cy., totally enclosed, fan cooled, ball bearing, type PA, frame 11230 #254 DP - 1725 to 80.2 RPM Style 47478 - cont. 55°C. Order B8155 on 4/24/36, Req. 69375 on 4/23/36. Chg. out $211.84 on 6/30. Drives stirrer in blending tank OT-0779.

M-0846 Vertical mounted induction motor. 1 HP 1800 purchased from Genl. Elect. Serial EP-2773. Est. 2025, Item 8a. Totally enclosed, fan cooled, ball bearing, thrust type with ring base and drip cover, 3 ph., 60 cy., 220/440 volts, 1720 RPM - model 5K204A1550. Frame 204Y. Order B8175 on 4/23/36, Req. 69371. Chg. out $55.44. Drives P-0573.

M-0847 Vertical mounted induction motor 1 HP 1800 purchased from Genl. Elec. Serial EP-2779, Est. 2025, Item 8a. Totally enclosed, fan cooled, ball bearing, etc., same as M-0846. Drives P-0574.

M-0848 Vertical mounted induction motor 1 HP 1800 purchased from Genl. Elec. Co. Serial EP-2777, Est. 2025, Item 8a, totally enclosed, fan cooled, ball bearing, thrust type with ring base and drip cover, 3 ph., 60 cy., 220/440 volts, 1720 RPM, model 5K204A1550, frame 204Y. Order B8175 on 4/23/36, Req. 69371. Chg. out $55.44. Drives P-0575.

M-0849 Wagner horiz. induction motor 5 HP 1800 Serial #1714362, Est. 2025, Item 5a. Totally enclosed, fan cooled, ball bearing, type OPI, frame 254, model W30J195, 3 ph., 60 cy., 220/440 volt, 1750 RPM, 12.6/6.3 amp. Order B-8177, Req. 69372, chg. out $97.06 6/30/36. Drives P-0578.

M-0850 Horiz. induction Wagner motor 5 HP 1800 Serial 1718376. Seme as M-0849 and 0851. Drives P-0579.

M-0851 Motor same as M-0849 and 0850. Serial 1718377.

M-0853 Vertical mounted induction motor 3 HP 1800 G. E. Makers. Serial FP-1104, Est. 2025, Item 28a, totally enclosed, fan cooled, ball bearing, thrust type with ring base and drip cover, 3 ph., 60 cy., 220/440 volts, 1730 RPM, model 5K225A2430, 8.54/4.27 amp., frame 225Y, type K. Order B8174 on 4/23/36, Req. 69367. Chg. out $95.92. Drives P-0583.

M-0854 Motor Serial FP-3898 same as M-0852 and 3 on OT-0768.

M-0856 Vertical mounted induction motor 3 HP 1800. Made by G. E. Serial FP-2457, Est. 2025, Item 2a, thrust type & drip cover, ring base, class 1, group d, underwriters #5474727. Explosion proof, ball bearing, 1720 RPM, 3 ph., 60 cy., model 5K225A2446, 220/440 volts, 8.42/4.21 amp., frame 225Y, type K. Order B8172 on 6/26/36, Req. 69368 on 4/23/36. Chg. out $115.58 on 7/13/36. Drives P-0585.

M-0871 Vertical induction motor 5 HP - 1750 RPM from G. E. Serial FP-3177, Est. 2025-19a. Totally enclosed, fan cooled, ball bearing, thrust type with ring base and drip cover. 220/440 v., 13.9/6.95 amp., frame 254Y, type K, 60 cy., 3 ph., model 5K254B1930. Order B8173 on 4/23/36, Req. 69369. Chg. out $124.21 on 7/31/36. Still pump drive, drives P-0593.

M-0873 Vertical mounted induction motor 5 HP - 1750 RPM. Purchased from G.E. Serial FP-3107, Est. 2025, 10a. 220/440 volt, 60 cy., 3 ph., totally enclosed, fan cooled, ball bearing, thrust type with ring base & drip cover. Model 5K254B1930, 13.9/6.95 amp., frame 254Y, type K. Order B8176 on 4/23/36, Req. 69370. Chg. out $124.21 on 7/31/36. Drives P-0592 in tank outside.

M-0875 Horiz. induction motor 1 HP 1200 made by G. E. Serial DP-5227, Est. 2025, Item 24a. Totally enclosed, fan cooled, 60 cy., 1130 RPM, model 5K204A1036, 220/440 v., 3.45/1.73 amp., frame 204, type K, 3 phase. Order B13188 on 7/2/36, Req. 71152, chg. out 7/21. Drives P-0595.

M-0885 Vertical mounted induction motor 1 HP 1800 purchased from Continental Equp. Co. Serial 50498. Est. 2025, Item 8. Totally enclosed, fan cooled, ball bearing, thrust type with ring base and drip cover. 2.9 amp. 3 ph., 60 cy., 220/440 v., 1750 RPM, Type NCU20. Ordered for spare. Drives P-0604. Price $48.00. Order B-13196, Req. 71147 on 7/1/36.

M-0904 Motor 3 HP - 1200 purchased from Continental Elec. Co. Serial 51704, Est. 2025, Item 38. Totally enclosed, fan cooled, normal starting current, squirrel cage induction motor, 3 ph., 60 cy., 220/440 volts, 1150 RPM, 55° cont. rise, type NF 254, 8.4/4.2 amp. Order B17431 on 9/1/36, Req. 72637, Chg. out $90.40 on 10/24. Drives B-0105 in Bldg. OR.

M-0914 Blackmer motor 7½ HP 1800 made by Louie Allie Serial 217543, Est. 2177, Item 2. Totally enclosed, fan cooled, type JX, 3 ph, 60 cy, 220/440 volts, 1750 RPM, frame 284, class 53d, form B, 18.4/9.2 amp. Order B21241 on 10/22/36, Req. 74034, Chg. out $133.12. Drives Napthalene pump P-0617 for CT-0347.

M-0955 Portable "Lightnin Mixer" 1/4 HP 1725 purchased from Mixing Equip. Co. Mixer Serial 37108, Motor Serial HK-4536. CABI 106/1936. Model C-4, 3" folding monel metal propeller monel shaft, 4/2 amp, 110/220 volts, single phase, 60 cy., class 1, group d, explosion proof, underwriters F-519372, extension cord and attachment plug.
Order B1340 on 1/19/37, Req. 76212 on 1/18.
Chg. out $109.42 on 2/27/37. Used for drum shipments.

M-0975 Motor 5 HP 1800 purchased from Wagner Elec. Serial 1725358, Est. 2170, Item 4. Totally enclosed, fan cooled, ball bearing, induction motor, type CPI, frame 254, model W30J247, 3 ph, 60 cy, 220/440 volts, 12.6/6.3 amp , cont. rating 55°C.
Order B2834 on 2/9/37, Req. 76765 on 2/5/37.
Cost $95.61. On P-0629.

M-01227 Vertical mounted induction motor 1 HP 1800 purchased from Louis Allis. Serial 269797. Est. 2543, Item 6. Totally encl., fan cooled, ball bearing, thrust type with ring base and drip cover, weatherproof conduit connection box, type IS, frame 204V, class L, form B. 220/440 v., 3 ph, 60 cy, 3/1.5 amp. cont. 55°0, 1730 RPM. Order B3853 on 3/4/38, Req. 86889 on 3/3/38. Chg. out $55.20 on 4/29/38. On P-0731.

M-01456 Westinghouse horiz. motor 3/4 HP 1200 Serial 4139. Est. 2720, Item 6 revised. Totally encl. fan cooled, low starting current, 440 volts, 3 ph., 60 cy., 1160 RPM. Type OS, frame 204, 2.6/1.3 amp., style 1707136, 55°0 rise. Chg. out mach. $41.03 on 12/29/39. Order B17367 on 12/18/39, Req. 1357 on 8/31/39.

M-01486 General Elec. Motor 1/4 HP 1800, totally encl., model 5 KH47AB984, type KH, 110 volts, single phase, 3.4 amp., 55°0ont. Order B17923 on 10/17/39, Req. 1531 on 9/8/39. Cost $24.25. On FC-046.

M-01573 Motorized car spotter 5 HP 1640 RPM purchased from Link Belt Co. motor serial 307939, spotter serial 5252. 220/440 volts, 60 cy, 3 ph, type IK, frame 225 VY, class 3, form B, 17.2/8.6 amp. 55°C. Order B26741 on 12/29/39, Req. 5128 on 12/29/39. Chg. out $373.86. On track 11 at load dock.

M-01622 General Elec. motor 7½ HP, 3600 RPM, Serial BU7108. Est. 3068, Item 1, totally encl., fan cooled, type KF, model 5KF254025, frame 254, 220/440 v., 3 ph., 60 cy., 3435 RPN, Drives ML-045. Order B4118 on 2/20/40, Req. 6737 on 2/20, chg. out $114.96.

M-01629 Vertical motor 7½ HP purchased from Turbo. Made by Westinghouse. Serial 2640, Est. 3018, Item 6. Totally encl., fan cooled, frame 284, class 1, RPM at full load 1735, cont. rating at full load 55°0 rise, 220/440 v., 3 ph., 60 cy., 18.8/9.4 amp., style 1071192. Order B8337 on 5/20/40, Req. 8441 on 4/9/40, chg. out $112.66. On MSC-01205.

M-01630 Louis Allis motor 5 HP, serial 258334, Est. 2487-2. 1750 RPM type JS, frame 254, class 43N, form B, 220/440 v., 3 ph., 60 cy., 13/6.5 amp., full load 55°0 cont. Order B26263, Req. 85432 on 12/24/37.

M-01656 Wagner Elec. Motor 5 HP 1800 RPM Serial 1758959, Est. 2956, Item 2, horiz. totally encl., fan cooled, ball bearing, less base and pulley, type OPI, frame 254, 220/440 v., 3 ph., 60 cy., 1750 RPM, cont. rating 55°OP, model 1E8J247B, 13.2/6.6 amp. Order B12802 on 7/8/40, Req. 10231 on 6/5/40, chg. out $87.92. Drives P-0907 Taber Horiz.

M-01660 Gen. Elec. Motor 1 HP 1800 RPM purchased from Taber Serial GU1902, Est. 2956, extra item. Totally encl., fan cooled, vertical mounted, ball bearing, thrust type, with ring base and drip cover, 3 ph, 60 cy, 220/440 volts, 1720 RPM, model 5K204A1550, frame 204Y, type K, 3.11/1.56 amp., cont. 55°C rise.
Order B13111 on 6/10/40, Req. on 6/10/40, chg. out $50.19. Drives new Taber sub. pump P-0909.

M-01697 Motor made by Wagner 1/3 HP, CABI 169, 30" dia. type 8-60WS, style 1249-4622 porteble circulating fan, single ph., 60 cy., 115 volts, complete with guards, floor column, and cord. B16528 on 7/26/40. Req. 11797 on 7/26/40. Chg. out $60.58. Used on oper. platform near chlor.

M-01706 Vertical mounted induction motor 3 HP 1800 made by G.E. serial JU3498, Est. 3207, Item 2. Totally encl., fan cooled, ball bearing, thrust type with ring base and drip cover, model 5K225A4264, frame 225VY, type K, 220/440 v., 3 ph., 60 cy., 1730 RPM, 8.54/4.27 amp., cont. 55°C rise.
Order B18443 on 8/23/40, Req. 12560 on 8/23/40.
Chg. out $92.24 on 10/31/40. On P-0929 Taber.

M-01772 Newis Motor 1/2 HP 3600 made by G. E. Serial J33, CABI 169, totally encl., model 5K49B0756A, type K, rise 55°C, 440 v, 3 ph, 3450 RPM, amp. 7.
Chg. out $25.00, Req. 16663 on 12/30/40.
Use with P-0378 on OT-0640.

M-01811 Louis Allis Motor 2 HP 1800 RPM Serial 385335, Est. 3479, Item 8. Totally encl., fan cooled, normal starting current, OI conduit connection box, less base and pulley. 220/440 volts, 3 ph., 60 cy., 1750 RPM, type JS, frame 225, class M, form R, code H, 5.6/2.8 amp.
Order B4136 on 3/7/41, Req. 18313 on 2/17/41
Chg. out $65.36 on 6/30/41.
On ground floor N.E. of P-0172 on P-01037

M-01850 Louis Allis Motor 1 HP 1800 RPM Serial 395205
Totally encl, fan cooled, ball bearing, 220/440 v., 3 ph., 60 cy., 1740 RPM, type IS, frame 204, class L, form B, 3.1/1.55 amp.
Order B7411 on 3/26/41, Req. 19634 on 3/26/41.
Chg. out $36.98. On ground floor.

M-01856 Louis Allis motor 5 HP 1800 RPM Serial 391009.
Est. 3479, Item 4. Totally encl., fan cooled, vertical flgd. mounted (OI conduit connection box) normal starting current, 3 ph, 60 cy, 220/440 v, 1750 RPM, type JS, frame 254 VB, class N, form R, code H, 1.3/6.5 amp. full load temp. rise 55°C.
Order B6380 on 3/13/41, Req. 19213 on 3/13/41.
Chg. out $109.74 on 6/30/41. On P-0997 top of S-062.

Dept. 246
Equipment List Continued

M-01859 Unit heater from Am. Blower Corp. Serial 1939.
Est. 3479, Item 25, #1036.
Order B8936 on 4/11/41 & Req. 20240. Chg. out $48.73.
In MSC-01393.

M-01995 Motor 1/3 HP 1800 RPM made by G. E. Est. 3378.
Explosion Proof, class 1, group d, underwriters No.
FA352-094. Totally encl., fan cooled, ball bearing,
type K, frame 45A, model 5K45AC1024A, temp. rise 55°C
trine rating cont., 440 v, 3 ph, 60 cy, 1725 RPM, 55 amp.
Order B4625 on 2/21/41, Req. 18520 on 7/21/41.
Chg. out $29.75 on 9/30/41. On P-01054.

M-02170 Geared head motor 5 HP 1800 RPM. Made by Master Elec.
Serial FD-9. Parallel, air jacketed, fan cooled,
totally encl., frame #254, 80 RPM on mixer shaft,
barrel mounting for vertical operation, style 103543,
220/440 v, 3 ph, 60 cy, 1725 RPM, type PA, amp. 13/6.5,
3 ph, trine hrs. cont. FLTR 55°C.
Order B3580 on 4/8/42, Req. 30060 on 2/10/42.
Chg. out $259.25. On CT-01399.

Dept. 246
Equipment List Continued

Mills

ML "Helix-Seal" impact mill purchased from Williams P. C. & Pul. Co. Serial #9394, Est. 2241, Item 1. Size #1. Less drive pulley driven at 5500 RPM thru V belt drive furnished by Monsanto.
Order B2371 on 2/1/37. Req. 76578. Price $420.00.
West lean-to.

Dept. 246
Equipment List Continued

Pumps

P-0378 Chas. Lewis pump Serial 4597, Est. 1093, Type BA-481, cast iron vertically split shell cent. pump. CI bed plate connected with flex. coupling, direct to 1/4 HP 3600 RPM motor. GE M-0466, 3 gal. PM - 35' head, 3450 RPM. Order B693 on 1/15/31. Price $68.00 incl. motor.

P-0427 Horiz. cast iron pump 1½ HP Monsanto Design. Direct connected, cold rolled steel shaft, includes base, coupling and c guard.

P-0565 Blackmer pump, Serial 197033, Est. 2025, Item 22a, type PA-50L bronze rotary pump, bronze lining, bronze steam jacketed heads, monel shaft, CI base, 1.65 sp. gr., temp. 350 to 500°F - 50 gal.
Order B-8170 on 4/23/36. Chg. out $155.45 on 6/30/36.
Distillate transfer pump.

P-0573 Vertical submerged centrifugal pump purchased from The Engineering & Equip. Co. Serial 33007, Est. 2025, Item 8. Size L-OB with 1½" inlet and 1" outlet.

P-0575 Taber submerged pump. Serial 33009. Est. 2025, Item 8. Order B7517 on 4/16/36, Req. 9161. Chg. out $177.80 on 6/30. Direct to vertical M-0848 in CT-0756.
Same as P-0573 and 0574.

P-0578 Taber horiz. cent. pump. Serial 33040, Est. 2025, Item 5. Type L-2, 2½" inlet, 2" outlet connections. Semi-steel with monel shaft and water jacketed stuffing boxes. Bed plate ready to receive motor. 20' static head, rate 80 g.p.m. 1.5 sp. gr. at 500°F. Uses M-0849.
Order B8237 on 4/24/36, Req. 69401. Chg. out $152.92 on 6/30.

P-0579 Taber horiz. cent. pump. Serial 33041. Same as 0578-80. For middle chlor. CT-0744, uses M-0850.

P-0580 Taber horiz. cent. pump. Serial 33042. Same as 0578-79. For west chlor. CT-0745. Uses M-0851.

P-0582 Taber vert. sub. cent. pump. Serial 33048, Est. 2025, Item 28, Fig. 1940, size J-3, 2½" inlet, 2" outlet connections, bronze except shaft which is monel metal. 11'6" length of column pipe. Spare pump for underground tanks. Order B7514 on 4/16/36, Req. 69158. Chg. out $409.20. Direct to M-0852. Same as P-0583 and 0584.

P-0583 Taber vert. subm. cent. pump. Serial 33049. In CT-0769, direct to M-0853. Same as P-0582-0584.

P-0584 Taber vert. sub. cent. pump. Serial 33050. In CT-0768, direct to M-0854. Same as P-0582 & 0583.

Dept. 246
Equipment List Continued

P-0585 Taber vert. sub. cent. pump. Serial 33069, Dwg. A387, Est. 2025, Item 2. Type C-3, fig. 1940, 2" inlet and outlet. CI body, renewable bronze bearings, bronze impeller mounted on nickel steel shaft. Length 11'6", sump cover plate, cap. 50 gal. p.m., 60' static head, sp. gr. 1.18 at temp. 165°-170°F. Driven by M-0856 in OT-0748. Order B7518 on 4/16/36, Req. 69162. Chg. out $257.62.

P-0592 Taber vert. sub. cent. pump. Serial 33113, Est. 2025, Item 10, type C-3, Fig. 1940, 2" inlet & outlet. All iron construction on nickel steel shaft length 11'6". Cap. 50 g.p.m., 60' static head, sp. gr. 1.368 at 70° to 90°F. In OT-0749, driven by M-0873. Order B7516 on 4/16/36, Req. 69160, chg. out $255.41.

P-0593 Taber vert. sub. cent. pump. Serial 33111, Est. 2025, Item 19. Type L-2, fig. 1940, 2½" inlet & 2" outlet, casing, yoke, impeller made of steel shaft nickel steel, column supporting intermediate bearing, wrought iron. Length 7'9". Cap. 75 GPM, static head 15', sp. gr. 1.8 at temp. 700°F. Driven by M0871. Order B7515 on 4/16/36, Req. 69159. Chg. out $382.91. In still S-043. Same as P-0574.

P-0594 Spare motor same as P-0593. Serial 33112. Driven by M-0872.

P-0595 Oberdorfer gear pump. Serial 2835, Est. 2025, Item 24. #7AXX unloader pump, all bronze gear type. 10-15 GPM at 20# pressure. Order B13188 on 7/2/36, Req. 71152. Cost $78.80.

P-0604 Vert. sub. cent. pump. Taber. Serial 33207, Est. 2025, Item 8. Size L-OB, 1½" inlet and 1" outlet. All iron const., open impeller on nickel steel shaft. Same as P-0573-4 & 5. In OT-0754. Order B13195 on 7/2/36, Req. 71148 on 7/1/36.

P-0617 Blackmer pump. Serial 201902, Est. 2177, Item 2, Size 100L, all iron, jacketed right hand pump, base plate for motor, & flex. coupling, direct connected (M-0914). Order B21241 on 10/22/36, Req. 74034. Chg. out $145.20.

P-0629 Taber horiz. cent. pump. Serial 33708, Est. 2170, Item 4. Type L-2, 2½" inlet and 2" outlet. Size 103. Order B2833 on 2/9/37, Req. 76766 on 2/5/37. Chg. out $152.52. Direct to M-0975.

P-0731 Taber sub. cent. pump. Serial 84722, Est. 2543, Item 6. Size L-OB, 1½" inlet and 1" outlet. Order B3854 on 3/4/38, Req. 86891 on 3/3/38. Chg. out $174.25. In OT-01013.

MONS 054918

Dept. 246
Equipment List Continued

P-0907 Taber horiz. cent. pump Serial 36622. Est. 2956, Item 2. Size 103, type L-2, 2½" inlet and 2" outlet connections, semi steel through out with monel shaft and water jacketed stuffing boxes, with bed plate ready to receive motor, 20' static head, rate 80 GPM, 1.5 sp. gr. at 500°F.
Order B12801 on 6/5/40, Req. 10230 on 6/5/40.
Chg. out $155.28, driven by M-01656 to circulate liquor for chlor. OT-01283.

P-0909 Taber sub. pump. Serial 36676, Est. 2956, Item extra, Size L-OB with 1¼" inlet and 1" outlet, all iron const., opsn impeller on nickel steel shaft.
Order B13110 on 6/10/40, Req. 10366 on 6/10/40.
Chg. out $193.75. On OT-0968 scrubber liq. tk.

P-0929 Taber sub. pump. Serial 36853, est. 3207, Item 2. Size O-3, fig. 1940, vertical, 2½" inlet and 2" outlet. Bronze except shaft to be monel metal, lg. of col. pipe 11'6". Order B18442 on 8/23/40, Req. 12559 on 8/23/40.
Chg. out $404.59. On stg. tk. OT-01310. Driven by M-01706.

P-0932 Roper cast iron pump. RIBI #169. Size 1" rotary, geared, complete with base, gears, pinion, big stand and adapter plate for motor mounting.

P-0984 Roper pump. Est. 3479, PA #145, Item 15. All iron series "0" rotary pump for 15 GPM. 1.6 sp. gr. 50' head pump, spiral gears pkgd. stuffing box with non-graphitic white asbestos pkg. built in by-pass and complete with base, drive gears.
Order B4118 on 2/17/41, Req. 18322 on 2/17/41.
For filter in CR.

P-0997 Taber vert. sub. pump, Serial 37682, Est. 3479, Item 4, Type OL4; 2½" inlet and 2" discharge for 75 GPM against 25' head. Pump of dynamo steel with wrought iron pipe column and nickel steel shaft, water cooled, stuffing box,
Order B6379 on 3/13/41, Req. 19214 on 3/13/41.
Chg. out $446.53. In S-062.

P-01037 Blackmer pump. Serial 246058. 5WG3202 bronze, size 51L, with base and relief valve.
Order B16097 on 7/21/41, Req. 22429 on 7/21/41.
Chg. out $177.56. On gr. fl. NE of P-0172.

P-01054 Pump made by Weil. Serial 13132, Est. 3328.
Type DSI, size 1".
Order B4625 on 2/21/41, Req. 18520 on 2/21/41.
Cost $65.00. On TW-0221. Driven by M-01995.

P-01056 Taber horiz. cent. pump. Serial 38318. Type L-2, size 103, 2½" inlet, 2" outlet complete with base.
Order B19730 on 9/3/41, req. 24125 on 9/2/41.
Chg. out $157.44 on 10/31/44.

Dept. 246
Equipment List Continued

P-01258 Blackmer pump, Serial 269500, Size 1202-50. Fig. 3203 complete with relief valve. No base.
Order B29303 on 1/28/43, Req. 40312 on 12/30/42.
Chg. out $134.63.

P-01277 Taber vert. sub. cent. pump. Serial 40890.
Type CL-4, 2½" inlet, 2" outlet, size 384.
Pump to be dynamo steel with wrought iron pipe, column cap. of pump 75 GPM at 25' head for liquid 1.8 sp.gr.
Order B8875 on 7/12/43, Req. 43713 on 4/16/43.
Chg. out $434.00 on 12/27/43.
At S-062 Spare. Same as P-0997.

Dept. 246
Equipment List Continued

Retort

R-026 Aroclor 1269 Retort assembled & erected by Monsanto.
Pots from Nooter $516.00 for 4.
Jacket from Graver Req. B69906
Burners from Surface Combustion. Req. 69374.
Burners - gas fired.
Jacket, steel, firebrick lined, holding 3'0" OD x 3'8" lg. over dished bottom still pot with cover. Equipped with 2 gas burners and stack. Still pot 1/2" fire box steel removable so residue can be dumped.

R-027 Aroclor 1269 Retort - Same as R-026.

Dept. 246
Equipment List Continued

Stills

S-043 Vac. still purchased from Graver. Plant A Drwg. O-809. Est. 2025, Item 18. Size 6' dia. x 5'6" lg. on str. side, 1/2" shell, dished head 5/8", supporting brackets - 60# Hydro press. test.
Order B-7705 on 4/17/36, Req. 69225. Chg. out $336.00. On 2nd fl., 12' level.

S-062 Vac. still purchased from Nooter. Serial #52. Dwg. D-6344, Est. 3479, Item 3. 6' ID x 11'10" str. shell, internal pipes, etc. Std. dished heads. Glass wool insulation 3" with 1/2" finish coat.
Order B10730 on 5/12/41, Req. 20421 on 4/28/41.
Chg. out $950.00. Suspended between 20'6" and 12' platform in OR.

Dept. 246
Equipment List Continued

Scales

80-095 Hove scale. Serial 1363314, Est. 2025, Item 35.
#1422 Skeleton type, ball bearing, dormant scale.
Platform 43 x 45. Double beams and short pillars,
steel shelf and hangers, Cap. 3500#. Upper beam
0 to 100# by 1/2# and lower beam 0 to 200# by 1#
divisions. All metal throughout, no wood anywhere.
Order B10340 on 5/22/36, Req. 70101.
Price $236.00.

80-098 Hove scale. Serial 1364566, Est. 2025, Item 41b.
#1420 Skeleton type, ball bearing, dormant scale,
cap. 2500# with double beams. Platform 46 x 38. All
metal incl. steel shaft. Order B14351 on 7/20/36.
Req. 71536 on 7/17/36. Price $213.85.

80-0100 Scale purchased from The Exact Weight Scale Co.
Serial 39992, Est. 2025, Item 40.
Style 1226, cap. 200# on ratio of 10 to 1. Dial with
indicator travel 12½" under wgt, and 2½" over wgt.
Fitted with bag holder for 100 to 200# bags.
All on swinging rack.
Order B17906 on 9/9/36, Req. 72843. Chg. out $289.41.
In lean-to near V-044 and V-045.

Dept. 246
Equipment List Continued

T-014 Transformer made by Westinghouse. Serial 530335, Est. 2025. 200 KVA, type SK, now used 440 volt primary 110/220 volt secondary.
Cost $10.00. Outside SW corner Bldg. CR.

TW-0166 Fused Silica Tower purchased from Amercel Co. Inc. Est. 2025, Item 12. 1 "U" bend trap.
12 absorbers sections B/P Gill 8" ID x 6'6" C to center.
Order B8161, Req. 69399. Same as TW-0165.

TW-0182 Scrubbing HCl tower made by Haveg. Drwg. C-4705, Est. 2439-1. "41" std. 2'6" dia., 10'2" deep, 5/8" thick walls x 3/4" thick bottom, machined dished head, and connecting material, 2" thick Haveg drilled plate with necessary supports 4-3", 1-8" and 1-10" std. Haveg nipple type outlets with flge.
Order B20284 on 10/5/37, Req. 83234 on 10/5/37.
Chg. out $668.56 on 12/31/37.
On 38' level steel struct. south side of CR.

TW-0206 Scrubbing Tower purchased from Nooter. Drwg. B-5815 support, drwg. 0-5814 tower. 17-18/" ID x 8' welded steel const. tower, welded steel scrubber support for tower. Order B7346 on 3/27/40, Req. 8063 on 3/27/40
Chg. out $277.00 on 4/30/40. Above CT-0756.

TW-0221 HCl absorption tower purchased from Fen Steel Metallurgical Corp. Serial 955-1941. Drwg. D-4300 foreign. Est. 3378 PA #147. Type AL-400. The tower, fittings and piping made of Karbate. Gas line of Haveg. Cap. to produce 20.5° Baume HCl at 4620# per hr.
Order B4625 on 2/21/41, Req. 18520 on 2/21/41.
Chg. out $5321.13 on 8/21/41.
On steel struct. S of CR.

MONS 054924

Dept. 246
Equipment List Continued

Conveyors

V-044 Screw conveyor made by Essmueller M.F. Co. Drwg. C-816, Est. 2025, Item 39b. Size 6", 6'8½" trough length with outlet at each end - cover of galv. iron. CI trough ends with zinc and tin sprayed. Req. 69909. On bottom CT-0764 - North conveyor. From stg. bin to bagging scale and back to boot of elevator, driven by M-0835.

V-045 Screw conveyor made by Essmueller MF Co. Drwg. C-816. Est. 2025, Item 39b, Size 6", 6'8-½" trough length with outlet at each end - cover of galv. iron. CI trough ends with zinc and tin sprayed. Req. 69909. On bottom of CT-0765 south conveyor. From storage bin to bagging scale and back to boot of elevator, driven by M-0836.

V-046 Screw conveyor made by Essmueller MF Co. Drwg. C-816. Same as V-044 and 045. From flaker discharge to elevator boot. Driven by chain on M-0827.

Dept. 246
Equipment List Continued

Closed Tanks

OT-0347 Tank 40' dia x 16' 3⅛" high, 1st course ¼" metal, 2nd course 3/8" top ¼" sheet - 2-6" OI nozzles on bottom, 4-4" CI noz. on top, 1-20" CI manhole on side shell near bottom, 1-20" th. steel batch on roof.
Est. 505 May 1927. Drwgs. D-978 and C-1117 (tank and foundations)

OT-0743 Jacketed vaporizer. Est. 2025, Item 13. 2 parallel vertical 10" dia x 4'4" tank surrounded by a 2'0" ID x 4'0" jacket. Use XHy pipe - jacket of ¼" plate, Drwg. C-818. Order B9038 on 5/6/36, Req. 69670. Price $180.00. 2nd floor 12' level south side Bldg. CR.

OT-0744 Middle chlor. tank made by Nooter. Drwg. E-880, Est. 2025, Item 4. 3'ID x 16' lg. with flg. head, shell 3/8" and head 7/16" thick, 3/16" jacket over lower half of tank. 3/16" inner shell and 2 sets of 1" XHY pipe coils. Order B9037 on 5/6/36, Req. 69669. Price $716.00. Same as OT-0745.

OT-0745 West chlor. tank same as OT-0744. On Dept. struct. steel MSO-0650.

OT-0748 Diphenyl storage tank made by Graver Drwg. C609, Est. 2025, Item 1. 10' dia. x 26' lg. str. side, dished heads 9/16", shell 1/2", welded const. 2" xHy pipe coils, 1" risers, manhole covers, outlets and sump.
Order B7700 on 4/17/36, Req. 69220. Price $1000.00
Underground west of CR, 1st from south. Same as OT-0749.

OT-0749 Aroclor 1148 and 1142 aroclor stg. tank. Same as OT0748.

OT-0750 Buffer tank made by Graver. Dwg. E-863. Est. 2025, Item 17. 7' dia x 7' str. sides, dished heads ¼", shell 3/8". 5 turn coil of 2" xHy pipe supported on brackets welded. Order B7704 on 4/17/36, Req. 69224. Cost $325.00. On steel MSO-0650 dept. steel, 12' level, 2nd floor level Bldg. CR.

OT-0751 Cyclone collector purchased from Graver. Dwg. B645. Est. 2025, Item 37B. 48" dia x 27" on str. side. 3'6" long and tangential inlet near top of side. 3/16" steel throughout, of welded construction.
Order B7712 on 4/17/36, Req. 69232. Price $84.00
On 2nd floor level, lean-to of CR.

OT-0752 Vertical steel closed tank made by Graver. Dwg. C804. Est. 2025, Item 31a. 4' dia. x 5' high with flat bottom and dished flanged head. Sides, bottom and top of 5/16", flange ¼", welded const. with outlets.
Order B7709 on 4/17/36, Req. 69229, Price $120.00.
On 1st floor, west side of CR. (Hot Well)

Dept. 216
Equipment List Continued

OT-0753 Scrubber tank made by Graver. Dwg. C-807. Est. 2025 Item 30. Steel, closed tank, 3' dia x 10' lg. with dished bottom and flgd. dished heads, shell 5/16", bottom 3/8", head 5/16" with 1" thick flanger. Order B7708 on 4/17/36, Req. 69228, Price $155.00. On 3rd floor elev. bldg. OR.

OT-0754 Scrubber liquor pump tank made by Graver. Dwg. C-800, Est. 2025, Item 7. 4'6" dia. x 5'6" on str. side with dished heads, shell 3/8" thick. Heads 1/2" thick, welded seams, pads and nozzles. Coil 3 turns of 1½" xHy pipe.
Order B7703 on 4/17/36, Req. 69223, Price $208.00.
Tank mounted on steel, east tank on 38' level.
Same as OT-0755 and 0756.

OT-0755 Scrubber liquor pump tank. Center tank. Same as OT-0754 and 0756.

OT-0756 Scrubber liquor pump tank. West tank. Same as OT-0754 and 0755.

OT-0759 East arcolor scrubber used on OT-0754. Made by Graver. Est. 2025, Item 6. Steel tubular tank, 12' dia. x 8' high, removable head. Pkgd. with 6' of Raschig rings. Chg. out $84.00.

OT-0760 Center arcolor scrubber. Same as OT-0759.

OT-0761 Scrubber tank made by Graver. Est. 2025. Steel tubular tank 12" dia. x 8' high, removable head. Packed with 6' of Raschig rings. On OT-0968. Chg. out $84.00.

OT-0762 Vent line scrubber stored in OR lean-to. Made by Graver. Est. 2025, Item 11. Steel tubular tank, 12" dia. x 8' high (50# std. pipe 3/8") removable head. Dwg. C-798. Packed with 6' of Raschig rings.

OT-0763 Melt and feed tank made by Graver. Dwg. C-810, Est. 2025, Item 16. Closed steel tank 4'6" dia. x 5'0" on str. side, shell 3/8", dished bottom and bolted dished head el ¼". 2" xHy pipe coil, 10 turn with 3 supports welded to head. Tk. test 90# and coil 300# Hydro Press. Order B7710 on 4/17/36, Req. 69230. Price $316.00. ¼ way in floor, south side of OR.

OT-0764 North Hopper Storage Bin made by Graver. Dwg. D-512. Est. 2025, Item 40. Vertical, 6' x 6' x 10'8¼" high overall, with sloping bottom and belt angles. 3/16" plate throughout with reinforced flat bolted on cover with trap door. Entire inside of hopper and underside of cover and trap door sprayed, 1st with .005" zinc and then .003" tin.
Order B7715 on 4/17/36, Req. 69233, Price $288.00.
Southwest end of OR lean-to. Same as OT-0765.

Dept. 246
Equipment List Continued

OT-0765 So h hopper storage bin. Same as OT-0764.

OT-0766 Circulating cooling tank made by Graver. Dwg. B644, Est. 2025, Item 21a. Steel tank 2'6" dia. x 3'0" str. side with dished head and welded on pipe legs, shell ¼", heads 3/8". Coil of 1½" dia. xHy pipe, 4 turns on supports welded to inside of shell. Test tk. 225# and coil 300# Hydro Press.
Order B7706 on 4/17/36, Req. 69226. Price $110.00.
On 38' floor level, Bldg. OR.

OT-0770 Tubular heat exchanger made by Nooter. Dwg. B651, Est. 2025, Item 21. Size 12" dia. x 5'0" lg. having 19 x 2" OD 11 ga. Monel Tuber, Monel tube sheets, Monel reducer and carbon steel jacket and back-up rings on flanger.
Order B8848 on 5/1/36, Req. 69605. Price $660.00.
Above still 8043, supported by 3rd floor steel.

OT-0771 Monel vacuum receiver made by Nooter. Dwg. O-795 (Plant A), Est. 2025, Item 22. Size 5'6" dia. x 5'6" str. side, 3/8" shell, ½" bottom and removable head, 4 support brackets on outside of tank of steel. 2" IP size xHy Monel coil with 2" inlet and 1" outlet with Monel bars and U bolts. 3 turns 5' dia. along side and 3 turns spiral on bottom. 60# Hyd. test on tank and 300# on coil.
Order B7379 on 4/14/36, Req. 69118. Price $3240.00.
On second floor level, 12' level, Bldg. OR.

OT-0767 Diphenyl mess. tank made by Graver. Dwg. O-799, Est. 2025, Item 3. Steel tank 4'6" ID x 5'6" str. side, dished heads, shell 3/8, top head 3/8 and bottom head 3/4" with ½" jacket over it and extending 9" up on tank side. Welded throughout. Test tk. 60# and jacket 105# Hydro press.
Order B7701 on 4/17/36, Req. 69221, Price $329.00.
At 38' level, Bldg. OR.

OT-0768 Aroolor 1260 finished product storage tank. Made by Graver. Dwg. O-609, Est. 2025, Item 27. Horiz. steel 10' dia. x 26' lg. on str. side, dished hds., shell ¼", heads 9/16". Test tank 60# and coil 300# Hydro Press. Coil 2" xHy pipe with 1" xHy risers. Welded construction throughout. All inside and flg. surfaces, coils, supports, etc., to be sprayed first .005" zinc and then .003" tin. Same as OT-0769. Order B7711 on 4/17/36, Req. 69231. Chg. out $1385.00.

OT-0769 Aroolor 1254 Finished Product Storage Tank. Same as OT-0768.

MONS 054928

Dept. 246
Equipment List Continued

OT-0779 Blending tank made by Graver. Dwg. E-862. Est. 2025, Item 23. Welded steel tank 7' dia. x 7' high dished heads ¼", shell 3/8". All inside surfaces and nozzles sprayed .005 zinc then .003 tin. 2" xHy pipe coil and supports. Yoke and drive supports. Cast bronze turbine stirrer and bronze shaft. Test tank 60# and coil 300# Hydrostatic Pressure.
Order B7707 on 4/17/36, Req. 69227, Chg. out $599.00.
On 2nd floor level, 12' level, Bldg. CR. Same as OT-0780.

OT-0780 Filtrate receiver tank. Dwg. E-862, made by Graver. Est. 2025, Item 26. Welded steel tank 7' dia. x 7' high, dished heads ¼", shell 3/8". Same as OT-0779.

OT-0785 Middle acid tank south of CR on foundation. Made by Goodrich. Dwg. C-823. Est. 2025, Item 120. "Vulcalok" linea - steel tk., 7'0" ID x 8'6", shell 5/16", dished head 5/16", bottom 7/16", 4" outlet for safety flg. on bottom. 18" manhole and cover, 5 - 5" flgd. outlets in head, 3/16" Triflex lining, rubber covered float and card for measuring device. Head with 6 - 1½" couplings for railings.
Order B9983 on 5/19/36, Req. 69966. Chg. out $945.65.
South of CR on foundation. Same as 0784 and 0786.

OT-0786 West acid tank, same as OT-0784 and 0785.

OT-0808 Storage tank and chlorinator with stirrer and gas burner. Made by Kilpatrick and Sons Pdy. Co. Dwg. A324, Est. 2025, Item 32. Cast Iron, 6' ID x 4'11" deep inside, wall 2" thick, bottom 3" thick and dished in 3". 3" outlet at lower rim. Marked S-459, weight 12,675#. Machining outside of top flange but without holes and machining outlet in rim including drilling and tapping holes. Cost of machine work $36.00. Order B8162 on 4/24/36, Req. 69398, Cost $517.65. On 12' level SW corner Bldg. CR.

OT-0831 Water condenser tank made by Heine Boiler Co. Dwg. B483 (Plant A), Est. 2025, Item 21B. Used as temperature control for Arocolor condenser OT-0770. 12 tubes, 1" OD - 10 GA seamless steel tubing 10'-0¼" lg. 10'0" overall lgth. of 6" std. pipe shell single pass. Order B8773 on 5/11/36, Req. 69576, Price $98.00.

OT-0833 Chlorinator purchased from Leader Iron Wks. Est. 2170, Item 1. Size 3' dia. x 16' made up complete including coils, inner shell, and grating. Dwg. E-880 and B-659. Order B-2813 on 2/5/37, Req. 76475 on 1/26/37, chg. out $790.00 on 3/31/37. East Chlorinator.

OT-0852 Raymond 2 stage cyclone dust collector sent to B by Anniston Plant. Each cyclone approx. 20" dia. - 21" str. section 32" depth of cone, steel construction, used with B-0105. In lean-to of Bldg. CR.

MONS 054929

Dept. 246
Equipment List Continued

OT-0968 Scrubber liquor pump tank purchased from Nooter. Dwg. 0-4616, Est. 2388, Item 2. Steel vertical jacketed, size 4'6" ID x 5'6" lg. with jacket.
Order B15673 on 8/2/37, Req. 81458 on 8/2/37.
Price $575.00.

OT-01013 Scrubber liquor pump tank made by Leader. Dwg. C-4616, Est. 2543, Item 4. Size 4'6" ID x 5'6" vertical, steel, flange quality, all welded. Jacketed.
Order B4164 on 4/29/38, Req. 87029 on 3/9/38.
Price $582.00. On 38' level SE corner OR.

OT-01014 Scrubber tank made by Heintz. Dwg. 0-4845. Est. 2543, Item 5. Steel 12" dia. std. wrought steel pipe 10'10" high, ¼" dished end and other end fitted with 3/4" faced and drilled flg. with 5/8" cover plate. Steel plate, and distributor. Use 5 cu. ft. 1" CI Raschig rings pkg., Order B3933 on 3/4/38, Req. 86921 on 3/4/38. Price $139.00. On top of OT-01013.

OT-01258 Monel gas chamber made by Nooter. Dwg. C-5825.
Est. 3018, Item 1. 4' dia. x 4' high constructed of Monel. Order B7835 on 4/3/40, Req. 8061 on 3/27/40.
Chg. out $867.00.

OT-01259 Cyclone Tank made by Heintz. Dwg. B5821, Est. 3018, Item 4. 2'6" dia. x 6'7" high constructed of 3/16" steel plate.
Order B7345 on 4/27/40, Req. 8062 on 3/27/40. Price $92.00. Hang from roof of Bldg. on 38' level.

OT-01263 Monel condenser made by Nooter. Dwg. C-6144, Est. 3018, Item 12. 42" dia. x 63" high cone bottom condenser constructed of 3/16 Monel metal welded construction throughout. Order B-8364 on 4/9/40, Req. 8198 on 4/1/40, Price $928.00.

OT-01279 Cyclone separator made by Nooter Dwg. 5821, Est. 2956, Item 7. 2' dia. x 6'7" high cyclone separator made of steel and welded throughout. Order B13177 on 6/12/40, Req. 10232 on 6/5/40. Chg. out $66.25. For use at OT-0968.

OT-01280 Cyclone separator made by Nooter. Dwg. B-5821, Est. 2956, Item 13. 2' dia. x 6'7" high cyclone separator made of steel and welded throughout. Order B13177 on 6/12/40, Req. 10232 on 6/5/40. Price $66.25. At OT-0762 east scrubber.

OT-01281 Cyclone separator. Same as OT-01279 and 1282. At OT-0759. 2nd from E scrubber.

OT-01282 Cyclone separator. Same as OT-01279-1280-1281. Used at OT-0760. 3rd from E. Scrubber.

Dept. 246
Equipment List Completed

OT-01283 Chlorinator made by Leader Iron Works, Inc. Dwg. E6209, Est. 2956, Item 1. 3' x 16' steel vertical chlor., welded const. Order B-14119 on 6/21/40, Req. 10408 on 6/11/40. Price $720.00. East of OT-0833.

OT-01310 Arocolors 1260 Storage Tank made by Leader Iron Wks. Dwg. C-609, Est. 3207, Item 1. Horiz. 10' OD x 26' long on str. shell, incls. coils, etc. Omitted 2 - 3" nozzles changed 18" noz. to 24" and added covers for 24" noz. Tanks, coils, coil supports, inside of noz. and manholes and noz. and inside covers must be sprayed with zinc.005" thick followed by a sprayed coat of .005" tin. Order B13240 on 6/11/40, Req. 10432 on 6/11/40. Price $2200.00. Underground S of OT-0848.

OT-01377 Still receiver tank made by Nooter. Dwg. C-795, PA #145, Est. 3479, Item 7. 5'6" x 5'6" Monel metal receiver, complete with cover, coil, etc. Glass wool insulation 2" and ¼" finished coat. Order B4137 on 6/27/41, Req. 18315 on 2/17/41. Price $3295.00. NE corner of 12' level platform in Bldg. OR.

OT-01378 Condenser tank made by Nooter. Dwg. B651, Est. 3479, Item 6. 12" ID x 5' lg. Monel metal. Order B4137 on 10/20/41, Req. 18315 on 2/17/41. Price $650.00 W of OT-01413 on 20'6" level platform, Bldg. OR.

OT-01396 Vacuum scrubber purchased from Combustion Engi. Co. Dwg. C-807, Est. 3479, Item 9. 3' ID x 10' high, steel const. including grating and screen. Order B8360 on 4/4/41, Req. 19989 on 4/4/41. Price $260.00. N one on 29' platform.

OT-01397 Water heat exchanger made by Leader Iron Wks. Dwg. B483, Est. 3479, Item 11. 6" dia. x 10' lg., 12 tube. Order B8324 on 4/4/41, Req. 19993, Price $119.00. North of OT-0831.

OT-01398 Cooler tank made by Leader. Dwg. B644, Est. 3479, Item 12. 2'6" ID x 3' high steel cooler tank complete with coil. Order B8324 on 4/4/41, Req. 19993. Price $152.00. South one on 29' platform.

OT-01399 Blending tank made by Nooter. Dwg. E-6838, Est. 3479, Item 13. 7' ID x 7' high, complete with coil, agitator, and drive support, zinc and tin lined, seams to be chipped and ground smooth. Order B8325 on 4/4/41, Req. 19990 on 4/4/41. Chg. out $950.00. Driven by M-02170. Middle one of 3, north end of 12' level platform.

OT-01400 Filtrate receiver made by Nooter, Est. 3479, Item 16. 7' ID x 7' high incl. coil and supporting legs. Inside of tank zinc sprayed, all seams chipped and ground. 1" glass wool insulations 2½" fin. coat. Order B8323 on 4/4/41, Req. 19992, Price $925.00. West one of 3 north end of 12' level platform, OR.

Dept. 246
Equipment List Continued

OT-01413 Separator tank made by Heintz Steel. Dwg. 06957, Est. 3479. 3' ID x 6' high tangential separator with integral vapor pipe complete.
Order B10722 on 5/9/41, Req.20429 on 5/1/41.
Chg. out $382.50. North one on 29' level platform Bldg. CR.

OT-01491 Heat exchanger tank made by Leader Iron. Dwg. B483, CABI #217. 6" dia. x 10' lg., all steel, 12 tubes
Order B21479 on 9/19/41, Req. 24894 on 9/19/41.
Chg. out $140.00.

MONS 054932

4d

Dept. 246
Equipment List Continued

Open Tanks

OT-0640 Drum, 110 gal. IC05, CABI #217-1941. With float valve on city water line connect 5 GPM Lewis pump to pump from drum through rotometer to acid absorption system. Black Iron.
$18.30 as trans. from 360 drum 360.

MONS 054933

Dept. 246
Equipment List Continued

Miscellaneous

MSC-0639 Speed reducer made by W. A. Jones Foundry, Serial 85957, Est. 2025. #105DW, assembly #1, style 4, 36 to 1 ratio, low speed shaft to be 7½" instead of 4" extension. Order B8242 on 4/24/36, Req. 69409 on 4/24/36, Price $156.00. Driven by M-0827, drives D-012. CR, lean-to.

MSC-0650 Struct. steel and foundations. Est. 2025, Item 43. Main and lean-to rooms of CR.

MSC-0655 Shepard Elec. Liftabout Hoist. Serial 36306. Est. 2025, Item 34. 440 v, AC, 3 ph, 60 cy, single speed control with motor drive trolley. Hoist speed 18' per min., lift 19'. Hoist motor 3 HP. Travel motor 3/4 HP. Order B7405 on 4/14/36, Req. 69120. Chg. out $906.70.

MSC-0663 Multiple temp. recorder 40112-291 Micromax Model S strip chart, 2 prints, surface panel $300.00. Made by Leeds and Northrup, Serial 276758, Est. 2025, Item 41. Order B9975 on 5/19/36, Req. 69970. In lean-to, Bldg. CR.

MSC-0668 L&N Temp. Recorder made by Leeds and Northrup. Dwg. B-666, Serial 276807. Est. 2025, Item 41.
(1) #40354-291 Micromax model S strip chart, multiple temp. recorder, 4 point. (Multiple colored dots instead of numbers on print wheel). Surface panel mounting $465.00.
(2) Extra for high contact for operating alarm 20.00
Order B9976 on 5/19/36, Req. 69969, Chg. out $491.82. South wall, west instrument, Bldg. CR.

MSC-0675 Temperature Recorder purchased from Leeds and Northrup. Serial 276784, Est. 2025, Item 41. #40353-291 Micromax, model S, strip chart multiple point temp. recorder for 3 prints. (Multi colored dots instead of numbers on print wheel.) Suface panel mounting $400.00. Extra for high contact for operating alarm, $20.00. 3 thermocouples to fit wheels. Our Dwg. B-666.
Order B9977 on 5/19/36, Req. 69968, Chg. out $424.05. South wall, east instrument, Bldg.CR.

MSC-0676 Gas Electric Water Cooler made by G.E. Compressor 6541356, cabinet 6600807, Est. 2025, Extra Item. Model RM-51 pressure type, 110 v, single phase, 60 cy.
Order B14045 on 7/14/36, Req. 71432.
Chg. out 7/31/31, $176.00. On 12' level, Bldg. CR.

MSC-0681 Rail truck purchased from Nutting Truck Co. Est. 2025, Item 35a. Dwg. C-827. Welded construction, wheels equipped with Hyatt Roller Bearings. Used as weigh truck for still pots on SC-095. Includes track.
Order B11134 on 6/3/36, Req. B70395.
In lean-to Bldg. CR.

Dept. 246
Equipment List Continued

MSO-0682 Brown mech. flowmeter. Serial 115969, Est. 2025, Item C1A, recording and integrating steam at 65# ga. press. Dry sat. orifice monel in 4" std. horiz. line. Max. flow 4000#/hr. Model 2221-x40. 2 lgs. 25' of ½" copper tubing and connectors - Monometer valves. Elec. clock for 110 v - 60 cy.
Order B14604 on 7/22/36, Req. 71548 on 7/20, chg. out $280.00.

MSO-0705 Palmer Industrial Thermometer CABI #89. #249 - 45° reclining industrial therm. 12" scale, steel separable socket - 30" long with 1" std. pipe thread. Range 0-200°C. No nickel plating, case painted reg. laquer.
Order B18261, chg. out $28.05 on 10/31/36.
On Buffer tank OT-0750.

MSO-0718 Lab & Office of Dept. Est. 2175 CABI #89 - 1936. 20' x 10' x 10' high includes partition and elec. lights on NW corner of CR.

MSO-0725 Lab.testing equipment.

MSO-0734 Elect. drying oven. CABI 89-1936. Cat. 7764, 3 heat oven with one shelf and 9525 thermometer for 110 v, AC current.
Order B23080 on 11/16/36, Req. 74628. Chg. out $26.60.

MSO-0760 Vacuum jet made by Worthington. Est. 2025, Item 31. #2½ JPD-S std. 3 stage steam jet ejector with 2nd stage condensing and fitted with jet type intercooler. Jet to be CI bronze nozzles, heads, monel nozzles.
Order B7404 on 4/14/36, Req. 69211 on 4/14.
Chg. out $796.00 on 6/30/36.
N of MSO-01392 Bldg. CR.

MSO-0903 Steel cabinet made by Medart. CABI #139. 1 unit 48" wide x 24" deep x 6'3" high 9" ledge, bin fronts, dividers and 2 doors on lower part with lock.
Order B3013 on 2/18/38, Req. 86579 on 2/17/38.
Chg. out $50.51.

MSO-0971 10 steel box lockers made by Medart. CABI 139. Olive green steel arranged 2 wide x 5 high. Complete with locks, 2 keys for each lock x 3 master keys common to all. Lockers 12 x 12 x 15"deep.
Order B15781 on 9/23/38, Req. 91603 on 9/21/38. Cost $25.75.

MSO-01061 Two loading ramps made by Monsanto. For one ton chlorine cylinders, using I beam supports and concrete footings with I beam rails. East side, outside Bldg. CR.

Dept. 246
Equipment List Continued

MSO-01191 Metal Desk and Stool. Desk 36-5/32" wide, 42" high front, 54" high back, 31" deep. Stool 30" high.
Order B5169 on 3/4/40, Req. 7148 on 2/29/40.

MSO-01205 Speed reducer made by Falk. Serial M0127-928. Est. 3018, Item 6. Size 28D2X, RPM 1750 to 180, ratio 9.7.
Order B8337 on 5/20/40, Req. 8941 on 4/9/40. Chg. out $169.94. Driven by M-01629 on CT-0808.

MSO-01392 #2½ Worthington vacuum jet 3 stage. Type 9-10-11.
Est. 3479, Item 10. North of MSO-0760.
Same as MSO-01686.

MSO-01393 Control Room. Dwg. C-9646, Est. 3479, Item 24.
Structural steel, floor plate, Bldg. tile 12x12x3.
Pyrobar roof, door and instrument panel for I-0441.

MSO-01495 ½ ton Peerless hoist and trolley. Est. 3479, extra item. Model C, 11' lift. Model J trolley.
Order B17508 on 8/6/41, Req. 23095 on 8/6/41.
Chg. out $72.74 on 11/27/41.
Used to remove plates of filter F-0172 for cleaning.

MSO-01686 #2½ Worthington 3 stage vacuum jet. Type 9-10-11.
North of MSO-01392. Same as MSO-01392.

MSO-01699 Lockers (4) made by Medart. CABI 152,1939.
2 only 15 x 18 x 60 dark green. #14 and #15.
2 only 15 x 15 x 36 double tier. #12 and #13.
Order B3439 on 3/8/39.

MSO-01877 Canvas tent for tank car. Approx. 7' dia. x 7' high with swing boom, to raise and lower tent into a wooden box along west wall of CS. To be located at load dock at track #11, SW corner CS. Also elec. light in tent.
Order B20696 on 9/7/43, Req. 48441 on 9/4/43.

MSO-01879 South dock, wood muriatic loading. Also swing plank and wood decking. Est. 4364, Item 1. On track 11 west of CS. 5' x 5'6". 1943.

MSO-01916 North load dock made of steel with swing plank. Est. 2025. 5' x 7' long, 9'6" high. 5 x 5 angle columns with 6" channels to support ¼" steel decking. 1½" pipe railings. North of MSO-01879. SW of CS on track 11. 1936

MSO-02071 Stoneware sink.

E. Tauber
4-2-46

T. H. Becker

leh

PART V

SPECIFICATIONS:

RAW MATERIAL SPECIFICATIONS
CRUDE LIQUID AROCLOR SPECIFICATIONS
CRUDE SOLID AROCLOR SPECIFICATIONS
DISTILLED LIQUID AROCLOR SPECIFICATIONS
DISTILLED SOLID AROCLOR SPECIFICATIONS
BY-PRODUCTS SPECIFICATIONS

RAW MATERIAL SPECIFICATION

DIPHENYL - Monsanto #611

	Specification	Method No.
Appearance & Color	light yellow crystalline solid	10,252-40
Crystallizing Point	68.7°C Min.	10,298-40
Distilling Range		
First Drop	252.5°C Min.	10,299-40
100%(First drop to dry pt)	1.5°C Max.	
Dry Point	256.5°C Max.	

DIPHENYL - Dow

Crystallizing point	68.5°C Min.
Distilling Range	2.0°C
Boiling Point	255.0°C

CRUDE HIGH BOILERS #618

Material used as received from Anniston.

DISTILLED HIGH BOILERS #619

Material used as received from Anniston.

TOLUENE #529

	Specification	Method No.
Appearance & Color	Clear, practically colorless liquid	67-40
Sulfur	Trace Max.	119-40
Paraffins	Report	118-40
Barrett acid wash	No. 2 Max.	120-40
Color of unquenched sulfonchloride - light		121-40
Distilling range		81-40
1st drop	110.0°C Min	
97%	Within 0.6°C	
Dry point	111.0°C Max	

HYDRATED LIME #565-A

	Specification	Method No.
Appearance & Color	Fine white or slightly grey powder free from lumps or gritty material	10,188-41
Sulfate (as SO_3)	0.30% Max.	10,189-41
$Mg(OH)_2$	0.50% Max.	10,192-41
$CaCO_3$	3.00% Max.	10,193-41
$Ca(OH)_2$	92.00% Min.	10,191-41

ATTAPULGUS EARTH #608

No specifications - Not analyzed

Sometimes the material is analyzed for moisture, however, there are no specifications on moisture.

CHLORINE GAS

There are no specifications for Chlorine Gas; however, the two types used, cell gas and sniffed gas, assay 95% or more and 75% to 95% respectively.

PRODUCT SPECIFICATIONS

CRUDE LIQUID AROCLOR

PRODUCT	APPEARANCE AND COLOR	SPECIFIC GRAVITY	ACID NO.
ANALYSIS NO.	10084-40	10114-40	10087-40
1142	Brown to black oily liquid	1348-1353 @ 65/15.5°C	Max.0.5 Mg NaOH/gm
1148	" " " " "	1412-1415 @ 65/15.5°C	" " "
1154	Brown to black viscous liq.	1.500-1.510 @ 65/15.5°C	" " "
1160	" " " viscous sticky mass	1.558-1563 @ 90/15.5°C	" " "
1162	" " " sticky mass	1.582-1.587 @ 90/15.5°C	" " "

SPECIFICATIONS SOLID CRUDE AROCLORS

METHOD NO.	10,084-40	10,087-40	10,127-40	10,085-40
PRODUCT	APPEARANCE & COLOR	ACID NO.	MOLD POINT	ASTM SOFTENING PT.
1168	Grey to black crystalline powder	-	145°-165°C	-
1169	" " " "	-	225-250°C	-
4065	Black brittle resin	-	-	66.0-72.0°C
5060	Black brittle resin	-	-	110.0-115.0°C
2565	Black brittle resin	0.3-1.0	-	66.0-72.0°C

MONS 054941

PRODUCT SPECIFICATIONS

DISTILLED LIQUID AROCLOR

ANALYSIS NO. 10084-40		10,114-40	10,087-40	10,086-40
PRODUCT	APPEARANCE & COLOR	SPECIFIC GRAVITY	ACID NO.	VISCOSITY SAYBOLT SEC.
1242	Clear oily liquid 0.5 NPA Max.	1338-1.348 @ 65/15.5°C	0.01 Max.	50-53 @ 54.5°C
1248	Yellow oily liquid 0.5 " "	1.404-1.414 @ 65/15.5°C	" "	73-80 @ 54.4°C
1262	Light yellow sticky resin 1.0 NPA Max.	1.572-1.583 @ 90/15.5°C	" "	88-100 @ 98.9°C
		Composition -	10,194-40	
1262M	Light yellow oily liquid	Aroclor 1262 90.5-89.5%	Toluene 9.5-10.5%	

MONS 054942

ARCOLOR SPECIFICATIONS

Property	1254(GE 1476)	1260(GE 1482)	Method No.
Appearance & Color	Yellow tinted viscous liquid APH 150 Max.	Light Yellow Stioky Mass APHA 150	10,084-40 10,084-40
Condition	Clear	Clear	10,084-40
Specific Gravity	1.495-1.505 @ 65°/15.5°C	1.550-1.560 @ 90/15.5°C	10,114-40
Acid No.(Mg.NaOH/gm)	0.01 Max.	0.01 Max.	10,087-40
Inorganic Chlorides	0.000015% Max.	0.000015% Max.	10,118-40
Viscosity (Saybolt Seconds)	44.5-47.5 @ 98.9°C(210°F)	72-77 @ 98.9°C(210°F)	10,086-4
Dielectric Constant 100°C	1000 cycles 4.15-4.35	1000 cycles 3.8-4.0	10,119-40
Resistivity 100°C 500V.	100 x 10^9 ohms/cm^3 Min.	500 x 10^9 ohms/cm^3 Min.	10,120-4
Dielectric Strength 25°C	30 KV Min.	30 KV Min.	10,122-40
Distilling Range	Corrected	Corrected	10,117-40
10%	365°- 370°C	385° - 395°C	
50%	370°- 377°C	390° - 400°C	
90%	377°- 390°C	400° - 415°C	
H_2O	0.0035% Max.	0.0035% Max.	10,620-40
Pour Point ASTM	8-12°C	26-34°C	10,115-40
Corrosion Test:	Change in weight of bright aluminum in contact with Pyranol for 6 hours at 210°C.		
Change	None	None	
Inorganic Chlorides	0.000015% Max.	0.000015% Max.	
Acid No.	0.01 Max.	0.01 Max	
Condition	Clear	Clear	
Color	400 APHA Max.	400 APHA Max.	
Loss on heating 100°C 6 hours	0.4% Max.	0.2% Max.	10,116-40

MONS 054943

SPECIFICATIONS FOR SOLID DISTILLED AROCLORS

METHOD NO. 10,084-40		10127-40	10087-40	10579-41	10577-41	10578-41	10510-40	10088-40
PRODUCT	APPEARANCE & COLOR	HOLD POINT	ACID NO. Mg.NaOH/gm	COLOR 5% TOLUENE	MOISTURE	MELTING POINT	FOREIGN ODOR	TOTAL CHLORINE
1268	White to yellow crystalline powder	135-160°C	0.05 Max.					
1269	White to grey or light yellow crystalline powder	225-255°C						
1270	White crystalline powder	285-300°C		80 APHA Max.			None	69.5 - 70.5%
1271	Practically white light fluffy powder	-		80 APHA Max.	0.50% Max.	304°C Min.		

METHOD NO. 10084-40		10085-40	10087-40	10086-40	10089-40	10088-40
		SofteningPt.		Viscosity Saybolt Seconds	Crystallinity	
4465	Clear light yellow brittle resin 1.5 NPA Max.		0.035 Max.	160-210 @ 130°C		
5460	Clear light yellow brittle resin 2.0 NPA Max.	100.0-105.5°C	0.05 Max.		To pass	59.0 - 60.6%

MONS 054944

DEPARTMENT 246

STANDARD CONVERSION FACTORS

AROCLOR	CHLORINE	DIPHENYL	DISTILLED HIGH BOILER	CRUDE HIGH BOILER	100% HCl
1142	0.875	0.6075			0.3829
1148	0.992	0.5475			0.4341
1154	1.130	0.4825			0.4945
1160	1.235	0.4160			0.5404
1162	1.253	0.4060			0.5485
1168	1.369	0.3625			0.5991
1169	1.433	0.3450			0.6271
1170	1.505	0.3485			0.6586
1171	1.505				0.6930
1242	0.921	0.6385			0.4030
1248	1.044	0.5765			0.4568
1254	1.186	0.5080			0.5192
1260	1.300	0.4585			0.5689
1262	1.327	0.4267			0.5809
1262M					
1268	1.331	0.3900			0.5827
1269	1.740	0.4060			0.7614
1270	1.828	0.4100			0.7998
1271	1.908				0.8350
25 65	1.345	0.2860		0.095	0.5883
4065	1.320	0.2400	1.164		0.5774
4465	1.466	0.2667	0.180		0.6415
5060	1.290	--	0.418		0.5645
5460	1.573	--	0.510		0.6885

DEPARTMENT 246

CONVERSION FACTORS

Theoretical Factors as Obtained from Experience

AROCLOR	CHLORINE	DIPHENYL	DISTILLED HIGH BOILER
1142-1242	0.8492	0.5874	
1148-1248	0.9664	0.5304	
1154-1254	1.0972	0.4669	
1160-1260	1.2000	0.4038	
1162-1252	1.2270	0.3930	
1168-1268	1.3330	0.3523	
1169-1269	1.3760	0.3314	
1170-1270	1.4190	0.3200	
1171-1271	1.4500	0.3100	
4065-4465	1.2682	0.2303	
2565	1.2950	0.2781	
5060-5460	1.2800	--	0.437

Aroclors are not pure compounds but are mixtures of two or more compounds, consequently do not have a definite composition and for this reason cannot calculate the theoretical factors.

MONS 055044

Specific Gravity of Aroclors at Various Temperatures

Dept. 246 - Aroclors

For	Temp. °C	Sp. Gr.	Lbs. Per Gallon
1242	60	1.347	11.23
	65	1.344	11.20
	70	1.338	11.16
	75	1.335	11.13
	80	1.332	11.10
	85	1.329	11.07
	90	1.324	11.03
	95	1.319	11.00
	100	1.315	10.96
1248	60	1.413	11.78
	65	1.410	11.75
	70	1.403	11.71
	75	1.400	11.68
	80	1.397	11.65
	85	1.394	11.62
	90	1.390	11.58
	95	1.385	11.55
	100	1.381	11.51
1254 or OR 1476	60	1.505	12.55
	65	1.500	12.50
	70	1.495	12.46
	75	1.490	12.42
	80	1.485	12.38
	85	1.480	12.34
	90	1.475	12.30
	95	1.470	12.26
	100	1.465	12.21
1260 or OR 1482	60	1.584	13.21
	65	1.580	13.17
	70	1.575	13.13
	75	1.570	13.09
	80	1.565	13.05
	85	1.560	13.01
	90	1.555	12.96
	95	1.550	12.92
	100	1.545	12.88

MONS 055045

Dept. 246 - Arochlors (Cont'd.)

Aroclor	Temp. °C	Sp. Gr.	Lbs. Per Gallon
1262	60	1.604	13.40
	65	1.600	13.36
	70	1.597	13.32
	75	1.593	13.28
	80	1.588	13.24
	85	1.582	13.19
	90	1.577	13.15
	95	1.572	13.11
	100	1.568	13.07

PART X

COST FACTORS

X. COST FACTORS
Experience and Recent Practice

Some of the factors that affect costs are:

1. Crude material requirements
2. Yields of products and by-products on theory = 100%
3. Metered service requirements
4. Labor requirements

The average requirements and yields for 1945 are tabulated below. These averages are based on a total Aroclor production of 7,089,875 lbs. of which 536,100 lbs. were solid Aroclors, and a total 100% HCl production of 2120.6 tons.

Crude Materials

The pounds of crude materials required per 100 lbs. of Aroclor produced were:

Chlorine	122.82#
#611 diphenyl	47.22
#565-A lime	0.44
#608 Attapulgus Earth	0.02
#529 toluene per cwt. 1262 Mix	11.67

Crude high boilers #618 and distilled high boilers, #619, are not included in this list since only very small quantities were used.

Yields

Yield of Aroclor on chlorine - 93.24%
Yield of Aroclor on diphenyl - 92.17%
Yield of 100% by-product HCl on chlorine - 94.58%

Metered Service Requirements

The quantities of metered services required for each 100 lbs. of Aroclors produced were:

Steam M lbs.	0.228
KWH Power	2.141
KWH Lights	1.005
Compressed Air M Cu. Ft.	0.110
City Water Cu. Ft.	25.990
Well Water M Gals.	0.464
Fuel Gas M Cu. Ft.	0.049

Labor Requirements

The following hours of labor were required for each 100 lbs. of Aroclors produced:

Packing	0.025 hrs.
Operating	0.235 hrs.

PART XI

STATUS OF PROCESS DEVELOPMENT

XI. Status of Process Development

In general, the quality of the Aroclors produced is good and meets all specifications. In the past, however, high moisture and high chloride contents have resulted in off-grade material.

Moisture may be introduced by absorption from the atmosphere, by using dry air whose moisture content is too high and by introduction through the use of wet Attapalgus Earth in the treating operation. During seasons of the year when the humidity is high moisture may be absorbed from the air. This is especially true during sampling operations. The dry air supply is checked every other week for moisture and the activated alumina used for drying the air, is renewed as often as necessary or about once a year. Wet Attapalgus Earth has perhaps been the greatest source of moisture in finished Aroclors. At the present time all earth is being dried just before using. Plans are in preparation for installing a continuous Attapalgus Earth dryer.

Investigations have failed to disclose the reason or source of the high chloride content in finished Aroclors. Hydrogen Chloride, as an acid or gas, and calcium chloride, used in tank "breathers", are possible sources; however, this has not been definitely established.

Time Table
Aroclor Production

Operation	Liquid Aroclors 1242-1248-1254-1260-1262 Time-hour	Equivalent Lbs. of fin. Aroclor	Solid Aroclors 1268-1269-1270-1271 Time-hrs.	Equiv. Lbs. of fin. Aroclor	Resinous Aroclors 2565-4465-5460 Time-hrs.	Equiv. Lbs. of fin. Aroclor
Melting Charge CHB and DHB					(1)12.00	
Pumping Diphenyl	(1)0.40		(1)0.40		(1) 0.40	
Charging Chlorinator	0.35		0.35		1.25	
Chlorination	1242-13.00	6100	1268-23.00	7000	2565-24.00	6500
	1248-15.00	5700	1269-24.00	7200	4465-24.00	6900
	1254-19.00	7200	1270-26.00	6800	5460-28.00	6200
	1260-20.00	7800	1271-28.00	-		
	1262-21.00	8500				
Transfer to aerating tk.	0.35				0.35	
Aerating	(2)4.00				(2)4.00	
Drawing to drums					2565-3.00	
Distillation	(3)12.00		1268-16.00		4465-14.00(3)	
			1269-24.00		5460-16.00(3)	
			1270-24.00			
			1271-24.00			
Drawing to drums			1268-3.00			
Blending & treating	(4)4.00		(1)8.00		(4)4.00	
Filling containers			(1)6.00			
Filtering	(4)5.00				(4)5.00	
Filling containers					(1)4.00	
Dropping to storage	(1)2.00					
Cleaning press	(1)3.00				(1)3.00	

MONS 055052

(1) These operations are performed at such times during the operating cycle that no production time is lost.

(2) When the production rate is low, the aerating operation is performed similarly to (1) without any lost time in production. However, during a high rate of production the chlorination and distillation operations are frequently held up until the aeration operation is completed which results in a loss of production.

(3) Approximately one and one-half chlorinator batches make one still charge.

(4) Normally these charges are equivalent to approximately three chlorinator batches.

Tabulated below are the times required to make completed batches of various Aroclors. Under column A is shown the time required to make only one chlorinator batch, assuming all equipment is immediately available and no delays are encountered. Under column B is shown the minimum and maximum times required to process one chlorinator batch under normal operating conditions; that is, blending chlorinator batches during the aeration, distillation, treating and filtering operations. These times begin with the preparation of the chlorinator raw material charge and include the entire processing time after the finished Aroclor has been packaged or pumped to the completed storage tank for further handling.

Aroclor No.	A Hours	B Hours Min.	B Hours Max.
1242	35.0	42.0	62.0
1248	37.0	44.0	64.0
1254	41.0	48.0	68.0
1260	42.0	49.0	69.0
1262	43.0	50.0	70.0
1268	43.0		
1269	63.0		
1270	65.0		
1271	67.0		
2565	45.0		
4465	65.0	71.0	83.0
5460	67.0	73.0	85.0

It should be noted that the above tables are only approximate and are dependent on having practically ideal working conditions.

If the department were operating at full capacity the main bottlenecks would be insufficient aerating and storage tank capacities.

The aerating capacity is inadequate when operating at full capacity, especially when making the low numbered Aroclors, and when changing from one type of Aroclor to another. In the first case, operating at full capacity producing low gravity Aroclors, the aerating capacity should be increased by at least 40% to prevent any lost time in production. In the second case it is possible to loose as much as twelve hours production time when changing from one type of Aroclor to another.

The present storage tank capacity will hold less than eight days' production of liquid Aroclors when operating at full capacity.

It is practically impossible to put operations in a complete balance due to the fact that different types of Aroclors are made, each requiring a different length of time for processing. If, however, the present aerating capacity were doubled, production lost time would be reduced to a minimum.

MONS 055053

The most effective means to reduce the cost in the present equipment

PART V-C By-PRODUCT SPECIFICATION

Muriatic Acid - 20°Be' Commercial

Property	Specification	Method No.
Appearance & Color	Colorless to light yellow liquid, N.P.A. 1.5 Max.	10,070-40
Turbidity	Practically clear	10,071-40
Sulfates(H_2SO_4)	0.01% Max.	10,073-40
As_2O_3	0.0001% Max.	10,074-40
Assay (HCl)	31.45% Min.	10,072-40

PART VI

PROCESS IN DETAIL
COMMENTS ON PROCESS

VI-A. PROCESS IN DETAIL

Raw Materials:

Diphenyl is received in 8,000 and 10,000 gallon tank cars from Anniston. It is necessary to melt a vent hole through the solid mass by insertion of a hair pin steam coil through the dome before steam is applied to the car coils. This avoids creation of excessive pressure. When the diphenyl is completely melted, a sample is taken for the laboratory and the car emptied through a standpipe by means of air pressure, to underground storage tanks. These tanks are maintained at 90°C by means of Fulton Sylphon regulators and the temperatures are recorded on an L & N recorder in the control room.

Chlorine is received by pipe line from the chlorine division. Cell gas of 95% purity is usually received; however, in order to facilitate operation of the chlorine liquefaction system "sniffed" gas ranging from 75% to 95% purity is received occasionally. A vaporizer is available for use of liquid chlorine from cylinders.

Distilled High Boiler is received in drums or bags from Plant D where it is a by-product of the diphenyl process.

Crude High Boiler is received in drums from Plant D where it is a by-product of the diphenyl process.

Toluene is received from Dept. 226 through the warehouse in 55-gallon drums. It is used in combination with 9 parts of Arocolor 1262 to make Arocolor 1262 Mix.

Hydrated Lime is received in 50 pound paper bags from the warehouse. It is used to protect the distillation equipment from free hydrogen chloride and to prevent the sublimation of ferric chloride during distillation.

Attapolgus Earth is received from the warehouse in 50 pound paper bags. It is used to reduce moisture and chloride content and to improve electrical properties of liquid Arocolors.

Liquid Arocolors:

Liquid Arocolors are made by chlorinating diphenyl to 42, 48, 54, 60 or 62% chlorine content. Thus, a series of products is obtained ranging from a light oily liquid to a thick sticky one. The products of this group are identified by four digit numbers; the last two represent the chlorine content and the first two the condition (crude or distilled). Crude Arocolors of this group would be 1142, 1148, 1154, 1160 and 1162; and distilled Arocolors would be 1242, 1248, 1254, 1260 and 1262.

Preparation of individual products in this series is essentially the same except for weight of diphenyl in the charge and specific gravity at the end of the chlorination. Batch data are listed on the chart below.

The prescribed charge of diphenyl is pumped from the storage tank

to the measuring tank by opening the proper valve in the overflow return line. The four overflow levels permit charges of 1800, 2800, 3600, and 4000 pounds. The charge is dropped by gravity into No. 2, 3 or 4 chlorinator. No. 1 chlorinator is reserved for crystalline and resinous Arcolors, so as to avoid contamination. These chlorinators are sixteen feet high and contain an eight foot bed of iron turnings which have been burned free of oil and moisture over an open gas flame prior to introduction into the unit. Addition of two or three hundred pounds of burned turnings is necessary every three or four months to maintain the proper depth of this catalyst bed.

Chlorine gas is admitted to the bottom of the chlorinator by means of a distributor from which it passes up through the catalyst bed. A temperature of 150°C or less must be maintained to avoid sublimation of Arcolor and diphenyl and subsequent plugging of the off-gas line from condensation. The temperature is controlled by regulating the rate of chlorination and using city water in the chlorinator jackets for cooling. To avoid sublimation of diphenyl, circulation of the charge by means of a centrifugal pump is delayed until four hours of chlorination have been completed. The charge is then circulated out the bottom and back into the top of the chlorinator for the remainder of the reaction period. The temperature is maintained within the prescribed limits for each product by applying cooling water to the chlorinator jacket. Progress of the reaction is checked every two hours starting with the fourth hour by determining the specific gravity. When approaching the desired specific gravity more frequent checks are necessary. When a specific gravity within the specified range is obtained, the chlorine is shut off and the batch pumped to the blow tank. The HCl line valve must be closed and the vent line from chlorinator to blow tank open in order to prevent scrubber tank material being sucked out. Observation of manometer during pumping will provide warning of trouble.

Crude Arcolors are aerated for four hours with dried air (from Lectrodryer). This removes most of the free hydrogen chloride. The products in this state are known as crude Arcolors. These may either be packaged for sale as such or refined by distillation and Attapulgus Earth treatment.

Liquid Arcolor Batch Data

	Type Arcolor				
	1142-1242	1148-1248	1154-1254	1160-1260	1162-1262
Diphenyl Charge	4000#	3600#	3600#	3600#	3600#
Finishing Temperature	120-135°C	120-135°C	120-150°C	120-150°C	120-150°C
Reaction Time	12-15 hrs.	14-16 hrs.	18-20 hrs.	18-22 hrs.	20-24 hrs.
Final Sp. Gr.	1.348-54 @ 65°C	1.418-14 @ 65°C	1.508-46 @ 65°C	1.558-62 @ 90°C	1.568-76 @ 90°C
Crude Wt.	6,483#	6,600#	7,571#	8,227#	8,850#
Distilled Wt.	6,165#	6,336#	7,200#	7,845#	8,517#
Tons HCl produced	1.24	1.43	2.05	2.22	2.43

MONS 054948

Vacuum distillation of liquid crude Arocolors and treatment with Attapulgus Earth produces a series of products similar in consistency to their respective crudes, but of clear light yellow to nearly white color instead of black. The first two digits of the identifying numbers are changed to 12 to signify the distilled product.

A 10,000 pound charge (40" in blow tank) of aerated Arocolor is pumped from the blow tank to either still. A heel from the preceding batch is kept circulating through the furnace coil between runs to prevent a freeze-up while 5 pounds of gas pressure is maintained on the furnace burners. Thirty pounds of lime are added to the still to neutralize any residual hydrogen chloride and the charging pipe cap is screwed down. Pressure is reduced to 7 mm Hg absolute by means of a three stage vacuum jet. Well water and 200-lb. pressure steam is used for the jet. Gas pressure to burners is boosted to either the maximum for the particular Arocolor as shown below or to a lesser value governed by operating rate.

Arocolor	1142	1148	1154	1160	1162
Furnace Gas pressure lbs. gauge	12	14	18	20	22

One half hour after condensate flow commences, adjust well water on Vogt condenser to such a rate as to provide a 20 to 30°F rise from inlet to outlet. This half hour delay permits the distilled water system to come up to temperature. The distilled water made by condensing steam is evaporated in the Arocolor condenser and condensed by well water in the Vogt condenser and recirculated. Well water should be shut off an hour prior to completion of the distillation to prevent higher boiling Arocolors from freezing in the condenser. Depending on the Arocolor being distilled, initial condensation will occur at a coil inlet temperature of about 200°C to 210°C and the end of the distillation will occur at a coil inlet temperature of about 275° to 300°C. When the spread between coil inlet temperature and vapor temperature reaches 40°C. distillation is considered complete. At this point the vacuum release valve is opened and on every fourth batch the residue is drained to the constant level point. This leaves enough heel to circulate and prevent a freeze-up. The gas pressure on the furnace burners is reduced to 5 lb./sq.in. just prior to draining of residue and during time between batches. Residue in open top cans is quenched with water to drown the fumes and finally scrapped. A very small amount is sold.

Distillate is pumped from the receiver to the blending tank where two batches are accumulated before being treated with ten pounds of dried Attapulgus Earth which acts as a scavenger for HCl and water. It is necessary to dry the Attapulgus Earth in order to be able to remove the moisture from the product. Analyses have shown as high as 9.5% moisture during periods of trouble.

Treatment is continued for four hours as the temperature is raised

to 150°C. At this temperature filtering characteristics are good. The Arocolor is filtered to a receiver through a Sparkler filter. During the filtration a half gallon sample is taken for control analysis which covers all tests of finished material except corrosion test. If quality is satisfactory, the filtered product is transferred to a storage tank from which, after mixing by circulation for six hours and sampling, it may be pumped to drums, tank cars, or a Pyranol mixing tank. Samples taken at this point are a half gallon for reserve, a gallon for complete analysis, and a 5 pint sample for General Electric which must be in a brown glass bottle. Tin lined buckets or glass bottles are used for the other samples. Satisfactory quality on all specifications must be found on analysis and a release must be obtained from General Electric Co. before pumping from storage to containers or mixing tank.

Arocolor 1262M is a mixture of 9 parts Arocolor 1262 and one part toluene.

Crystalline Arocolors

Crystalline Arocolors are made by chlorinating diphenyl to 69% or more chlorine content. 71% chlorine represents decachlordiphenyl and is therefore the upper limit. A two step chlorination is used in which the first step is much the same as that for liquid arocolors while the second step is performed in an agitated cast iron vessel provided with gas firing to maintain fluidity after chlorination is complete. Crude Arocolors in this group are 1169, 1170 and 1171 which become 1269, 1270 and 1271 on distillation. Distillation is accomplished in gas fired retorts. Distillate is flaked off a chilling roll and packed in barrels.

Diphenyl is charged to the chlorinator from the measuring tank. Only 2800 pounds is used in a batch. This amount is frequently adjusted to allow for charging scrubber liquor. Such adjustments are figured by the foreman and issued with scrubber liquor charging instructions when scrubber liquor specific gravity reaches 1.350 to 1.400 or drops below 1.200. If this precaution is not taken, there is danger of a freeze-up in the scrubber system.

Chlorine is passed through the distributor and into the catalyst bed of iron turnings. After four hours of chlorination, the charge is sufficiently reacted to avoid sublimation of diphenyl, so circulation of the charge by pump is possible. Also, at this point, the determination of specific gravity every two hours is begun. A temperature rise to 150°C is permitted until a specific gravity of 1.570 @ 100°C is reached. The charge then undergoes several changes as chlorination progresses. It becomes sticky, plastic and finally crystalline when cool. From this last point on, hold points are run instead of specific gravities and the reactor temperature is maintained 25 to 50°C above the hold point. An hour before completion of this preliminary chlorination, fire is applied to the circulating line, bottom ring of the reactor and dropping line to the secondary chlorinator. The batch is ready to be transferred to secondary chlorinator when its hold point reaches

185°C to 195°C. The chlorine is shut off and the circulating pump stopped. The batch is dropped to the secondary chlorinator which is an agitated cast iron vessel mounted on a gas fired furnace. This vessel must have less than 15 inches of Aroclor in it to hold a fresh batch. Drain lines are left open for 10 minutes to permit complete drainage and avoid freeze-ups. The primary chlorinator is not recharged until the secondary chlorination is complete.

The agitator of the secondary chlorinator is started and chlorine gas fed in through the dip pipe. Because the scrubber for No. 1 chlorinator is also used for the secondary chlorinator operation, it is necessary to close the off-gas line between the scrubber and No. 1 chlorinator to prevent fumes from backing into No. 1 chlorinator. The chlorine pressure is maintained at 3 to 5 pounds per sq. in. to give an increase in hold point of 15° to 20°C per hour. The temperature is maintained 25°C to 50°C above the hold point.

Overheating can be overcome by reducing chlorine feed and opening furnace doors. Chlorination is continued until the hold point is within the range specified for the particular Aroclor (see table below). It is necessary to clean the off-gas line and separating pot after every other batch. Cleanings are charged to the secondary chlorinator.

	1169	1170	1171
Final Hold Pt.	235-245 ~~255-260~~°C	250-255 ~~265-270~~°C	305°C Min.
Temperature Start	220°C	220°C	220°C
" Finish	325°C	325°C	325°C
Second Chlorination Time	24 hours	24 hours	24 hours
Batch Weight	8000#	8100#	

Distillation of crude crystalline Arocolors produces Arocolors 1269, 1270 and 1271. It is accomplished by drawing 500 pound charges from the chlorinator to retort pots which can be hoisted by crane to positions on two furnaces. Filling is done on a small rail cart which carries the retort from the scale to a position under the crane. A lid with a vent on it is clamped to the top with C-clamps. The retort is equipped with a channel about half way up the inside in which Arocolor collects after condensing on the wall. A pipe connection is made from the outlet of this channel to the pan of the flaking roll after the retort has been swung into position on the furnace. Heat is applied by means of gas burners in the furnace. When distillation commences the first condensate known as "preruns" is off grade and is run into drums. Likewise, the distillate at the end of the run is contaminated and is diverted into drums with the preruns. Off-grade fractions are charged back in later distillations. The major portion of the distillate is run into the gas heated flaker pan from which it is picked up by the chilling roll. The roll is normally cooled with low pressure steam, but sometimes water is used. The solid Arocolor is cut off the roll as flakes, by means of a bronze knife and is conveyed

to hoppers from which barrels are filled. Termination of the distillation is readily noticeable because of a mild decomposition which takes place. Fumes from the decomposition as well as those from handling the molten product are exhausted by two fans after passing through cyclone collectors. Retorts are replaced by charged ones and residue cleaned from them.

Resinous Arocolors

Resinous Arocolors result from the chlorination of high boilers from diphenyl or mixtures of high boilers and diphenyl. Arocolors 2565, 4065, and 5060 are included in this group. Arocolor 1168 is classed with this series because of the similarity of processes even though the product is more nearly like the crystalline Arocolors.

Diphenyl is pumped from storage tank to measuring tank where valve setting permits overflow of excess to return to storage. It is then dropped to No. 1 chlorinator by gravity providing the chlorinator temperature is below 150°C. High boilers in cans are broken up and charged to the melter from which, when molten, the charge is blown to the chlorinator. High pressure, 200 lb. steam is used to melt the high boilers in the melter.

Chlorine is admitted through the distributor and passes up through the charge and an eight foot depth of iron turnings catalyst. After four hours of reaction the tendency of diphenyl to sublime has been reduced sufficiently to permit circulation of the charge by centrifugal pump. Specific gravity is determined at this point and every two hours thereafter until it reaches about 1.500. From this point on hold points are determined on 1168 and softening points on the others. The temperature increases during the chlorination from 120°C to 150°C at the start to 175°C to 210°C at the finish. Application of water to the jacket provides control. When the hold point or softening point is within the limits indicated in the table below, reaction is considered complete. Chlorine is shut off, and fire is applied to the bottom ring of the chlorinator as well as to the dropping line. The batch is dropped to the blow tank where it is aerated for four hours with dry air (from Lectrodryer). Crude Arocolors are drawn to containers from the blow tank or transferred to the still.

Distillation of resinous Arocolors is performed at 7 m.m. Hg absolute pressure. Heat is supplied by pumping the material through coils in a gas fired furnace. Vacuum is applied by means of a three stage steam ejector. The distillation rate is controlled by the gas pressure at the burners. This is specified by the foreman according to the desired rate of operation. Toward the end of the distillation the temperature difference between vapor and liquid entering the still increases sharply. When this difference is 50°C, the distillation is considered complete. The gas pressure is reduced to 5 pounds per sq. in. and the circulation pump is kept operating to prevent a freeze-up. Residue is removed after every fourth charge by draining out the constant level line which leaves sufficient heel to maintain circulation. It is run into drums which are quenched with water to control fumes. A coke packed scrubbing tower is used in the vacuum line

to prevent product from reaching the jets. The coke is saturated with 50% NaOH solution which neutralizes any HCl given off thus protecting the jets from corrosion. Distillate is drawn from the receiver into drums or cans for shipment.

	Raw Material No.	1168 1268	2565	4065 4465	5060 5460
Charge:					
Diphenyl	611	2800#	1800#	1800#	
Distilled High Boiler	619			1200#	3300#
Crude " "	618		600#		
Initial Temperature		120°C	120°C	120°C	120°C
Final "		190°C	175°C	175°C	210°C
" Hold Point		145-155°C			
" Softening Point			68-70°C	72-74 75-80°C	108-110°C
Batch Wt. Crude		7800#	6560#	7725#	7800#
" " Distilled		7000#		6950#	6200#

Hydrogen Chloride Absorption

Hydrogen chloride evolved in the reaction is passed through a scrubbing tower to remove entrained Arocolor and then either to absorbers or to Dept. 217.

By-product hydrogen chloride is passed through a scrubbing tower on leaving the chlorinator. The tower contains 8 feet of Raschig Rings over which light Arocolor is circulated counter current to the rising gas. Unreacted chlorine as well as organic matter is removed in the scrubbing. On the discharge of the scrubber is a cyclone separator which further reduces the entrained organic matter.

Scrubbed gas passes to either the absorption system or Dept. 217. The absorption system consists of a tantalum absorber and a set of silica tourills. The gas is absorbed in city water in both units. The water feed rate is adjusted by means of a rotameter to produce 20.20° Be acid. Heat of dilution is dissipated by means of water in the jacket of the tantalum condenser and just enough water is used for the wall to be warm to the touch. On the tourills enough water is used to keep the entire length wet. In addition, gas is received from Dept. C-248, and when Dept. 217 operation is reduced, gas is received from Dept. 233. In operating either absorber the water rate is regulated by rotameter to produce acid of 20.20° Be at 65°C. This crude acid is collected in receivers for processing in Dept. D-218.

MONTARS

Aroclor still residue is known as Montar. No significant commercial uses have yet developed, although it appears that Montars may be useful in imparting certain higher melting characteristics to asphalt mixtures in the production of tile or other articles of commerce, compounded as asphalt compositions.

The Montars are derived as follows:

Montar No. 1	Aroclor 1242 Still Residue
Montar No. 2	Aroclor 1248 Still Residue
Montar No. 3	Aroclor 1254 Still Residue
Montar No. 4	Aroclor 1260 Still Residue
Montar No. 5	Aroclor 5460 Still Residue
Montar No. 6	Aroclor 4465 Still Residue
Montar No. 7	Aroclor 1262 Still Residue
Montar No. 9	Santowax Still Bottoms
Montar No. 10	(50% No. 5) (50% No. 9)

The properties of the Montars are as follows:

Montar No. 3

Softening Point (ASTM)	130-160°C
Flash Point	570°F (298°C)
Fire Point	None at 650°F (343°C)
Acidity (Mgm NaOH/gm)	Slightly basic
Chlorine	51.6%
CaO	3.47%
Fe	0.31%

Montar No. 4 (Polychlorinated Polyphenyl)

Softening Point	191-208°C
Penetration, 250 gm wt.	0 at 75°C

Montar No. 5 (Polychlorinated Polyphenyl)

Softening Point	165 - 180°C
Penetration, 250 gm wt.	2 cm x 10^{-2} per min. at 75°C
Chlorine	57-59%
CaO	Max. 1.6%
Fe	Max. 0.12%

Montar No. 6 (Polychlorinated Polyphenyl)

Softening Point	168°C
Chlorine	59.9%
CaO	2.0%
Fe	0.13%

Monter No. 9

Softening Point (ASTM)	140-160°C
Flash Point	495°F (257°C)
Fire Point	580°F (304°C)
Acidity (Mgm NaOH/gm)	0.10%
Chlorine	0.18%
CaO	None
Fe	0.21

Monter No. 10 (Mixed Polyphenyl and Polychlorinated Polyphenyl)

Softening Point	139°C
Penetration	47 cm x 10^{-2} per 5 sec. at 75°C

Reference: The above information was taken from a memo dated May 10, 1946 from Mr. Logue to Mr. Barbre.

VI-B. COMMENTS ON PROCESS

In charging diphenyl a temperature of 85° should be maintained in the measuring tank and transfer to the measuring tank should not be made more than one hour prior to time of use. The chlorinator temperature should be 150°C or less before charging to avoid freeze-ups from sublimed diphenyl. All diphenyl lines should be steam traced. City water is used in the chlorinator jackets, for cooling, to reduce scaling to a minimum.

Use no steam on blow tank coils when aerating Arocolors 1142 and 1148. Loss of product would result from aerating at elevated temperatures.

Care is necessary to avoid freeze-up of still coil. The circulating pump has an alarm which rings when operation is interrupted. In addition, the maintenance of a sufficient heel to circulate continuously is necessary. For extended shutdowns the coil is "sucked" out, all arocolor removed from the coil, by proper manipulation of valves, vent and the vacuum system.

In addition to its action as a catalyst, the bed of iron filings provides more intimate contact between chlorine and diphenyl and reduces corrosion of the reactor wall. Corroding of the catalyst makes it necessary to inspect it monthly and replenish if necessary. Presence of chlorine in off-gas is indicative of the need to replenish the catalyst. This condition may develop between inspections should moisture be present in a charge or a leak develop in the jacket. Iron filings which have been burned free of oil and moisture are used to restore the bed to normal size. Under normal conditions 200 to 300 pounds must be added every 3 or 4 months .

Because the freezing points of both diphenyl and highly chlorinated arocolors are high, the scrubber liquor for off-gas must be maintained in an intermediate specific gravity range of 1.200 to 1.400. During rapid operation the specific gravity tends to increase because of an excess of chlorine in the off-gas, whereas, during slow operation it tends to decrease due to an excess of diphenyl in the off-gas.

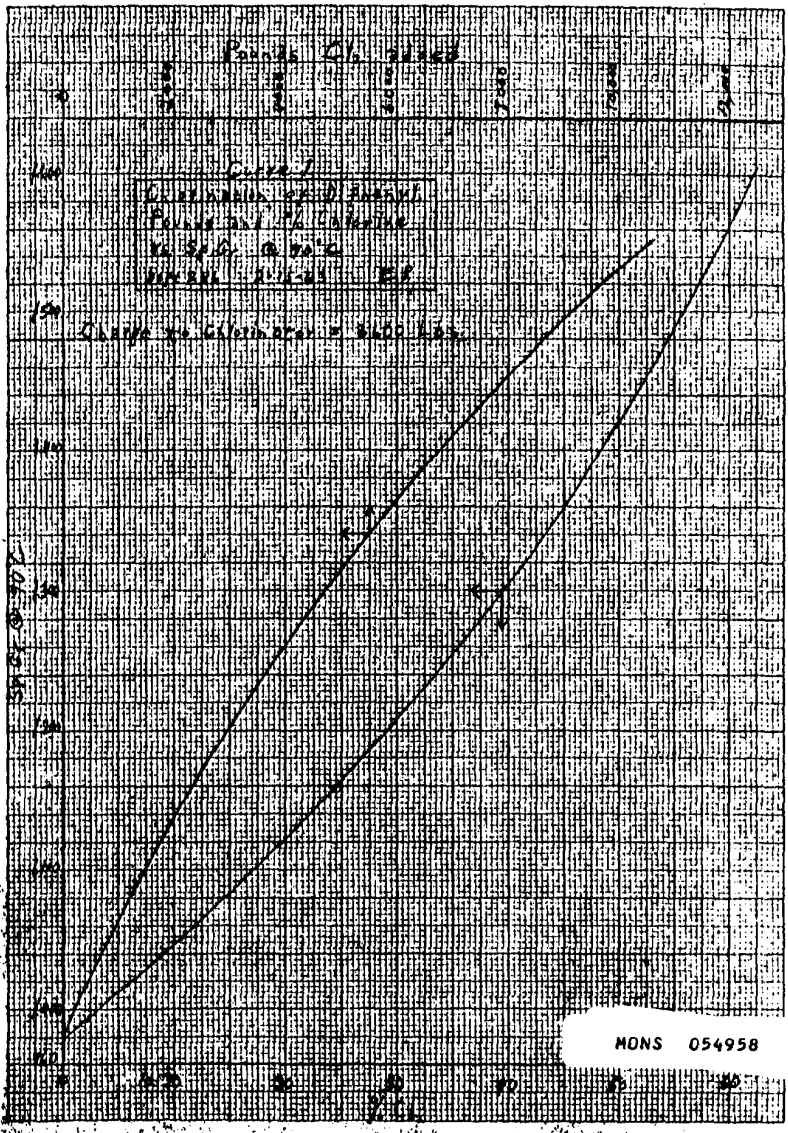
Vacuum trouble on the stills is usually caused by flashing of product, plugging of vacuum line or improper functioning of the jets. Flashing can usually be stopped by reducing the load on the condenser by slower operation or by increasing the condenser capacity through lower water inlet temperature. Plugging of lines ahead of the still receiver could also cause flashing and heating of these lines with a flame is necessary to remove solids. Plugging of vacuum lines between receiver and tower is usually overcome by tapping which loosens the scale and permits it to be carried to the tower. In general, the jets will perform satisfactorily if pipe scale is kept away from them by strainers in the stream line, and if inter-condensers are operated at a lukewarm temperature. When none of the above are responsible for vacuum trouble an examination of the jets and scrubbing tower is indicated. The tower has a removable top which permits access to the top screen and upper section of coke on which Arocolor may collect. Replacement of that portion of coke which is coated with Arocolor and cleaning of the screen is generally necessary. Liquid Arocolors are removed by draining

through a valve in the bottom. Coke in the tower should be treated annually with caustic to neutralize any acid fumes drawn into it. This is done by filling the tower with 50% caustic from drums. After 24 hours of soaking the caustic is drawn out the bottom and the tower closed up for use.

In charging high boilers to the chlorinator, it is necessary to blow the line out thoroughly with air after melt tank is empty in order to avoid a freeze-up. For the same reason the charging lines to each of the other three chlorinators are blown out.

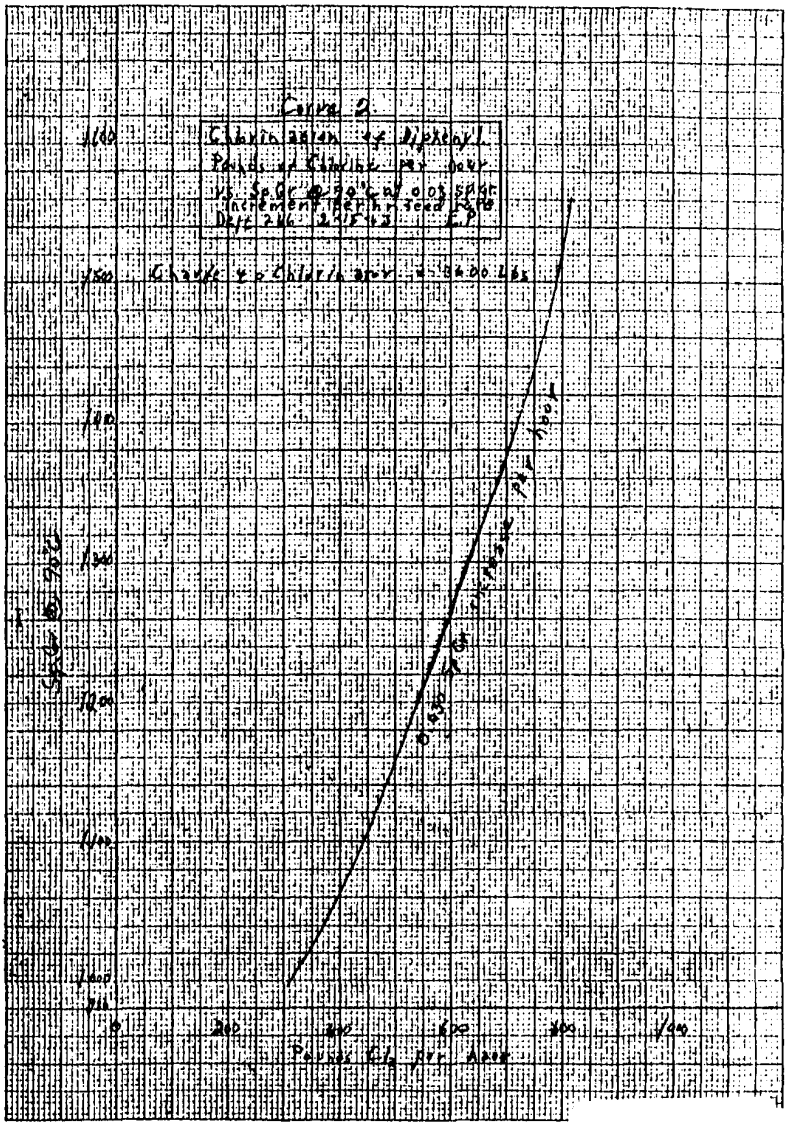
In aerating resinous Arcolors, low pressure steam is used on the melt tank coils for 2565 and 4065, but high pressure steam is necessary for 5060.

MONS 054957



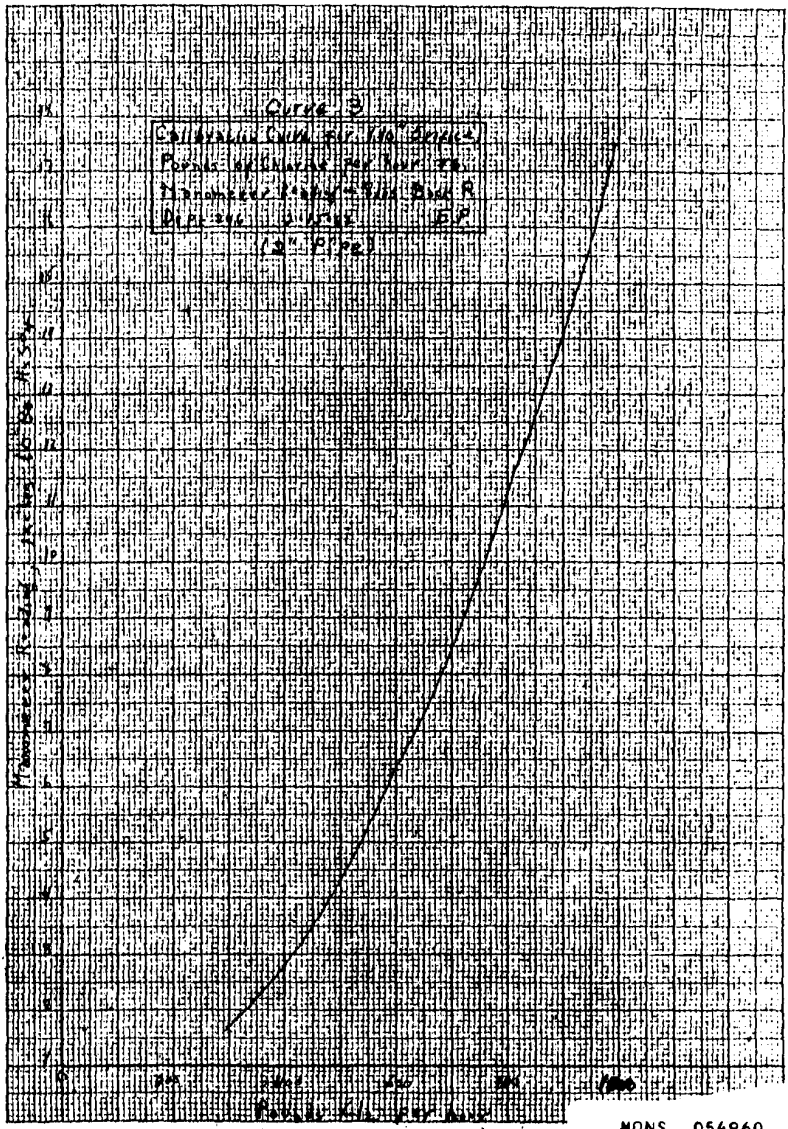
MONS 054958

A-8395



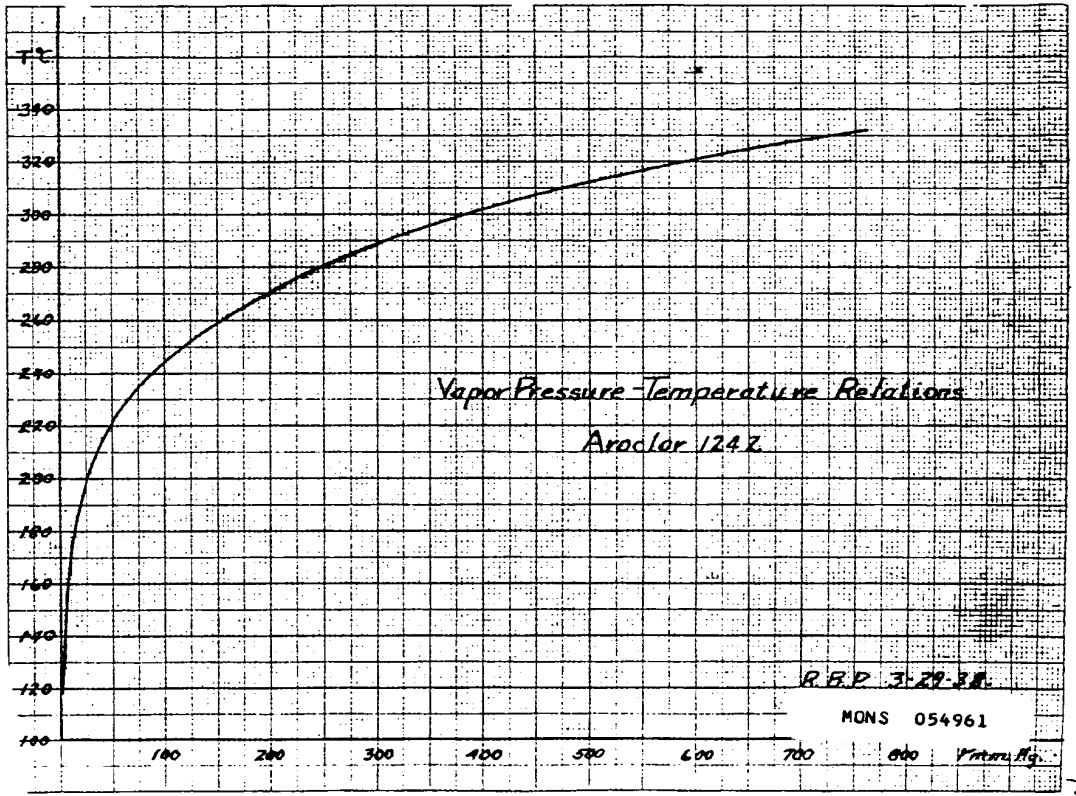
MONS 054959

A-8394

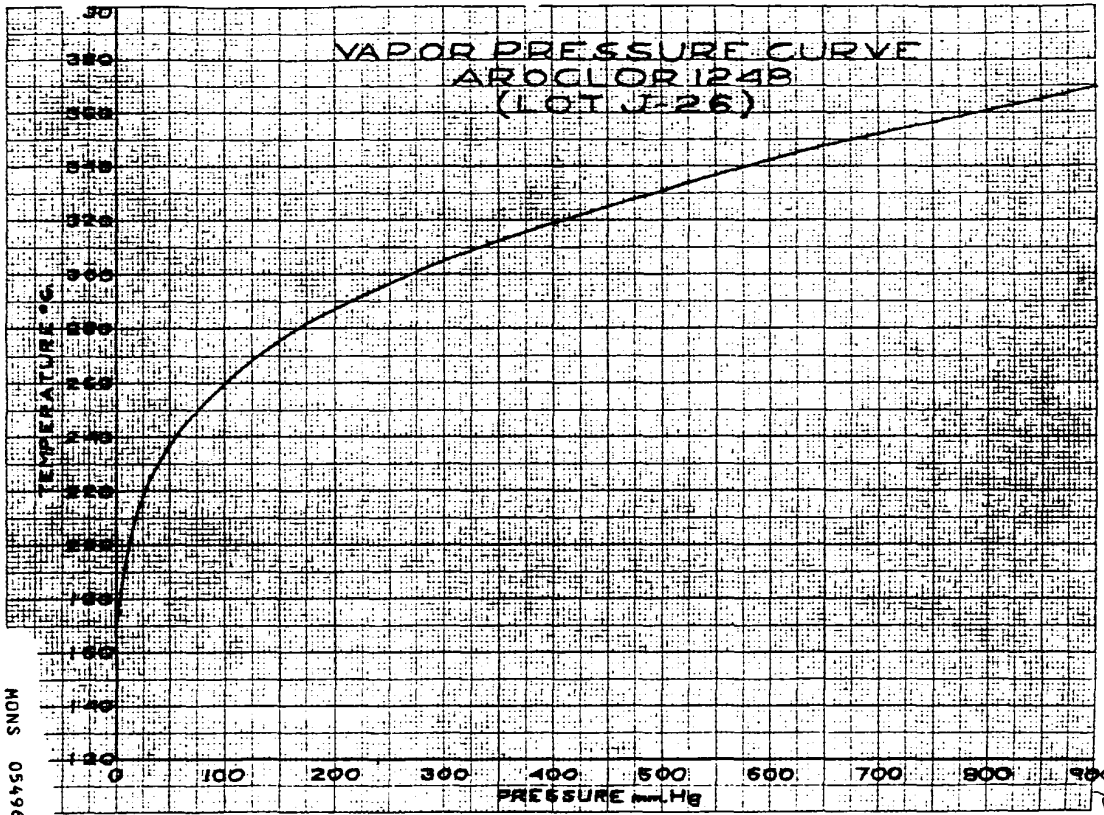


MONS 054960

IA-8395

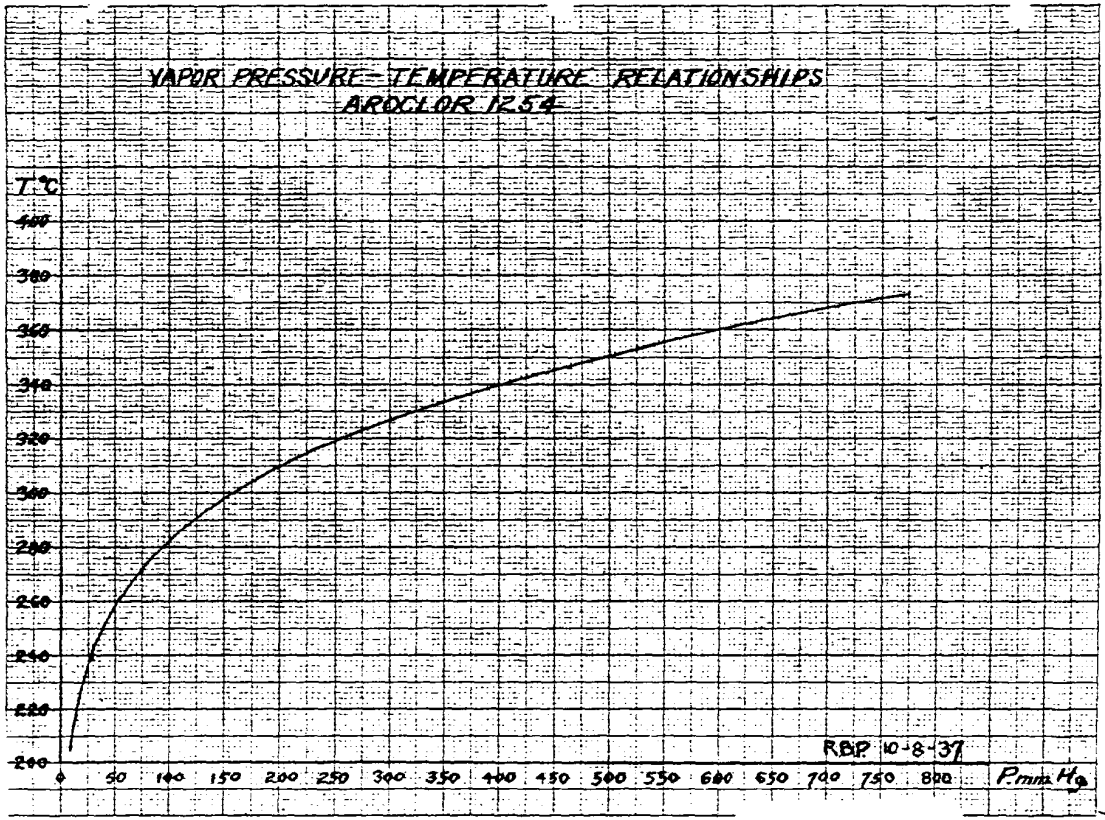

T°C
390
320
300
280
260
240
220
200
180
160
140
120
100
100
200
300
400
500
600
700
800
mm Hg.
Vapor Pressure-Temperature Relations
Aroclor 1242
R.R.P. 3-29-38.
MONS 054961

A6569



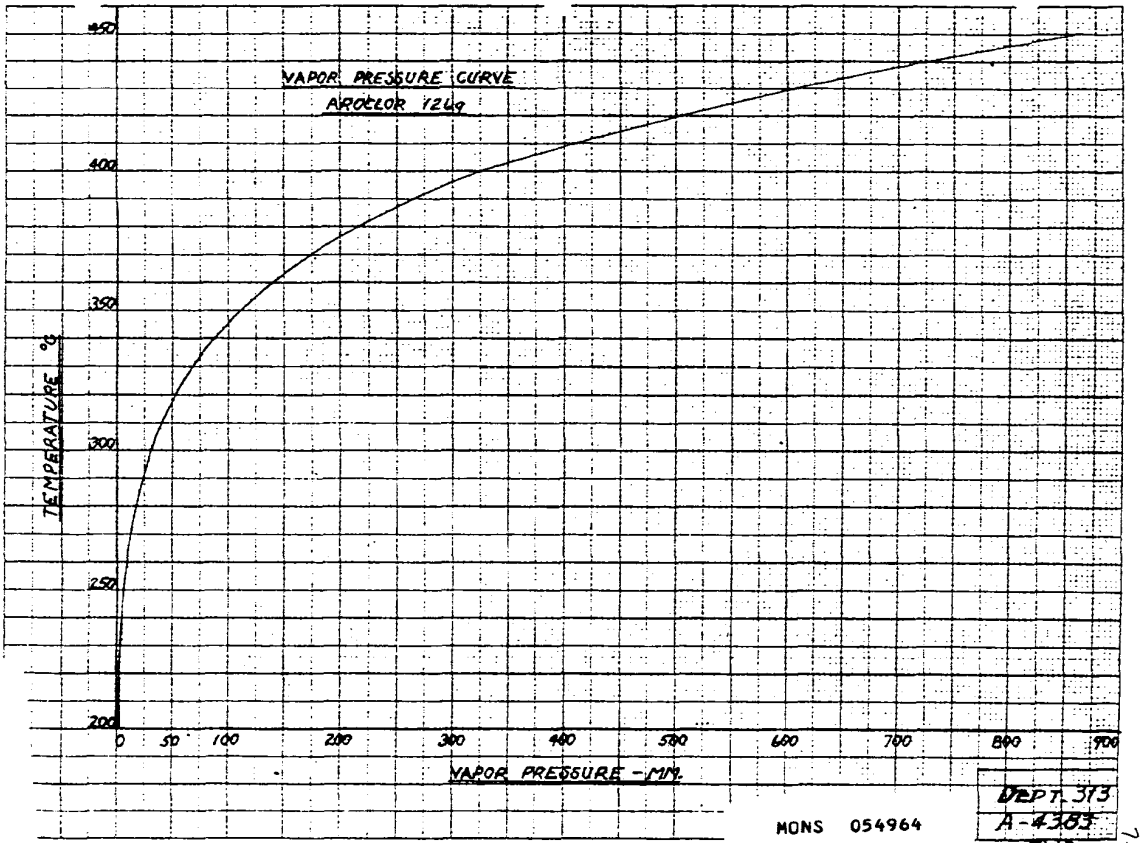
RBP
3-22-31

MONS 054962



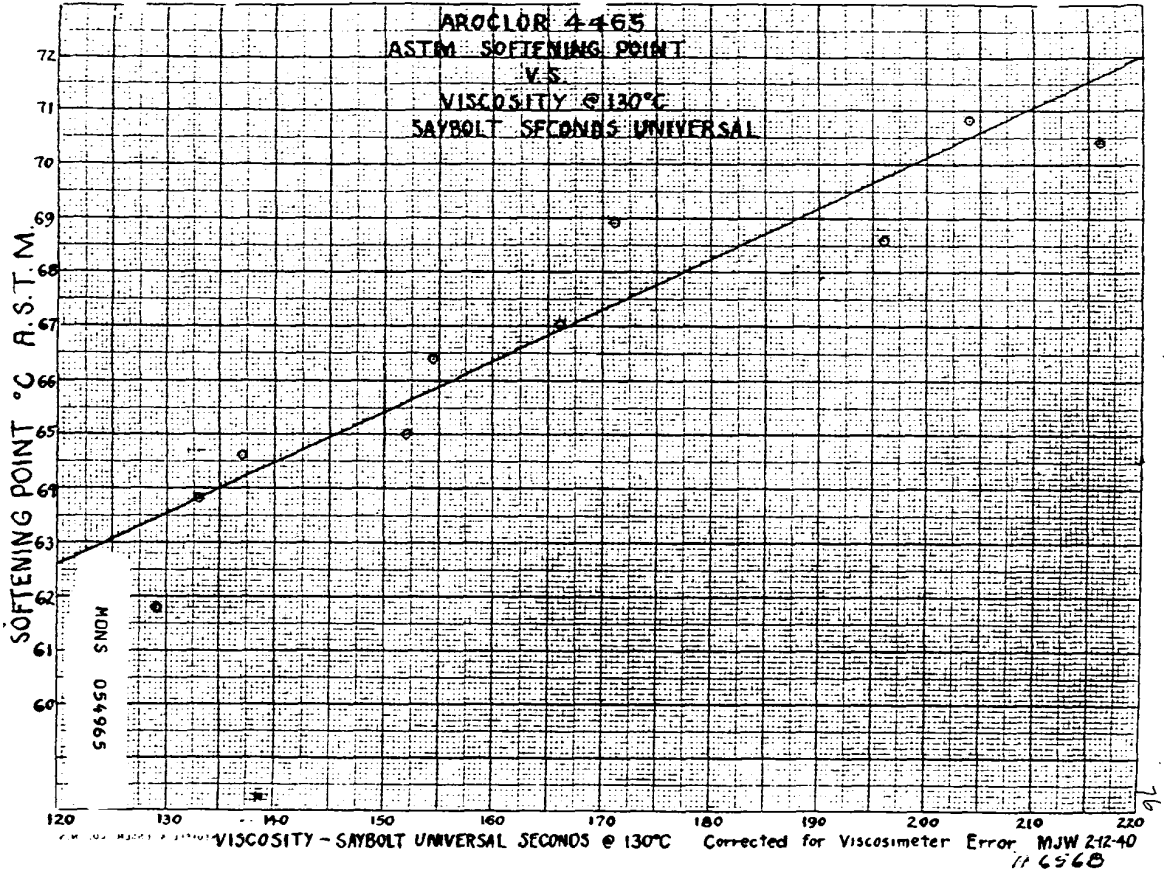
MONS 054963

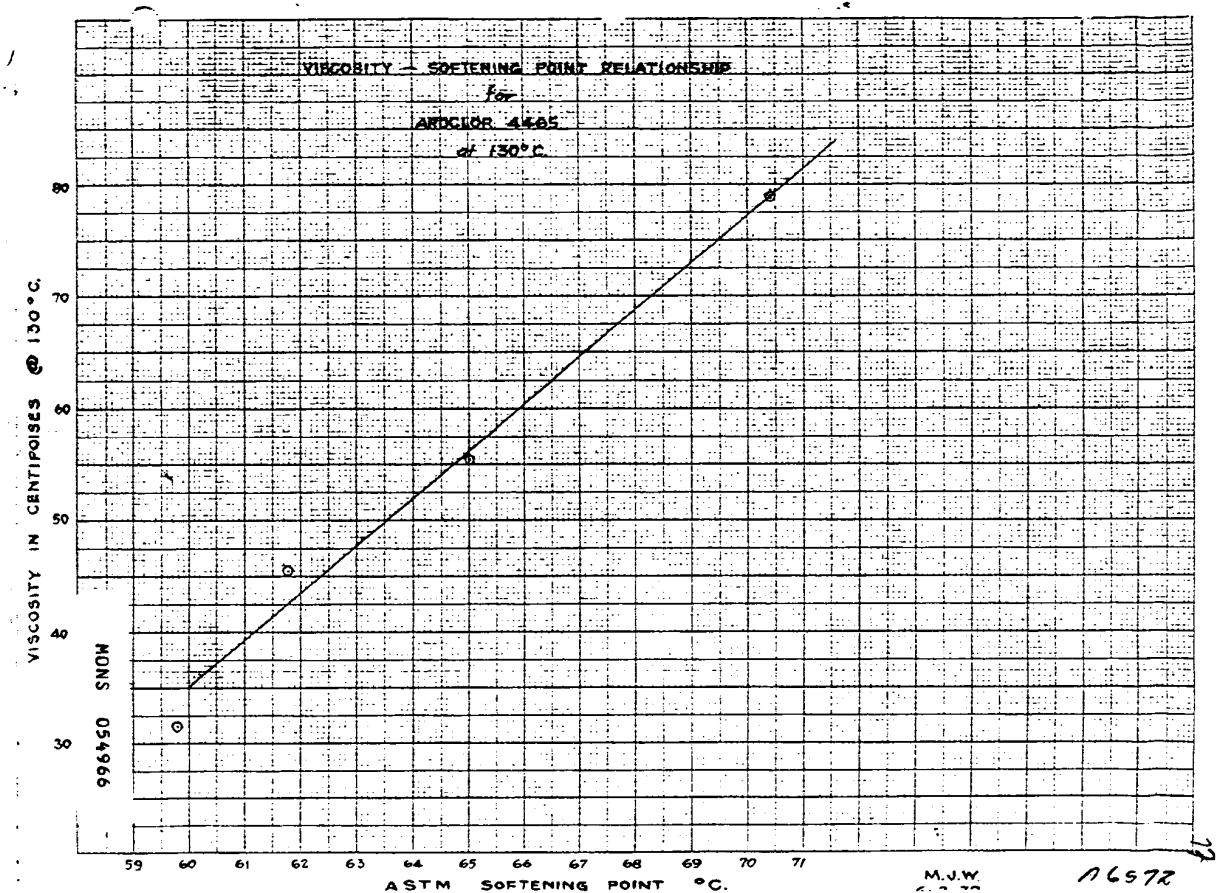
A6571

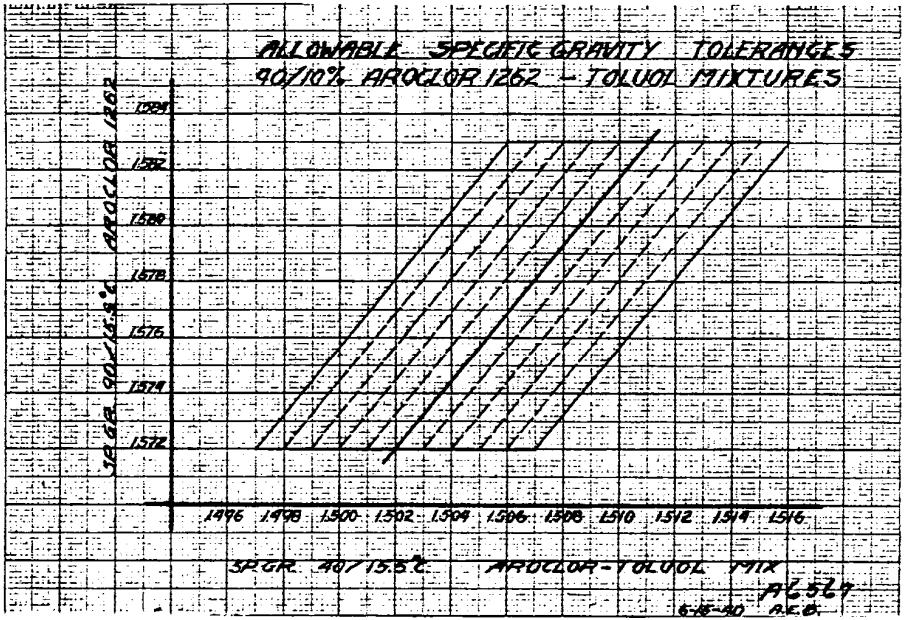


MONS 054964

DEPT. 313
A-4383
T.W.D.
12-23-36


AROCLOR 4465
ASTM SOFTENING POINT
V.S.
VISCOSITY @ 130°C
SAYBOLT SECONDS UNIVERSAL
SOFTENING POINT °C A.S.T.M.
72
71
70
69
68
67
66
65
64
63
62
61
60
120
130
140
150
160
170
180
190
200
210
220
VISCOSITY - SAYBOLT UNIVERSAL SECONDS @ 130°C Corrected for Viscosimeter Error MJW 2-12-40
MONS 059965


VISCOSITY — SOFTENING POINT RELATIONSHIP
for
ARDCLOR 4485
at 130°C.
VISCOSITY IN CENTIPOISES @ 130°C.
80
70
60
50
40
30
59
60
61
62
63
64
65
66
67
68
69
70
71
ASTM SOFTENING POINT °C.
M.J.W.
A6572


ALLOWABLE SPECIFIC GRAVITY TOLERANCES
90/10% AROCLOR 1262 - TOLUOL MIXTURES
SP GR 90/15.5°C AROCLOR 1262
1584
1582
1580
1578
1576
1574
1572
1496 1498 1500 1502 1504 1506 1508 1510 1512 1514 1516
SP GR 90/15.5°C AROCLOR-TOLUOL MIX
AC 527
6-15-60 A.C.B.

MONS 054967

79

A-5190.

MONS 054968

HYDROCHLORIC ACID

Authority - W. C. Ferguson

This table has been approved and adopted as a standard by the Manufacturing Chemists' Association of the United States.

°Be. at 60/60°F. vs. %HCl

Sp.Gr.	Be.°	% HCl	Sp.Gr.	Be.°	% HCl	Sp.Gr.	Be.°	% HCl
1.0741	10.00	14.83	1.1363	17.4	26.90	1.1713	21.2	33.69
1.0761	10.25	15.22	1.1372	17.5	27.07	1.1722	21.3	33.88
1.0781	10.50	15.62	1.1381	17.6	27.24	1.1732	21.4	34.07
1.0801	10.75	16.01	1.1390	17.7	27.41	1.1741	21.5	34.26
1.0821	11.00	16.41	1.1399	17.8	27.58	1.1751	21.6	34.45
1.0841	11.25	16.81	1.1408	17.9	27.75	1.1760	21.7	34.64
1.0861	11.50	17.21	1.1417	18.0	27.92	1.1770	21.8	34.83
1.0881	11.75	17.61	1.1426	18.1	28.09	1.1779	21.9	35.02
1.0902	12.00	18.01	1.1435	18.2	28.26	1.1789	22.0	35.21
1.0922	12.25	18.41	1.1444	18.3	28.44	1.1798	22.1	35.40
1.0943	12.50	18.82	1.1453	18.4	28.61	1.1808	22.2	35.59
1.0964	12.75	19.22	1.1462	18.5	28.78	1.1817	22.3	35.78
1.0985	13.00	19.63	1.1471	18.6	28.95	1.1827	22.4	35.97
1.1006	13.25	20.04	1.1480	18.7	29.13	1.1836	22.5	36.16
1.1027	13.50	20.45	1.1489	18.8	29.30	1.1846	22.6	36.35
1.1048	13.75	20.86	1.1498	18.9	29.48	1.1856	22.7	36.54
1.1069	14.00	21.27	1.1508	19.0	29.65	1.1866	22.8	36.73
1.1090	14.25	21.68	1.1517	19.1	29.83	1.1875	22.9	36.93
1.1111	14.50	22.09	1.1526	19.2	30.00	1.1885	23.0	37.14
1.1132	14.75	22.50	1.1535	19.3	30.18	1.1895	23.1	37.36
1.1154	15.00	22.92	1.1544	19.4	30.35	1.1904	23.2	37.58
1.1176	15.25	23.33	1.1554	19.5	30.53	1.1914	23.3	37.80
1.1197	15.50	23.75	1.1563	19.6	30.71	1.1924	23.4	38.03
1.1219	15.75	24.16	1.1572	19.7	30.90	1.1934	23.5	38.26
1.1240	16.0	24.57	1.1581	19.8	31.08	1.1944	23.6	38.49
1.1248	16.1	24.73	1.1590	19.9	31.27	1.1953	23.7	38.72
1.1256	16.2	24.90	1.1600	20.0	31.45	1.1963	23.8	38.95
1.1265	16.3	25.06	1.1609	20.1	31.64	1.1973	23.9	39.18
1.1274	16.4	25.23	1.1619	20.2	31.82	1.1983	24.0	39.41
1.1283	16.5	25.39	1.1628	20.3	32.01	1.1993	24.1	39.64
1.1292	16.6	25.56	1.1637	20.4	32.19	1.2003	24.2	39.86
1.1301	16.7	25.72	1.1647	20.5	32.38	1.2013	24.3	40.09
1.1310	16.8	25.89	1.1656	20.6	32.56	1.2023	24.4	40.32
1.1319	16.9	26.05	1.1666	20.7	32.75	1.2033	24.5	40.55
1.1328	17.0	26.22	1.1675	20.8	32.93	1.2043	24.6	40.78
1.1336	17.1	26.39	1.1684	20.9	33.12	1.2053	24.7	41.01
1.1345	17.2	26.56	1.1694	21.0	33.31	1.2063	24.8	41.24
1.1354	17.3	26.73	1.1703	21.1	33.50	1.2073	24.9	41.48
						1.2083	25.0	41.72

A6634

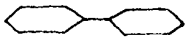
MONS 054969

Form 610

91

PHYSICAL CONSTANTS OF DIPHENYL

COMPILED BY W. P. Metzner
DATE 2-12-43
Corrected 6-22-43
Corrected 1-11-44



Beilstein V - 576

NAME		SOURCE	DATE
Formula	$C_6H_5.C_6H_5$		
Appearance	Monoclinic	Chem. Rubber Handbook	1941-42
Molecular Weight	154.20	" " "	
Boiling point at 760mm	255°C	Int. Crit. Tables	1928
Boiling point at 10.4mm	118	*Swann file #137	1933
Crystallizing point	69.0°C	*Swann curves	1934
Melting point	69°C	Int. Crit. Tables	1928
Solution point			
Specific gravity @ 77/4°C	2.9896	Int. Crit. Tables	1928
Specific gravity @ 20/4°C	1.041	" " "	"
Refractive index @ 77.1°C	D = 1.58822	" " "	"
Viscosity @ 100°C	28.8 Say. Sec.	*Swann File #137A	1930
Surface tension at 129.2°C	29.5 dyne/cm	Int. Crit. Tables	1928
Solubility in water at 80°C	Insoluble	Dow	1943
Viscosity at 70°C	31.2 Say. Sec.	*Swann File #137A	1930
Solubility in Abs. Alc. at 19.5°C	9.96 g/100 g. solvent	Seidell	1941
Solubility in 100% Methanol at 16.6°C	6.57 g./100 g. solvent	Seidell	1941
Benzene at 27.9°C	137 g./100 g. solvent	Seidell	1941
Heptane at 26.5°C	25.1 g./100 g. solvent	Seidell	1941
Flash point °F (method)	235°F - closed cup 255°F - open cup	Ind. & Eng. Chem. 32, 888	1940
Fire point °F	128°C	Dow	1943
Heat of combustion Kg-cal(15)	per gm.mol = 1524.4	Int. Crit. Tables	1928
Heat of formation			
latent heat of fusion	28.8 gm-cal per gm. (53.1 BTU/lb.)	Lange Handbook	1937
latent heat of vap at 69.2°C	190.9 BTU per lb.	*Swann File #137A	1928
Specific heat at 80°C	1.61 joule/gm.	Int. Crit. Tables	1928
Critical temperature			
Critical pressure			
Dissociation constant			

MONS 054970

Pounds per gal. @ 77 °C	8.23 lbs. per gal.	Swann File #137A	1930
Toxicity (give reference) (1)	Dr. McLester, Anniston Plant, Report-		1937

MF:-Files of W. P. Metzner, St. Louis (2) Percy Way-"Chemistry of Synthetic Drugs" 3rd Edition, p. 15.

Copy in St. Louis physician's file

PART VII

OPERATING INSTRUCTIONS IN USE

EMERGENCIES
OPERATING INSTRUCTIONS
EXPLANATION OF RECORD SHEETS
SPECIAL OPERATING INSTRUCTIONS
UTILITY FAILURES
HEALTH AND SAFETY

Aug. 22, 1946 83

AROCLOR DEPARTMENTS

OPERATING INSTRUCTIONS

EMERGENCIES

Fire

To report a fire break the glass in the fire alarm box on the wall of the sprinkler house or dial 200 on the telephone. When you receive an answer, say "fire at Aroclor departments, Zone 1-1". Notify all men in the department that a fire exists. Send somebody to the road at the south side of building CR to direct firemen to the location of the fire. Then do what you can to put it out until the firemen arrive providing it is a small fire. If it is a large fire and looks dangerous, retreat to a safe distance.

Explosion

Same procedure as for fire.

Accident

Apply what first aid you can immediately. Send someone for help or go yourself if alone. At night call the superintendent or give the emergency call, 5 blasts followed by the department call, as given at the bottom of the horn call instructions located on the west wall at the head of the stairs on the second floor. Get injured man to dispensary as soon as possible after giving necessary first aid and sufficient help is available. The closest stretcher case is on the west outside wall of the lean-to.

First aid instructions are:

Fall - In case where there might be a broken bone or in case of a serious unidentified injury do not move the person without the assistance of someone having first aid knowledge.

Cut or Wound - Wash with plenty of clean water. If the bleeding is heavy, try to stop the flow by applying a tourniquet or by applying pressure with your fingers.

Shock - Keep patient warm with blankets and keep him quiet. If his face is flushed (with blood), keep his head higher than the rest of his body. If his head is pale, keep his head lower than the rest of his body.

Equipment Failure

In case of equipment failure on the day shift, contact the Foreman or Supervisor immediately. At night call the Night Superintendent.

J. Soffranko

cc - Mr. Cottrell-Tompkins
Mr. Barbre (2)
Mr. Becker (2)
Mr. Soffranko (2)
Mr. E. Smith
Dept. 246
Extra (3)

6-20-46

DEPT. 246
OPERATING INSTRUCTIONS

PROCESS OUTLINE

Liquid Aroclors are made by chlorinating diphenyl. A measured amount of molten diphenyl is charged into a chlorinator containing an iron catalyst. Chlorine gas is passed into the chlorinator at a predetermined rate to produce the type of Aroclor desired in a certain length of time. During the chlorination an off gas, hydrogen chloride, is produced which is delivered to another department or absorbed by water to produce muriatic acid. After chlorination the crude Aroclor is aerated with dry air to remove HCl. It is then charged into a still to which lime is added, heated in a gas fired furnace and distilled under vacuum. The distilled Aroclor is blended with Attapulgus earth and filtered. The filtered Aroclor is then transferred to a storage tank from which it is loaded into drums or cars or used for making Pyranol blends.

The chlorination of solid Aroclor 1269, 1270 and 1271, in the early stages is similar to that of liquid Aroclors. Final chlorination, however, takes place in an agitated, gas-fired iron pot. Small quantities of the crude Aroclor are then charged into small gas heated pots and distilled into a pan in which a rotating drum operates. The Aroclors solidify on the drum and are cut off flake form with a knife. The solid Aroclors are then conveyed into storage hoppers from which containers are filled. Frequently some of the Aroclors are milled and then packed into containers.

The hydrogen chloride produced is either used as a gas elsewhere in the plant or absorbed in water to produce Muriatic Acid. The muriatic acid is treated with activated carbon to produce food grade acid by removing the impurities. Occasionally, crude muriatic acid from other departments is treated to produce food grade acid also.

E. Smith
J. Soffranko

lo

cc - Mr. Cottrell-Tompkins
Mr. Barbre (2)
Mr. Becker (2)
Mr. Soffranko (2)
Mr. E. Smith
Dept. 246
Extra (3)

6-20-46

DEPT. 246
OPERATING INSTRUCTIONS

RECEIPT AND HANDLING OF RAW MATERIALS

RECEIPT OF DIPHENYL CARS

Diphenyl is received in 8,000 and 10,000 gallon cars from the Monsanto plant located in Anniston, Alabama.

The diphenyl when received is frozen in the car and is approximately two to six inches below the top of the shell. After melting the diphenyl expands and rises one to four inches into the dome.

MELTING OF DIPHENYL IN CARS

The following steps should be taken to melt a car of diphenyl.

1 - Place track flags in position.

2 - Remove car dome cover.

3 - Insert the hairpin coil and connect to a low pressure steam line by means of a rubber steam hose.

4 - Open the steam valve about 1/2 turn or just enough to permit a small stream of steam to escape from the discharge end of the coil.

5 - Guide the hairpin coil so that as it melts its way through the diphenyl it will contact the bottom of the tank shell and not the side. Let steam pass through the hairpin coil for at least thirty minutes.

6 - Connect the low pressure steam to the tank car coils using steam traps on the discharge side of the coils.

7 - Turn the steam on the car coils AFTER the hairpin coil reaches the bottom of the tank car shell and the steam has been on for ten minutes.

8 - Keep the steam on the hairpin coil for at least twenty minutes after the steam has been turned on the car coils.

9 - Remove the hairpin coil after it has been in the car at least thirty minutes and visual inspection shows that

MONS 054974

molten diphenyl is rising through the opening made by thiscoil.

10 -During the melting operation the open car dome should be covered with a tarpaulin to eliminate the possibility of moisture getting into car.

11 - Keep steam on the car coils until the diphenyl is thoroughly melted. The length of time will range from eleven to eighteen hours depending on the outside temperature.

UNLOADING DIPHENYL CARS

12 - As soon as the diphenyl is molten, agitate the car with dry air for twenty minutes. Apply air slowly so that diphenyl will not splash out through the dome opening.

13 - After agitating with air, check the standpipe to see that it is open. Use a rod and not an open end pipe. The latter may cause molten diphenyl to be splashed on personnel.

14 - Deliver a 16 oz. sample to the laboratory.

15 - Remove the air agitator, replace the car dome cover, connect the unloading line to the standpipe and install the "christmas tree".

16 - The christmas tree has an air inlet, air outlet for relieving the car pressure and a gauge.

17 - In cold weather, the steam jacketed swinging pipe connection should be heated before unloading the car.

18 - Measure the storage tank and record measurement. The measurement should be less than 40 inches. If the storage tank has more than 40 inches check with the foreman before unloading the car.

19 - Check to see that the storage tank vent is open and the valves are properly set for unloading from the car to the desired storage tank.

20 - Apply air pressure to the tank car slowly. Do not exceed 15# gauge pressure. Do not depend on the pressure reducing valve to maintain the air pressure at 15#. Watch the gauge closely.

21 - After the flow of diphenyl starts check the storage tank measurement frequently to see that the flow does not stop. It will take about 2½ hours to unload a car after the flow has begun.

22 - After the car is unloaded, which is indicated by the flow of air through the storage tank vent, shut off the air supply to the car and release the car pressure through the storage tank and the christmas tree vent line at the same time, remove the christmas tree, disconnect and blank off the loading line and replace the car dome cover.

23 - Disconnect the steam line to the car coils, remove the steam traps, blow out the coils with air and replace the coil caps.

24 - Measure the storage tank and record measurement.

25 - Call the rip track to head up the car for switching and take down the track flag.

PRECAUTIONS

1 - NEVER TURN THE STEAM ON THE CAR COILS UNTIL THE STEAM HAS BEEN ON THE HAIRPIN COIL FOR AT LEAST TEN MINUTES AFTER IT REACHES THE BOTTOM OF THE CAR. Failing to do so will result in a damaged car due to internal pressure.

2 - Always use a pressure reducing valve in the air line, set at 15 pounds.

3 - Never exceed 15 pounds air pressure on the car when unloading.

4 - Always use dry air, moisture will corrode the equipment.

5 - Never use an open end pipe for checking the standpipe; Cap it off.

6 - Always apply air pressure slowly.

E. Smith
J. Soffranko

lo

cc: Messrs. Barbre (2)
Becker (2)
Soffranko (2)
E. Smith (4)
Extra (12)

DEPT. 246 July 25, 1946

OPERATING INSTRUCTIONS

Liquid Aroclors - Nos. 1242, 1248, 1254, 1260, 1262

Charging Chlorinators with Diphenyl

CAUTION: DIPHENYL IS INFLAMMABLE - KEEP FIRES AWAY

1. Maintain the diphenyl storage tank temperature between 90-95°C by means of the automatic regulator. This temperature is shown on the chlorinator recorder, point No. _____.

2. Keep the steam on the tracer lines of the vent, inlet, outlet and overflow lines of the diphenyl measuring tank.

3. Set valves so that the required amount of diphenyl may be pumped from the storage tank to the measuring tank. It will be necessary to close the cock in the bottom outlet line, open the cock in the inlet line and open the cock in the proper overflow line to the overflow header of the measuring tank. Check the vent line to see that it is open.

4. Unless instructions are issued to the contrary, the following amounts of diphenyl should be charged to the measuring tank for the liquid Aroclors listed below.

Aroclor	1242 - 4000#	diphenyl
"	1248 - 3600	"
"	1254 - 3600	"
"	1260 - 3600	"
"	1262 - 3600	"

The diphenyl measuring tank calibrations are:

To first	overflow	line	from	bottom	- 1800	lbs.
" second	"	"	"	"	- 2800	"
" third	"	"	"	"	- 3600	"
" fourth	"	"	"	"	- 4000	"

5. Do not pump diphenyl to the measuring tank unless it is to be used within an hour.

6. The diphenyl temperature in the measuring tank should be above 85°C. Heat the tank to maintain this temperature if necessary.

7. Check the temperature of the chlorinator to be charged. If the temperature is above 150°C, cool the chlorinator before charging with diphenyl by passing water through the jacket.

CAUTION: If the chlorinator temperature is above 150°C the diphenyl will sublime and condense in the off gas line to the scrubber tower which will eventually plug up the line. If this line is plugged, the chlorinator safety disc will rupture.

8. Close both cocks in the discharge line from the chlorinator to the blow tank and open the cock in the vent line from the chlorinator to the blow tank. The cock in the off gas line should be closed.

9. Drop the diphenyl from the measuring tank to the chlorinator to be charged by properly setting the necessary valves in the discharge line.

10. After the diphenyl is dropped close the cock beneath the measuring tank, close the cock in the diphenyl line above the chlorinator, close the cock in the chlorinator vent line to the blow tank and open the valve in the off gas line.

Chlorination - Arocolor Nos. 1142, 1148, 1154, 1160, 1162

11. Start scrubber liquor circulating over the scrubber tower if it is not already in operation. The Merco cock in the circulating line should be about half open or just enough to give a flow over the tower of ¼"-½" diameter stream. The gravity of the scrubber liquor should be held between 1.200 and 1.400 at 65°C.

12. Align the HCl off-gas to flow either to Dept. 217 or to the absorption system. If the gas is sent to Dept. 217, do not exceed 6" pressure as shown on the Mercury Monometer. If this pressure is exceeded, the scrubber seals will be broken and gas will escape to the atmosphere.

13. Start adding chlorine and maintain between 2" and 3" gas pressure for 4 hours without circulating the charge.

14. If the HCl is sent to the absorption system, start a small flow of city water through the tourills on tantalum tower for absorbing the gas. Watch the gravity of the HCl closely and adjust the water flow to give an acid gravity above 20° Be at 60°F.

15. Start the flow of well water through the tantalum tower or over the tourills for cooling the acid.

16. Start cooling water through the chlorinator jacket as soon as the temperature reaches 140°C. Do not exceed a chlorinator temperature of 150°C when making liquid Arocolors as diphenyl and light Arocolors will carry over and plug up the off-gas line which may blow the safety disc. During the last stages of chlorinating Arocolor 1162 a chlorinator temperature of 175°C is permissible.

17. After 4 hours of chlorination start the batch circulating through the chlorinator. The gravity of the batch at the end of 4 hours of chlorination should be 1.100-1.150 at 65°C.

18. Continue chlorinating and check the gravity every two hours until within 0.050 sp. gr. of the final gravity, then check the gravity as often as is necessary until the batch is finished.

19. Liquid Aroclors batches should be chlorinated in the times and to the gravities shown below unless otherwise specified by the Foreman or unless unusual or unforseen operating circumstances arise such as a chlorine shortage or changing from one type of Aroclor to another.

Type of Aroclor	No. of hours to chlorinate batch	Batch to be finished to Sp.Gr. of _____ at _____°C
1142	12-14	1.342-1.346 @ 65
1148	14-16	1.410-1.414 @ 65
1154	17-20	1.502-1.506 @ 65
1160	18-22	1.558-1.562 @ 90
1162	20-24	1.568-1.572 @ 100

Aeration - Aroclor Nos. 1142, 1148, 1154, 1160, 1162

20. After a chlorinator batch is completed close the chlorine feed valve, close the 3" valve in the HCl line just outside of the building, open the chlorinator vent line to the blow tank, open the two cocks in the transfer line to the blow tank and close the cock in the recirculating line. Transfer the crude Aroclor to the blow tank.

21. While the batch is transferring to the blow tank watch the chlorinator mercury monometer. If a negative pressure develops, the chlorinator is not vented properly. Continued pumping will "suck" the scrubber liquor onto the completed charge and throw it off grade. If a vacuum develops, stop the pump and correct the trouble.

22. The blow tank should have an outage of 40" or an innage of less than 60" before transferring a chlorinator batch into it.

23. After a chlorinator batch is transferred close the cock in the chlorinator vent line, close both cocks in the transfer line to the blow tank, and open the valve in the dry air line to the blow tank sparger just enough to cause the crude Aroclor in the blow tank to "roll" or about 3# to 4# gauge pressure.

24. Aerate the Aroclor in the blow tank at least 4 hours before transferring to the still. NOTE: Aeration is necessary to remove HCl to prevent corrosion of equipment

MONS 054979

and to produce a product that meets specifications.

25. Do not use steam on the blow tank heating coil when it is charged with 1142 or 1148. Aerating these Arocolors at elevated temperatures will result in their loss through the vent stack. The temperature of all other Arocolors should be maintained at approximately 140°C by using the steam coil.

Distillation - Arocolors 1242, 1248, 1254, 1260, 1262

26. After a batch has been blown for the proper length of time the "empty" still is ready to be charged. A heel of crude Arocior is always left in the still and circulated to keep the coils from freezing.

27. If the still has been in operation -
    a - Reduce the furnace gas pressure to 5 lbs.
    b - Open the vacuum release valve on the still
    c - Remove the cap from the lime charging nozzle.
    d - Transfer the Arocolor from the still receiver to the blending tank and close the cock and valve in the transfer line.
    e - Open both cocks in the transfer line from the blow tank to the still and start the transfer pump.

28. Charge 40" of crude Arocolor from the blow tank into the still. This is equivalent to 50" outage in No. 1 still and 114" outage in No. 2 still. Close both cocks in charging line after charging.

29. Charge 30 lbs. of lime to the still and replace the cap on the charging nozzle. The purpose of the lime is to remove as much of the remaining HCl as possible.

30. If the still has been in operation there will be a "heel" of still bottoms which keeps circulating through the coil in the gas fired furnace.

    CAUTION: The still pump should never be stopped and the fire on the heating coil in the gas fired furnace should never be cut off as long as there is a heel in the still. Otherwise, the material in the coil will freeze and the coil will have to be changed.

31. Close the vacuum release valve; apply vacuum to the still by turning on the water to the ejector. The ejector bowl should be warm to the touch of the hand at all times to get the maximum efficiency.

32. Adjust the gas burner pressure to the furnace burners. The gas pressure to be used for the maximum distillation rate for the different types of Arocolors is given below. These gas pressures, however, are not always used. They

are usually specified by the Foreman from day to day depending on the rate of production.

Aroclor to Distill	Furnace Gas Pressure Lbs. Gauge
1142	12
1148	14
1154	18
1160	20
1162	22
1168	22

33. Thirty minutes after the flow has started turn on the condenser cooling water. This flow should be adjusted to meet conditions. If flashing is noted in the condenser sight glass, cooling water flow should be increased until the flashing is eliminated. If the distillate is too viscous, stop the flow of condenser water temporarily. Adjust the cooling water on the Vogt head exchanger to give cool condenser water at all times. During the last hour of distillation the cooling water may be discontinued to keep the higher Aroclors from freezing in the condenser.

34. A still batch is usually distilled in 10-12 hours under 6 mm of pressure. Distillation beging when the coil inlet temperature is approximately 200°-210°C and finishes at about 275°-300°C depending on the type of Aroclor being distilled.

35. In general when the spread between the coil inlet temperature and vapor temperature is 40°C the distillation is complete. Release the vacuum by opening the valve on top of the still provided for that purpose.

36. Open the cock and the valve in the transfer line between the still receiver and the blending tank and transfer the distilled Aroclor by means of the Blackmer pump.

37. Drop bottoms through the still constant level drain line after every fourth still batch. The procedure for dropping still bottoms is described under Special Operating Instructions.

38. NOTE: Do not distill a batch unless there will be enough crude Aroclor to recharge the still. A bell will sound if the still pump stops at any time.

Blending Aroclor Nos. 1242, 1248, 1254, 1260, 1262

39. After the blending tank has received two still batches, start the blending tank agitator, turn on the low pressure steam to the heating coils and add 10 lbs. of dry Attapulgas

earth to the Aroclor.

40. Blend for 4 hours. The temperature at the end of this time should be about 150°C. This temperature is necessary to give a rapid filtration rate.

Filtering - Aroclor Nos. 1242, 1248, 1254, 1260, 1262

41. After blending set the valves so that the Aroclor will circulate through the press and back into the blending tank. Keep steam on the press and circulating lines at all times.

42. After 15 minutes of circulation, take a sample at the sampling cock on the press. If the solution is not clear, continue circulating.

43. As soon as a clear solution is obtained change the flow from the blending tank to the finished product tank by setting the proper valves.

44. During the filtration operation take a sample in a 1/2 gallon clean, hot glass jar label and deliver to the laboratory.

45. After the laboratory analysis is received, if it passes specifications, drop the filtered batch from the finished product tank to the storage tank designated by the Foreman.

46. At the request of the Foreman circulate the storage tank for the specified length of time. The laboratory will obtain a lot sample of the storage tank.

47. If the laboratory analysis is within specifications, the Aroclor is ready to be loaded into drums or tank cars.

E. W. Smith

J. Soffranko

as

Liquid Arocolor Specifications

Property	1242	1248	1254	1260	1262
Appearance	Clear	Yellow tinted	Yellow tinted	Yellow tinted	Light yellow
Color - Maximum	0.5 NPA	0.5 NPA	100 APH	100 APH	1.0 NPA
Specific Gravity	1.338 - 1.348 @ 65°C	1.404 - 1.414 @ 65°C	1.496 - 1.505 @ 65°C	1.550 - 1.560 @ 90°C	1.572 - 1.583 @ 90°C
Acid Number - Max.	.01	.01	.01	.01	.01
Viscosity Sec. Saybolt	50-55 @ 54.5°C	65-80 @ 54.5°C	44.5-47.5 @ 98.9°C	72-77 @ 98.9°C	88-100 @ 98.9°C
Inorganic Chlorides - Max. %			.000015	.000015	
Dielectric Constant @ 100°C - 1000 Cycles			4.15-4.35	3.8-4.0	
Resistivity 100°C & 500 Volts 10^6 ohms/cu^3 Min.			100	500	
Dielectric Strength 25°C - Min.			30 KV	30 KV	
Refractive Index - 25°C			1.637 1.639	1.6455 1.6465	
Pour Point			8°-12°C	28°- 34°C	
Water - % Max.			0.0035	0.0035	

MONS 054983

DEPT. 246

OPERATING INSTRUCTIONS

Solid Arocolors - Nos. 1268-1269-1270-1271

Charging of Chlorinator

1. Arocolors Nos. 1168, 1169, 1170 and 1171 are made in No. 1 chlorinator only. The reason for using only No. 1 chlorinator is to eliminate the possibility of contaminating liquid Arocolors with solid Arocolor crystals.

2. Charging the chlorinator with diphenyl is done in precisely the same manner as charging a chlorinator for liquid Arocolors with the exception that the diphenyl charge is only 2800 lbs.

3. During the chlorination of solid Arocolors the scrubber liquor increases rapidly in gravity and has to be changed frequently. This high gravity scrubber liquor is used for charging the No. 1 chlorinator for making solid Arocolors. The foreman always calculates the charge of scrubber liquor to use.

Chlorination - Arocolor Nos. 1168-1169-1170-1171

4. The chlorination of solid Arocolors is done in the same manner as the chlorination of liquid Arocolors until a specific gravity of 1.570 at 100°C is reached.

Chlorination, aeration and distillation of Arocolor 1168

5. After a specific gravity of 1.570 is reached continue chlorinating at the same manometer pressure and chlorine gas gauge pressure until a hold point of 145°-155°C is reached.

6. Before the final hold point is reached the Arocolor in process will pass through a sticky and a gummy stage. The sticky, gummy and hold point determinations are described under Special Instructions.

7. As the final stages of the chlorination take place the chlorinator temperature should be held 25°-50°C above the hold point. The heat of reaction is enough to exceed this temperature differential and must therefore be controlled by the water jacket cooling system.

8. After a hold point of 145°-155°C is reached close the chlorine feed valve, and open the chlorinator vent line valve.

9. Set valves properly and transfer the batch to the still.

10. Distill the Arocolor the same as any liquid Arocolor. However, due to the high freezing point extreme care must be exercised to prevent stoppages in the system.

11. Load the distilled Arcolor into drums. If powdered product is required, the Arcolor has to be milled in the Williams Mill. Dry ice has to be used during the milling operation to keep the Arcolor from melting and plugging the mill.

Chlorination of Arcolors 1169, 1170, 1171

12. After a specific gravity of 1.570 at 100°C is reached continue chlorinating at the same manometer pressure and chlorine gas gauge pressure until a hold point of 185°-195°C is reached.

13. Keep the chlorinator temperature 25°-50°C above the hold point of the batch at all times. If at any time the chlorinator temperature is less than 25°C above the hold point, apply fire to the circulating line and the ring beneath the chlorinator.

14. The Arcolor in process will pass through a sticky and gummy stage during the chlorination.

15. About one hour before the hold point of 185°-195°C is reached apply fire to the circulating line, drop-out line and ring beneath the chlorinator.

16. During this last hour of chlorination rod the drop-out line through the cross above the pot and rod the chlorine standpipe in the chlorinator pot to see that they are open. Also measure the chlorinator pot.

17. If the pot has less than 15" of Arcolor it is ready to receive a chlorinator batch. Stop the agitator and open the valve in the chlorinator vent line; stop the circulating pump and drop the batch to the pot after a hold point of 185°-195°C is reached. Leave fire on circulating and drop out lines for 5-10 minutes with drop out line valves open to insure complete drainage.

18. Close both valves in drop out line while line is still hot and shut off fires on circulating line, drop out line and ring beneath chlorinator. Start the pot agitator.

19. Do not recharge the chlorinator until chlorination is completed in the chlorinator pot and the chlorinator temperature is less than 150°C.

20. Close the valve in the HCl off-gas line between the chlorinator and the scrubber and start chlorinating the batch in the chlorinator pot by opening the valve in the chlorine standpipe line to the pot.

21. Chlorinate the batch in the pot to give an increase of 15° to 20°C in the hold point per hour which will require a chlorine gas pressure of approximately 3-5 lbs.

22. Continue chlorinating until the following hold points are reached for the Aroclors listed:

Aroclor 1189 - Hold Point 235°-245°C
Aroclor 1170 - Hold Point 290°-295°C
Aroclor 1171 - Hold Point 305°C Minimum

23. Maintain the chlorinator pot temperature 25°-50°C above the hold point. Use the gas burners if necessary.

If the chlorinator pot temperature becomes too high, shut off the gas burners, open the door to the gas burner chamber and adjust the chlorine feed until the proper temperature differential is obtained.

24. After chlorination is completed close the chlorine valve, light the gas burners and adjust them to give a chlorinator pot temperature of 25°-50°C above the final hold point.

25. Clean the off-gas lines and catch tank after every other chlorinator batch and charge this material to the pot just before dropping the next chlorinator batch to the chlorinator pot.

Distillation and Flaking -Aroclor Nos. 1269, 1270, 1271

26. After the chlorination is completed watch the pot temperature closely. Keep it 25°-50°C above the hold point by means of the gas burners provided for that purpose.

27. Heat with a gas flame the 3" pot drain line and cock. Keep a small flame beneath the cock and line at all times during distillation. However, a few minutes before drawing a charge from the pot increase the flame size.

28. By means of the electric hoist place the distillation pot on the truck and roll the truck on to the scale. Connect the 1½" still discharge line to the still and cap it off. Start the two roof ventilating fans and the large duct fan.

29. Set scale to balance the weight of the pot, then set the scale beam 30 lbs. above the balanced weight. Add 30 lbs. of lime to the scale pot.

30. If "preruns" are available, add 100 lbs. to the lime and then draw 600 lbs. of Aroclor from the chlorinator pot into the still pot. Clamp the still pot lid into position.

31. By means of the electric hoist transfer the still pot from the truck to the still furnace and remove the cap off the still discharge line. Insert the thermometer through the still pot cover.

32. Light the two gas burners and set the gas pressure to read 25 lbs. Use caution when lighting the gas burners. Do not stand in front of or look into the inspection door

while lighting the burners.

33. Heat the flaker drum with steam for the first still pot distillation. After the first distillation the heat of the distilled Arocolor will be sufficient to keep the flaker drum hot from one still batch to another until the chlorinator pot is empty.

34. Place the small catch pan inside of the flaker pan to catch and drain the first distilled material, from the still, into a drum under the flaker pan. This material will be dark in color and is known as preruns.

35. As soon as distillation begins reduce the gas pressure to the burners from 25 to 15 lbs. Start the flaker blower, start the flaker, adjust the cutting knife and start the elevator.

36. The cutting knife should be so adjusted that there will be less than 1/32" clearance between the knife edge and the drum. This clearance should be checked frequently since the clearance will vary as the distillation progresses and the drum becomes hot.

37. Continue distillation until the distillate becomes clear, then change the position of the small catch pan so that the distillate runs directly into the flaker pan.

38. Keep a gas flame under the flaker pan and adjust it so that the distillate in the flaker pan remains molten at all times.

39. Continue distillation until the distillate turns dark, then swing the small catch pan into position so that the dark material is run into the prerun drum.

40. Completion of the distillation is indicated by a sudden rise in the still pot temperature and excessive fuming of the still pot.

41. As soon as the distillation is completed stop heating the still, remove the thermocouple, open the damper in the exhaust duct and let the pot cool for 20 minutes.

42. A second still pot should be charged and placed in position and burners lighted when the first still pot reaches a temperature of approximately 500°C.

43. After distillation is completed and the pot has cooled for 20 minutes remove the still pot from the furnace and place on the concrete slab south of the building. Close the damper in the exhaust duct.

44. Remove the still pot cover, remove the 1½" discharge line, cool the pot by spraying the inside and outside with water and remove the still residue.

45. If the Aroclor comes off the drum "soggy", wet, reduce the gas flame beneath the flaker pan and cool the flaker drum with steam if necessary.

46. If flakes drop off the rising side of the drum, the side opposite the knife edge, the drum is too cold. Stop the steam flow to the drum and increase the gas flame beneath the flaker pan.

47. Change the prerun drum beneath the flaker when about 3/4 full.

Milling and Packing - Aroclor Nos. 1260, 1270, 1271

48. The flaked Aroclor is transferred to a storage hopper by means of a screw conveyor and an elevator.

49. When the storage hopper is filled to within 10 inches of the elevator discharge spout and distillations have been completed, circulate the Aroclor in the storage hopper for two hours by means of the elevator and conveyor beneath the hopper.

50. Deliver a sample of the Aroclor to the laboratory. If it meets specifications, mill or barrell the Aroclor according to the instructions issued by the Foreman.

51. If the Aroclor is to be packed use either Monsanto Salt Barrells, ICC-11A barrells or Lever Pak containers. Pack 400# of Aroclor, flaked or milled, into the containers. Use liners for the barrells and use the heavier end of the barrells for the bottom.

52. If the Aroclor is to be milled, fill barrells from the hopper, transfer the full barrells to the milling platform by means of the electric hoist, place an empty container beneath the discharge spout of the Williams mill, start the mill and feed Aroclor into the mill feed hopper from the full barrell on the platform by means of a hand scoop.

E. Smith

J. Soffranko

es

SPECIFICATIONS

AROCLORS 1268, 1269, 1270, 1271

	Arocolor			
	1268	1269	1270	1271
Appearance & Color	White to yellow crystalline powder	White to lt. gray or lt. yellow crystalline powder	White crystalline powder	Practically white light fluffy powder
Acid No.	0.05 Max.			
Hold Point	135-160°C	225-255°C	285-300°C	
Color of 5% Toluene Solution			80 Max.	80 Max.
Foreign Odor			None	
Total Chlorine			69.5-70.5%	
Moisture				0.60% Max.
Melting Point				304°C Min.

OPERATING INSTRUCTIONS

AROCLORS 2565, 4465, 5460

Charging Chlorinator

1. The following chlorinator charges are used for making the Arcolors listed:

Type Arcolor	Lbs. of Diphenyl	Lbs. of Crude High Boiler	Lbs. of Distilled High Boiler
Arcolor 2565	1800	600	--
Arcolor 4465	1800	--	1200
Arcolor 5460	--	--	3300

Note: Before charging the chlorinator to make Arcolor 5460, the chlorinator must be rinsed with distilled high boiler - See Special Instructions.

2. The diphenyl is charged to the chlorinator in the same manner that diphenyl is charged to chlorinator for making liquid Arcolors. Charge the diphenyl after the crude or distilled high boiler is charged.

3. The crude high boilers and the distilled high boilers are received in containers. Charge the desired amount of crude or distilled high boilers to the high boiler melter.

4. Open the high pressure steam valve to the melter coil and melt the high boilers. Hold the charge in the melter until the chlorinator is ready to be charged.

5. As soon as a chlorinator is ready to be charged, bolt the manhole cover on the melter, close the melter vent line, open the cock to the chlorinator to be charged, apply full air pressure to the melter and blow the charge to the chlorinator.

6. After blowing the charge to the chlorinator, which is indicated by the drop in gauge pressure, close the air valve, continue blowing until the gauge pressure is approximately 10 lbs. and then close the cock in the charging line to the chlorinator.

7. Open the air valve to the melter and build up the pressure to approximately 25 lbs., then open the cocks in the charging line to the other chlorinators momentarily to blow out any material which would otherwise freeze and plug the line.

8. Release the melter pressure through the vent line.

Chlorination of Arcolors 2565, 4065, 5060

9. Set valves properly and start circulating the chlorinator charge.

10. Start chlorinating and proceed in the same manner as when chlorinating liquid or solid Arcolors until a specific gravity of approximately 1.500 at 90°C is reached. Continue chlorinating at the same rate.

11. Two hours after the specific gravity of 1.500 is reached start taking the softening point as often as is necessary. Finish the chlorinator charges as follows:

Arcolor 2565	SP = 68-70°C
Arcolor 4065	SP = 72-74°C
Arcolor 5060	SP = 108-110°C

The method of taking the softening point is given under Special Instructions.

Aeration of Arcolors 2565, 4065, 5060

12. After the chlorination is completed transfer the Arcolor to the blow tank and aerate the same as liquid Arcolors.

13. During the aeration use low pressure steam for heating Arcolors 2565 and 4065 and use high pressure steam for heating 5060.

14. After aerating Arcolor 2565 submit a sample to the laboratory to be checked for acid number and softening point. If the material passes specifications, drop directly into 40-gallon black iron friction top cans, 500 lbs. net, or into 100-lb. galvanized Santochlor cans, 210 lbs. net.

Distillation of Arcolor Nos. 4465 and 5465

15. After aeration, charge and distill these Arcolors in the same manner as liquid Arcolors. Before charging the still, however, drop bottoms at the bottom out when changing from liquid Arcolors.

16. When the vapor temperature reaches 325-330°C reduce the furnace gas pressure from 22 lbs. to 10 lbs. and agitate the still receiver by releasing the vacuum slowly through the bottom outlet.

17. After thoroughly mixing the still receiver, close the bottom outlet and release the vacuum through the vacuum release valve on top of the receiver.

18. Draw about 6" of Arcolor from the bottom outlet of the still receiver into a drum and obtain a sample.

19. Check the softening point (S.P.) of the sample. If the softening point is too low, continue distillation another two hours or until the proper S.P. is reached. If the S.P. meets specifications, drop the Arcolor directly into 40-gallon galvanized friction top drums, 500 lbs. net, or into 100 lb. galvanized Santochlor cans, 200 lbs. net.

20. After drawing several drums obtain a ½ gallon sample and submit it to the laboratory for analysis.

MONS 054991

21. Drop bottoms after every fourth still batch or more often if necessary. Drop bottoms through the bottom outlet after the entire run of Arcolor has been completed.

E. Smith

J. Soffranko

as

SPECIFICATIONS

AROCLOR NOS. 2565, 4465, 5460

	Arochlors				
	2565	4065	4465	5060	5460
Apperrance & Color	Black Brittle Resin	Black Brittle Resin	Clear lt. yellow brittle resin	Black Brittle Resin	Clear lt. yellow brittle resin
			NPA - 1.5 Max.		NPA - 2.0 Max.
Softening Point (ASTM) °C	66.0-72.0	66.0-72.0		110.0-115.0	100.0-105.5
Acid Number	0.5-1.0		0.035 Max.		0.05
Viscosity Sec.Say. @ 130°C			160-210		
Crystalline test					To pass test
Chlorine					59.0-60.6%

105

CC [illegible] (2)
Mr. Decker (2)
Mr. Ault (2)
Mr. Soffranko (2)
Mr. E. Smith
Extra (5)

Depts. 246 & A-246

July 9, 1946

Operating Instructions

Handling of General Electric Pyranol Samples

The sampling of Pyranols for General Electric Co. is extremely important and should therefore be done in a meticulous manner. The bottles and thiefs should be scrupulously clean and oven dried. Clean diaper cloths should be used where the samples are obtained through sampling nozzles.

The obtaining and handling of Pyranol samples should be done as outlined below.

Pyranol 1478 - TOB

1. As soon as the moisture content of the control sample of a car or lot of TOB is within specifications, preferably below 0.0025%, the department will filter and take two one-gallon samples in clean, oven-dried bottles, and deliver them to the laboratory.

2. The department will notify the laboratory by memo to send a sample of the TOB to General Electric Co. (GE) as soon as the analysis is completed providing it meets specifications.

3. The laboratory will ship the sample to GE and will notify the department by memo when the shipment is made.

Pyranols ~~1467~~ 1476 (Arochlor 1254) and 1482 (Arochlor 1260)

1. As soon as a lot of Pyranol 1476 or 1482 is available the laboratory, at the request of the department, will take the necessary samples which are --

   1 - 1 gallon jar
   1 - ½ gallon jar
   1 - 5 pint brown bottle for GE

2. The department will inform the laboratory by memo to release the lot sample to GE as soon as the analysis is completed providing the analysis is within specifications.

3. The laboratory will make the shipment and notify the department by memo when shipment is made.

4. After the GE approval is received, the Pyranol will be used to make a mix with TOB or will be used for tank car shipments.

   NOTE: On special occasions, shipments are made at the request of the Sales Department without GE approval.

MONS 054994

5. When tank car shipments are made the laboratory, at the request of the department, will take the necessary samples which are --

1 - 1 gallon jar
1 - ½ gallon jar
1 - 5 pint brown bottle

NOTE: Tank car samples are not sent to GE when GE has approved the storage tank advance sample.

6. When tank car shipments are made, the department will notify the laboratory by memo the customer's name and address, car number, type Pyranol, lot number, shipping date and customer's order number.

Pyranol 1467

Pyranol 1467 is made by adding the required amount of tintetraphenyl to Pyranol 1488.

1. As soon as a batch of Pyranol 1488 is made the laboratory, at the request of the department, will obtain the necessary samples and run a complete analysis.

The samples to be taken are --

1 - 1 gallon jar
1 - ½ gallon jar
1 - 5 pint brown bottle

No samples are sent to GE unless requested.

2. After the required amount of tintetraphenyl is added to the Pyranol 1488 to make Pyranol 1467 the department submits a 16 oz. sample to the laboratory to be run for tintetraphenyl, gravity, moisture and chlorides.

3. As soon as a lot of drums or a tank car is filled, the laboratory at the request of the department will obtain the necessary samples which are --

1 - 1 gallon jar
1 - ½ gallon jar
1 - 5 pint brown bottle for GE

4. The department will request the laboratory by memo to release the sample to GE as soon as the analysis is completed, providing it is within specifications.

5. The laboratory will make the shipment and notify the department by memo when shipment is made.

6. After GE approves the material the department will notify the laboratory by memo the customer's name and address, car number, shipping date, and customer's order number.

107

Expeditious handling of the samples is of paramount importance.

A copy of the laboratory analysis of each sample released to GE is sent to GE as well as to the department.

Any deviation of the above procedure must be approved by the supervisor.

J. Soffranko

T. H. Becker

leh

Aug. 28, 1946

DEPT. 248
OPERATING INSTRUCTIONS
EXPLANATION OF RECORD SHEETS

Operating sheets are provided for the recording of actual operating data and act as a guide toward good operation. By recording actual operating data it is frequently possible to determine the source of trouble when off-grade material is produced or operating difficulties are encountered. Other than actual operating data is of absolutely no value.

Chlorinator Record Sheet

Start a new Chlorinator Record sheet for each chlorinator batch. Use a second sheet if necessary when chlorination continues longer than the normal length of time. Supply the items as indicated on the following sample record sheet.

Time - Show time when readings are taken.

Chlor. T°C - Chlorinator temperature.

Back P - HCl off-gas pressure, inches of mercury on manometer.

Sp. Gr. @ °C - Specific gravity at 90°C.

Acid Be @ 60°F - Beaume reading of Muriatic Acid, entering receivers, corrected to 60°F.

H_2O Rotameter Setting - Rotameter water setting

Remarks - Any deviations from normal operating procedure.

Still Record Sheet

Time - Time when readings are taken.

Vacuum Rec. - Vacuum of still receiver in mm of mercury.

Flow - An arbitrary flow figure.

Burners - Gas pressure, pounds gauge, to burners.

Temperatures °C - Temperature in °C of still receiver, vapor, Aroclor entering coil and Aroclor leaving coil.

Cond. Water - Whether on or off the condenser.

Remarks - Record any deviations from normal operating procedure.

Form 888

DEPARTMENT 246
CHLORINATION RECORD

SHEET NO. 2 109

AROCLOR NO. 1160 BATCH NO. 577 CHLORINATOR NO. 2

STARTED BY A. Smith TIME 10:00 AM DATE 1-8-46

FINISHED BY J. Jones TIME 6:15 PM DATE

CHARGE { DIPENTY 3600 @ °C; D.N.B. ; C.N.B. } Cl_2 { TOTAL HRS. ; HRS. TO BLOW 1170 ; HRS. @ °C; OAR HRS. ; HRS. IN SCRUBBER @ °C; LIQ. HRS. ; HRS. ACID IN REC. @ °BE60° }

TIME	Cl_2 LIQ. GAS	CHLOR. T°C	VAPOR T°C	BACK P	SP. GR. RATE PER HR.	SP. GR. @ °C HOLD PT. SOFT PT.	ACID BE @ 60°F	KgO Mix Boos-ter Setting	REMARKS
10:00	AM	105		5			20.3	2.0	1101 to Dept. 217 off.
11:00		115		5			20.2	2.0	"
12:00		125		6			20.5	2.1	"
1:00	PM	115		5		1.125-90	20.2	2.1	"
2:00		135		5			21.4	1.9	"
3:00		130		5		1.178-90	20.5	2.1	"
4:00		134		5			21.0	2.1	"
5:00		137		5		1.231-90	20.9	23	"
6:00		138		5			20.7	23	"
7:00		140		6		1.285-90	209	23	"
8:00		135		6			20.8	23	"
9:00		137		6		1.345-90	20.2	20	"
10:00		135		6			204	20	"
11:00		134		6		1.393-90	206	20	"
12:00		140		7			20.6	2.0	"
1:00	AM	140		7		1.443-90	20.5	2.0	"
2:00		146		7			20.9	2.0	"
3:00		150		7		1.498-90	21.4	2.0	"
4:00		152		8		1.518-90	21.4	2.0	"
5:00		154		8		1.536-90	21.6	2.0	"
6:00		152		8		1.555-90	21.5	2.0	"
6:15	AM	154		9		1.561-90	21.7	2.0	"

MONS 054998

FORM 682

DEPARTMENT 246
STILL RECORD

SHEET NO. 3

ARCLOR NO. 1260 BATCH NO. 780

STARTED BY A. Smith TIME 2:45 AM DATE 10-26-45

FINISHED BY J. Jones TIME 2:30 PM DATE 10-26-45

CHARGE
- INS. FROM BLOW TANK 40 @ ____ °C — TOTAL HRS. ____
- 1168 INS. TO STILL ____ @ ____ °C — STILL BOTTOMS ____ LBS.
- STILL OUTAGE 114 INS.
- LINE 30 LBS.

TIME	VACUUM REC.	VACUUM STILL	VACUUM EJECTOR	FLOW	BURNERS 1	BURNERS 2	TEMPERATURES °C REC.	VAPOR	IN LET	OUT LET	COND. WATER	REMARKS
5:00 AM	7		175	25	20	20	52	203	214	219	Off	
6:00	"		"	"	"	"	60	208	223	231	On	
7:00	"		"	"	"	"	67	212	229	237	"	
8:00	"		"	"	"	"	70	217	234	242	"	
9:00	"		"	"	"	"	72	222	238	246	"	
10:00	"		"	"	"	"	76	225	242	249	"	
11:00	"		"	"	"	"	77	227	244	253	"	
12:00	"		"	"	"	"	78	230	249	262	"	
1:00 PM	"		"	"	"	"	79	232	252	268	"	
2:00	"		"	"	"	"	80	234	260	270	Off	
2:30	"		"	"	"	"	80	235	275	290	"	

MONS 054999

Arcolor Departments Inventory Sheet

Take an inventory each morning at 7:00 a.m. of all raw materials, process goods, finished goods and metered services. It is only necessary to supply the information in the spaces marked with an "X". The daily inventory sheets cover departments 246, A-246 and D-218.

DAILY INVENTORY

[illegible] 2NS-4846

T[illegible] by x Time x [illegible]. Date x

Muriatic Acid	Batch-Car No.	Temp	Wt	Inches	Gallons	Pounds
#1 Receiver - CT-0788			x	x		
#2 Receiver - CT-0789			x	x		
#3 Receiver - CT-0804	x		x	x		
Existing Wt.-CT-0851	x		x	x		
Crude Cars on 10A	x		x			
#1 Storage - CT-0795			x	x		
#2 Storage - CT-01260			x	x		
#3 Storage - CT-01575			x	x		
Crude "A" cars on 11	x		x			

	Material	Batch-Car No.	Inches	Gallons	%/Wt.	Pounds
#1 Storage - CT-0748	Diphenyl		x		8.0	
#2 Storage - CT-0749	Diphenyl		x		8.0	
Surge Stg. - CT-0347	Diphenyl				8.0	
Measuring Wt.CT-0767	Diphenyl				x	
Cars on Track 11	Diphenyl	x				
#3 storage - CT-0768	1260		x		12.7	
#4 Storage - CT-0769	1254		x		12.7	
#5 Storage - CT-01310	1260		x		12.7	
#6 Storage - CT-0840	TCB		x		12.0	
Aroclor Cars on 11		x				

Process	Type	Lot-Car No.	Inches	Gallons	%/Wt.	Pounds
Mixing tank CT-01321			x	13		
Cars on track 11		x		13		
Drums			Drums x	@	lbs.	

Aroclor in Process	Type	Batch No.	Sp.Gr. 0:00 am	Pounds
#1 Chlorinator CT-0745	x	x	x	
#2 Chlorinator CT-0748	x	x	x	
#3 Chlorinator CT-0833	x	x	x	
#4 Chlorinator CT-01283	x	x	x	
1170 Stg.Pot CT-0808				MONS 055001
Melter CT-0763				

DAILY INVENTORY

Aerolor in Process	Type	Batch	Outage	Temp	Gallons	#/Gal.
Blow tank CT-0750 (in)	x		x			12.7
#1 Still S-043	x	x	x			12.7
#2 Still S-062	x	x	x			12.7
#1 Blend.Tk. CT-0779	x	x	x			12.7
#2 Blend.Tk. CT-01399	x	x	x			12.7
#1 Fin.Prod. CT-0780	x	x	x			12.7
#2 Fin.Prod. CT-01400	x	x	x			12.7

Misc.

Inches (Hg) HCl gas to dept. 217 at 8:00 am. x 4:00 P.M. x 12 P.M. x

Receiving HCl gas from dept. 249 at 8:00 am. x

Drums x

List the number of drums, type of material and lot numbers. Do not include part drums.

Operation x

List any difficulties or unusual operating difficulties occurring during the day.

Repairs x

List any repairs made in the department during the day.

DEPT. 246 DAILY INVENTORY

TAKEN BY x _____ DATE x _____ TIME x _____

1170 Stg. Pot x _____

City Water Meter x _____

Well Water Meter x _____

H.P. Steam x _____

L. P. Steam x _____

Carbon bags. In box x _____ On Main Floor x _____

Lime - Main Floor x _____ Upstairs x _____

Attapulgus Earth - Main Floor x _____ Upstairs x _____

Samples Ready for Lab. at 8:00 A.M. x

REMARKS: x

Dept. 246

Special Operation Instructions August 12, 1946

Scrubber Liquor System

1. Scrubber liquor pump tanks should be charged with crude Aroclor having a specific gravity of approximately 1.300 at 65°C to a depth of 2" above the "step".

2. The scrubber liquor level in the scrubber pump tanks should be held between 2" and 30" above the measuring "step" and the gravity between 1.200 and 1.400 at 65°C. Do not heat the scrubber liquor unless it becomes very viscous.

3. Check all scrubber liquor in pump tanks every Tuesday and Friday for measurement and specific gravity and record the results on the daily inventory sheet and in the log book provided for that purpose.

4. Keep scrubber liquor circulating over the tower continuously unless the chlorinator is to be down for an extended period of time, more than 6 hours.

5. At the request of the Foreman drain or recharge the scrubbers as instructed.

Muriatic Acid (HCl) Absorption System

1. During chlorinations an off-gas, HCl, is produced, passes through the scrubber, and is either sent to dept. 217 or is passed through the tantalum tower or tourills where it is absorbed in city water to form Muriatic acid.

2. Start the flow of city water, for absorbing the gas, as soon as a batch of diphenyl starts chlorinating and shut off the water supply when chlorination stops. Regulate the flow of city water through the rotameter so that the acid strength leaving the tantalum tower or tourills is above 20.20° Be corrected to 60°F.

3. Pass just enough cooling water through the tantalum and/or over the tourill to give an acid discharge temperature of 80° to 120°F. The discharged cooling water from the tantalum should feel cool to touch of the hand. Pass just enough cooling water over the tourills to give a flow of water over the entire length of both sides of the distributor box.

4. To correct a gravity reading for temperature the following rough rule may be used. For every 3 degrees Fahrenheit (F) above 60°F add 0.1° Be to the gravity reading. For every 3 degrees Fahrenheit below 60°F subtract 0.1° Be.

   Example:
   Gravity reading is 19.85 Be at 75°F
   75° - 60° = 15°
   15° ÷ 3 = 5
   5 x 0.1° Be = 0.5° Be correction
   19.85° Be + 0.5° Be = 20.35° Be at 60°F.

5. When the tantalum absorber is shut off and all of the gas from the chlorinators is sent to Dept. 217, the back pressure is increased on the chlorinator at Dept. 248. This makes changes in the operation of the chlorinator necessary at that department.

6. Call the operator at Dept. 248 (Station 223) before shutting off the tantalum absorber. In case of an emergency, and you do not have time to call the operator before shutting off the absorber, then call Dept. 248 as soon thereafter as possible.

7. The Dept. 248 operator has been instructed to call the Dept. 246 operator before he charges the chlorinator. During the time he is charging the chlorinator, do not make any changes in the operation which will increase the back pressure on the gas line. If such changes are necessary, call Dept. 248 before making them. The charging of the chlorinator requires approximately 45 minutes. The operator will call you back when his charging is finished.

Three Stage Ejector

1. Open wide the valve in the high pressure steam header to the 3- three stage ejectors.

2. Open wide the 3 steam valves to each of the three stages of the ejector to be used.

3. Regulate the flow of water to the condenser bowl until the bowl feels luke warm to the touch of the hand. This will give the best efficiency and prevent water waste.

4. Set the valves in the vacuum header so that vacuum is applied to the still in operation by the desired ejector.

5. After a still batch is finished close the valves in the steam, water and vacuum lines.

Dropping Still Bottoms

1. Approximately one hour before a still batch is finished apply fire to the still constant level line.

2. After distillation is completed reduce the furnace gas pressure to 5 lbs. and reduce the vacuum from 30" to 20".

3. Start the fume exhaust fan and place an empty drum, mounted on a dolly, beneath the discharge end of the constant level line.

4. As soon as the vacuum is reduced to 20" open the valve in the constant level line momenterily. The purpose of this operation is to check the constant level line to see whether or not it is plugged. If it is plugged rod the line to open it. Use extreme care.

5. If the constant level line is open release the vacuum and start draining the still bottoms into drums.

6. By means of a hose and from a distance of about 10 feet, add water to the filled drums to keep the fumes down.

7. As soon as all the still bottoms are dropped discontinue heating the constant level line, close the discharge valve and stop the exhaust fan.

8. After the still bottoms have cooled and are frozen, break up and dump into the trash box.

9. When still bottoms are to be saved for sales the Foreman will issue special instructions to that effect. Do not add water to still bottoms that are to be saved for sales.

Lighting of Gas Burners and Gas Furnace

1. USE EXTREME CARE IN LIGHTING GAS BURNERS AND JETS

2. Always have a gas lighter at hand before the gas valve is open. Never open a gas valve and then look for a lighter.

3. When igniting a gas jet open the gas valve just enough to permit a small flow of gas. Never open the gas valve wide open.

4. Apply the gas igniter to the gas stream as soon as the gas valve is opened.

5. To light the furnace burners first ignite the pilot light which is connected to the gas line by means of a rubber hose.

6. Insert the lighted pilot light through the port into the furnace just ahead of the furnace burner and turn the gas on the furnace burner slowly.

7. If the furnace burners should go out or if the gas is turned on the furnace burners for an extended period of time without being ignited, close the gas valve to the burners, open the inspection ports and let air pass through the furnace for at least 5 minutes before attempting to ignite the burners. Otherwise an explosion may result.

8. Keep as far away from the inspection port as possible when igniting the burners as the flame may shoot through the ports.

To "Suck" Out Still Coils

1. Close valves in gas lines to burners.

2. Stop still circulating pump.

3. Remove the cap from the 1" nipple between the two-2" valves in the circulating line from the still to the furnace.

4. Close the 2" valve between the 1" nipple and the furnace, open the valve connected to the nipple and leave open until a good flow of air into the still is observed then close this 2" valve.

5. Open the 2" valve between the 1" nipple and the coil and leave open until a good flow of air into the still is observed.

6. Repeat this operation three more times then open both 2" valves and leave open until the vacuum is released.

7. After the vacuum is released close the valve in the 1" line and cap it off.

Leotrodryer

1. To reactivate the alumina throw the 4 way valve lever, located between the tanks, away from the tank to be reactivated. The lever will be against the tank in use.

2. Open the valve behind and below the Leotrodryer.

3. Turn on blower and open valve behind and below the Leotrodryer to blow air through the tank to be reactivated. Blower switch is the left one of two above the lever.

4. Turn on heating unit switch which is to the right of the blower switch.

5. Allow to heat until air leaving the valve, below and behind Leotrodryer, is above 212°F or for 4 hours. Then shut off the blower.

6. Turn off the heating unit.

7. Close the valve below and behind the Leotrodryer.

8. The alumina is now reactivated and is ready for use.

9. Change tanks every 8 hours unless otherwise instructed by the foreman.

Condenser Make Up Water

1. The storage tank for the condenser cooling water should be maintained approximately 2/3 full.

2. To make condenser water, open wide the cooling water valve to the Vogt heat exchanger.

3. Open the steam valve to the Vogt heat exchanger until steam escapes through the vent of the condenser water storage tank. Then close the steam valve until the steam stops flowing through the vent.

4. Fill the storage tank to the desired capacity close the steam valve and close the cooling water valve if it is not required.

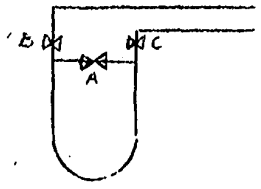
To Clean Sparkler Press

1. The Sparkler press should be cleaned after every four batches.
2. Connect the dry air supply line to the air connection on the press.
3. Open valves in the process lines so that the Aroclor in the press and in the lines will be blown to the blending tank.
4. Open the air valve and blow for one hour. Do this while the press is hot.
5. Close the air valve, remove the press cover and remove the filter plate assembly.
6. Remove the dirty filter papers containing the filter cake.
7. Use two filter papers between the filter plates and reassemble the press.
8. Disconnect the air line when not in use.

To Make 1262 Mix

1. 1262 mix is a mixture of 10% toluene and 90% of Aroclor 1262.
2. At the request of the Foreman add the specified amount of toluene to a drum or tank.
3. On top of the toluene add the specified amount of approved Aroclor 1262.
4. Mix the solution. If the mixture is made in a drum mix for 15 minutes. If the mixture is made in a tank mix for one hour.
5. Sample each individual mix and deliver to the laboratory for a gravity check.
6. If the gravity is not within the range as shown on the chart adjust the mixture. If it is within the proper range the mixture is ready to be packed into drums.
7. CAUTION: Toluene is inflammable. Keep away all fires. Ground the drums, tanks, and pumps.

Operation of Values at Chlorine Manometer



Manometer contains 60° Be H_2SO_4

Suppose all valves are closed

1. Open valve A first to equalize the pressure.
2. Open chlorine feed valve, cautiously.
3. Open valves B and C.
4. Slowly close A.
5. Regulate chlorine feed.

In between chlorinator batches, it will be necessary to shut off the manometer to prevent losing the sulfuric acid (60° Be or 78%)

To proceed (Shut off)

1. Close chlorine feed valve.
2. Open valve A, leave B & C open.

Starting up again.

1. Make sure valves A, B and C are open.
2. Open chlorine feed valve, cautiously.
3. Slowly close valve A.
4. Regulate chlorine feed.

Determination of Sticky and Gummy Stages of Aroclors 1168, 1169, 1170, 1171

1. Shortly after a specific gravity of 1.570 at 100°C is passed the Aroclors will pass into the sticky stage which lasts for a period of 2-4 hours.
2. Place a small amount of the Aroclor on a smooth metal surface, cool slightly and test between the thumb and forefinger, while wearing a rubber glove. If the material is stringy it is in the sticky stage.
3. If the material can be rolled into a ball it is in the gummy stage. The gummy stage follows the sticky stage and lasts 2-4 hours.

Determination of Crystallizing or Hold Points of Aroclors 1168, 1169, 1170 1171

1. After passing the gummy stage the Aroclors, when tested on a metal surface, solidify immediately into a sort of grey crystalline mass. Hold points can then be run on the chlorinator batch.
2. To run the hold point obtain a sample in a pyrex test tube and heat to about 200°C over a gas flame. Agitate with a 0-360°C thermometer.

3. Insert the test tube into a Dewar tube which is mounted in a large mouth bottle packed with asbestos or rags.

4. Stopper the test tube witha cork stopper through which is inserted the thermometer.

5. Cool slowly, at the rate of 4-5°C every 20 seconds, until the hold point is reached.

6. The temperaturewill continue to drop until a period is reached where there is no change in temperature for 2-3 minutes. If the temperature increases after this period then the highest temperature attainedwill be the hold point. However, if there is no increase in temperature then the point where it held steady is the hold point.

7. CAUTION: Wear goggles and asbestos gloves when obtaining samples of the solid Arocolors in the molten stage.

Softening Point (SP) Determination of Arocolors 2565, 4065, 4465, 5060, 5065

ASTM Method

The sample shall be melted and stirred thoroughly, to avoid having air bubbles in the mass and then poured into the ring so as to leave an excess on cooling. The ring, while being cooled, should rest on a metal plate. After cooling, the excess material shall be cut off cleanly on top with a slightly heated knife.

Fill the 600 CC beaker to a depth of 3-1/4" with glycerine at room temperature. Suspend the ring containing the sample and ball in the glycerine,so that the lower surface of the ring is exactly 1" above the bottom of the beaker and the upper surface 2" below the upper surface of the gvycerine. Suspend the thermometer so that the bottom of the bulb is level with the bottom of the ring and within 1/4" but not touching the ring.

Apply the heat in such a manner that the temperature of the glycerine is raised 5°C each minute.

The temperature se read on the thermometer at the instant that the melted material from the ring touches the bottom of the beaker will be the softening point.

Run a standard sample along with the chlorinator sample for comparison and make corrections as follows: Suppose the S.P. of the standard sample is 112°C and drops at 110°C, which indicates too rapid heating, then add 2°C to the S.P. of the chlorinator sample.

It is important to follow the setting of the ring and the thermometer as well as the rate of heating.

Cleaning of Chlorinators for Making Aroclor 5060

1. Since diphenyl is not used in the production of aroclor 5460, the chlorinators must be cleaned as well as possible of all other Aroclors which have been made from diphenyl.

2. Charge 2000 lbs. of molten distilled high boilers to the chlorinator to be "washed" and circulated for 24 hours. If more than one chlorinator is to be used pump this charge to each of the other chlorinators and circulate for 24 hours. Save the high boilers for making Aroclors 2565 and 4465.

3. Charge a second 2000 lbs. of molten distilled high boilers and circulate for 8 hours in each of the chlorinators.

4. After "washing" the chlorinators sample the second washing charge. If the chlorine content is less than 0.30% use this material for making a regular Aroclor 5060 chlorinator charge. If the chlorine content is above 0.30% save the washing charge for making Aroclors 2565 and 4465.

5. Usually two washings are enough. However, if the chlorine content after the second washing is two high repeat the washings.

Cleaning of Still and Still Receiver after Making Aroclor 1268.

1. After a run of Aroclor 1268, it is necessary to clean the still and still receivers.

2. Drop still bottoms through the bottom outlet.

3. Charge approximately 2000 lbs. or 8" - 10" from the blow tank to the still and distill this still charge in the normal manner.

4. After distillation drop still bottoms through the bottom outlet and drain the still receiver to drums. Save the latter for making solid Aroclors.

5. Make an internal inspection of the still receiver, clean and scrape if necessary.

Cleaning of Chlorinator Pot Off-Gas System

1. Clean the catch tank and lines for the off-gas system of No. 1 chlorinator every second batch of solid Aroclors made.

2. Clean the 10" off gas line first by removing all clean out blanks and rodding the caked material either into the chlorinator pot, catch tank or drums.

3. After the 10" lines are cleaned remove the manholecover from the catch tank and shovel all material into drums.

4. Replace all blanks and manhole covers. Make sure that all gaskets are in good condition.

5. Remove manhole cover from chlorinator pot and charge all the

caked material into the chlorinator pot.

6. Replace the manhole cover on the chlorinator pot and proceed with chlorinations.

Aroclor Specific Gravity Adjustments

Adjustments in the specific gravity of the first two chlorinator batches of Aroclor are made when changing from one type of liquid Aroclor to another. Unless instructions are issued to the contrary, use the gravities shown in the following table for these first two chlorinator batches.

Aroclor to be Made

Still	1248	1248	1254	1260	1262
Heel	@ 65°C	@ 65°C	@ 65°C	@ 90°C	@ 100°C
1242		1414-1416	1606-1607	1662-1664	1674-1676
1248	1345-1347		1604-1606	1660-1662	1672-1674
1254	1343-1345	1410-1412		1658-1660	1670-1672
1260	1342-1344	1408-1410	1602-1604		1668-1670
1262	1340-1342	1406-1408	1600-1602	1656-1658	

E. Smith

J. Soffranko

8-13-46

Dept. 246

Scrubber Liquor - Diphenyl

The table below lists the approximate range of Sp.Gr. of aroclors that may be found in scrubber liquor. In addition to the Sp.Gr. the equivalent aroclor as well as the pounds of solution per gallon is shown. Opposite the measurement two figures are shown in each square. The top No. represents the total pounds of aroclor and the lower figure represents the total pounds of diphenyl in the scrubber liquor.

Sp.Gr. @ 65°C		1200	1225	1250	1275	1300	1.325	1.350	1.375	1.400
Equivalent Aroclor		1126	1129	1132	1135	1138	1140	1142	1145	1147
Wt. Lb./Gal.		10.00	10.21	10.42	10.63	10.84	11.05	11.26	11.46	11.67
Scale on Side Sheet	Approx. No. of Gal.									
Heel	73	730 540	745 529	760 517	776 504	791 490	806 484	822 477	837 460	852 452
1"	83	830 614	847 601	865 588	882 573	900 558	917 550	935 542	951 523	969 513
2	93	930 688	949 673	970 659	988 642	1009 626	1028 616	1048 607	1065 586	1086 574
3	103	1030 762	1051 745	1075 730	1094 711	1118 694	1139 682	1161 672	1179 649	1203 635
4	113	1130 836	1153 817	1180 801	1200 780	1227 762	1250 748	1274 737	1295 712	1320 696
5	123	1220 910	1255 889	1285 872	1306 849	1336 830	1361 814	1387 802	1407 775	1437 757
6	133	1330 984	1357 961	1390 943	1412 918	1446 898	1472 880	1500 867	1521 838	1554 818
7	143	1430 1058	1459 1033	1495 1014	1518 987	1554 966	1583 946	1616 932	1636 901	1671 879
8	153	1530 1132	1561 1105	1600 1085	1624 1056	1663 1034	1694 1012	1726 997	1749 964	1788 940
9	163	1630 1206	1663 1177	1705 1156	1730 1125	1772 1102	1805 1078	1839 1062	1863 1027	1905 1001
10	173	1730 1280	1765 1249	1810 1227	1836 1194	1881 1170	1916 1144	1952 1127	1977 1090	2022 1062
11	183	1830 1354	1867 1321	1915 1298	1942 1263	1990 1238	2027 1210	2065 1192	2091 1153	2139 1123
12	193	1930 1428	1969 1393	2020 1369	2048 1332	2099 1306	2138 1276	2178 1257	2205 1216	2256 1184
13	203	2030 1502	2071 1465	2125 1440	2154 1401	2208 1374	2249 1342	2291 1322	2319 1279	2372 1245
14	213	2130 1576	2173 1537	2230 1511	2260 1470	2317 1442	2360 1408	2404 1387	2433 1342	2490 1306
15	223	2230 1650	2275 1609	2335 1582	2366 1539	2426 1510	2471 1474	2517 1452	2547 1405	2607 1367
16	233	2330 1724	2377 1681	2440 1653	2472 1608	2535 1578	2582 1540	2630 1517	2661 1468	2724 1428
17	243	2430 1798	2479 1753	2545 1724	2578 1677	2644 1646	2693 1606	2743 1582	2775 1531	2841 1489
18	253	2530 1872	2581 1825	2650 1795	2684 1746	2753 1714	2804 1672	2856 1647	2889 1594	2958 1550

		2630	2683	2755	2790	2862	2915	2969	3003	3075
19	263	1946	1897	1866	1815	1782	1738	1712	1657	1611
		2730	2785	2860	2896	2971	3026	3082	3117	3192
20	273	2020	1969	1937	1884	1850	1804	1777	1720	1672
		2830	2887	2965	3002	3080	3137	3195	3231	3309
21	283	2094	2041	2008	1953	1918	1870	1842	1783	1733
		2930	2989	3070	3108	3189	3248	3308	3345	3426
22	293	2168	2113	2079	2022	1986	1936	1907	1846	1794
		3030	3091	3175	3214	3298	3359	3421	3459	3543
23	303	2242	2185	2150	2091	2054	2002	1972	1909	1855
		3130	3193	3280	3320	3407	3470	3534	3573	3660
24	313	2316	2257	2221	2160	2122	2068	2037	1972	1916
		3230	3295	3385	3426	3516	3581	3647	3687	3777
25	323	2390	2329	2292	2229	2190	2134	2102	2035	1977
		3330	3397	3490	3532	3625	3692	3760	3801	3894
26	333	2464	2401	2363	2298	2258	2200	2167	2098	2038
		3430	3499	3595	3638	3734	3803	3873	3916	4011
27	343	2538	2473	2434	2367	2326	2266	2232	2161	2099
		3530	3601	3700	3744	3843	3914	3986	4029	4128
28	353	2612	2525	2505	2436	2394	2332	2297	2224	2160
		3630	3703	3805	3850	3952	4025	4099	4143	4245
29	363	2686	2597	2576	2505	2462	2398	2362	2287	2221
		3730	3805	3910	3956	4061	4136	4212	4257	4362
30	373	2760	2669	2647	2574	2530	2464	2427	2350	2282
		3830	3907	4015	4062	4170	4247	4325	4371	4479
31	383	2834	2741	2718	2643	2598	2530	2492	2413	2343
		3930	4009	4120	4168	4279	4358	4438	4485	4596
32	393	2908	2813	2789	2712	2666	2596	2557	2476	2404
		4030	4111	4225	4274	4388	4469	4551	4599	4713
33	403	2982	2885	2860	2781	2734	2662	2622	2539	2465
		4130	4213	4330	4380	4497	4580	4664	4713	4830
34	413	3056	2957	2931	2850	2802	2728	2687	2602	2526
		4230	4315	4435	4486	4606	4691	4777	4827	4947
35	423	3130	3029	3002	2919	2870	2794	2752	2665	2587
		4330	4417	4540	4592	4715	4802	4890	4941	5064
36	433	3204	3101	3073	2988	2938	2860	2817	2728	2648
		4430	4519	4645	4698	4824	4913	5003	5055	5181
37	443	3278	3173	3144	3057	3006	2926	2882	2791	2709
		4530	4621	4750	4804	4933	5024	5116	5169	5298
38	453	3352	3245	3215	3126	3074	2992	2947	2854	2770
		4630	4723	4855	4910	5042	5135	5229	5283	5415
39	463	3426	3317	3286	3195	3142	3058	3012	2917	2831
		4730	4825	4960	5016	5151	5246	5342	5397	5532
40	473	3500	3389	3357	3264	3210	3124	3077	2980	2892
		4830	4927	5065	5122	5260	5357	5455	5511	5649
41	483	3574	3461	3428	3333	3278	3190	3142	3043	2953
		4930	5029	5170	5228	5369	5468	5568	5625	5766
42	493	3648	3533	3499	3402	3346	3256	3207	3106	3014
		5030	5131	5275	5334	5478	5579	5681	5739	5883
43	503	3722	3605	3570	3471	3414	3322	3272	3169	3065
		5130	5233	5380	5440	5587	5690	5794	5853	6000
44	513	3796	3677	3641	3540	3482	3388	3337	3232	3126

MONS 055014

		5230	5335	5485	5546	5696	5801	5907	5967	6117
45	523	3870	3749	3712	3609	3550	3454	3402	3295	3187
		5330	5437	5590	5652	5805	5912	6020	6081	6234
46	533	3944	3821	3783	3678	3618	3520	3467	3358	3246
		5430	5539	5695	5758	5914	6023	6133	6195	6351
47	543	4018	3893	3854	3747	3686	3586	3532	3421	3309
		5530	5641	5800	5864	6023	6134	6246	6309	6468
48	553	4092	3965	3926	3816	3754	3652	3597	3484	3370
		5630	5742	5905	5970	6132	6245	6359	6423	6585
49	563	4166	5037	3996	3885	3822	3718	3662	3547	3431
		5730	5845	6010	6076	6241	6356	6472	6537	6702
50	573	4240	4109	4067	3954	3890	3784	3727	3610	3492
		5830	5947	6115	6182	6350	6467	6585	6651	6819
51	583	4314	4181	4138	4023	3958	3850	3792	3673	3553
		5930	6049	6220	6288	6459	6578	6698	6765	6936
52	593	4388	4253	4209	4092	4026	3916	3857	3736	3614
		6020	6151	6326	6394	6568	6689	6811	6879	7053
53	603	4462	4325	4280	4161	4094	3982	3922	3799	3675

E. Smith

Messrs: Barbre(2)
Becker(2)
Soffranko(2)
E.Smith(4)

DEPARTMENT 246

SPECIAL OPERATING INSTRUCTIONS

Utility Failures

There are occasions when interruptions in normal operating procedure occur. They are mainly caused by utility failures and may be of short or long duration. If normal operations are interrupted momentarily, then all equipment should be checked immediately and placed in the proper operating position. If the interruption is to extend over a long period of time, then the department should be shut down in a manner that will prevent loss of material, damage to equipment and expedite starting-up operations.

POWER FAILURE

1. Close both valves in the chlorine feed lines to each chlorinator.
2. Shut off still furnace gas burners.
3. "Suck out" still coils.
4. Stop flow of city water and well water to both HCl absorption systems.
5. Stop flow of cooling water to chlorinators.
6. Stop flow of high pressure steam and well water to the three-stage ejectors.
7. Throw into the "off" position all motor switches.
8. If filtering Aroclor and if air is available, blow out the press and lines to the blending tank.
9. Shut off all gas burners.
10. Close all valves beneath the acid tanks.
11. Close the valve in the pump up line to the HCl filter.
12. Replace all acid tank plugs.
13. If any cars are being loaded or unloaded, disconnect and head-up cars.
14. Drain still bottoms through the bottom outlet, if there is only a heel in the still.

AIR FAILURE

1. Air is used for mixing purposes, unloading cars, aeration of the blow tank, air jet in the blow tank vent stack and air jet in the acid tanks vent stack.

2. The department may operate without air until the blow tank becomes full with unaerated Aroclor. It will be necessary to discontinue distilling operations as soon as no aerated Aroclor is available.

WELL WATER FAILURE

1. Well water is used for ejector operation, cooling tantalum absorber, cooling tourills, packing glands for still pumps, packing gland for chlorinator pot agitator, cooling the flaker drum, cleaning still pots and the Vogt heat exchangers.

2. In case of well water failure, chlorinations would have to stop immediately because of the lack of cooling the tantalum and tourill absorbers. The remainder of the department may continue operating.

CITY WATER FAILURE

1. City water is used for the packing glands of the chlorinator circulating pumps, chlorinator jackets, make-up water for both HCl absorption systems, adjustment of muriatic acid strength, cleaning cars, safety showers, drinking and sink and toilet facilities.

2. In case of a city water failure, chlorinations would have to stop immediately since no water would be available for absorbing the HCl and the chlorinators could not be cooled unless a connection was made to the well water line. The remainder of the department may continue operating.

NATURAL GAS FAILURE

1. Natural gas is used to heat all still pots, chlorinator pot, No. 1 chlorinator circulating line and various lines and equipment.

2. In case of a natural gas failure, the still operation will have to cease immediately. The remainder of the department may operate for a short period of time.

LOW PRESSURE STEAM FAILURE

1. Low pressure steam is used for steam tracers, blow tank coils, chlorinator jackets, chlorinator coils, scrubber liquor tank coils, scrubber liquor tank jackets, all underground storage tank coils, blending tank coils, finished product tank coils, flaker drum, condenser make-up water, melting diphenyl cars, heating and cleaning cars and unit heaters and radiators.

2. In case of a low pressure steam failure, the department may continue operations for several hours. However, such a failure in winter would necessitate the blowing of all tracers, lines and coils to prevent freezing and damage by breakage.

HIGH PRESSURE STEAM FAILURE

1. High pressure steam is used for the tracer on the product line from No. 1 chlorinator to the still, the tracer line for the product line from the high boiler melter to the chlorinators, high boiler melter coil, still receiver coils and ejectors.

2. In case of a high pressure steam failure, the distillation operation will have to stop immediately since no vacuum will be available. Chlorinations may continue until the blow tank is full.

If the air, well water, city water, low pressure steam and high pressure steam are to be off for only a short period of time, reduce the still coil burners to 5 lbs. gas pressure and circulate the still charge. If these utilities, including natural gas, are off for a long period of time, shut down the department as outlined under Power Failure.

E. Smith

J. Soffranko

dfh

Aug. [illegible], 19[illegible]

AROCLOR DEPARTMENTS
OPERATING INSTRUCTIONS
GENERAL - HEALTH & SAFETY

Plant Horn Call System

The push button for the plant horn call system as well as the instructions for its use are located on the wall at the head of the stairs on the second floor inside of building CR.

Fire Alarm

A fire alarm box is located on the sprinkler house wall which is on the south side of building CR. To turn in an alarm break the glass. A fire alarm may also be turned in by dialing 200 and answering "fire at Aroclor department, Zone 1-1".

Fire Extinguishers

There are two 2½-gallon Foamite fire extinguishers in the department - one on the toilet wall and one on the inside wall of building CR, beside the door of the top floor. These extinguishers may be used on fires caused by trash such as paper, rags and wood and flammable liquids such as toluene and oil. DO NOT use Foamite extinguishers on electrical fires.

There are three quart carbon tetrachloride extinguishers in the department. One is located beside the door leading to the lean to. The second one is located on the west wall at the head of the stairs on the second floor. The third one is located on a building steel support at the southwest side of the blow tank on the second floor. These extinguishers may be used for all types of fires and especially electrical fires.

Fires

Paper, Rags, Wood, etc. - Fight with water, or Foamite or Carbon Tetrachloride extinguishers.

Flammable Liquids (oil, etc.) - Fight with Foamite or Carbon Tetrachloride extinguishers. Water may also be used especially when the fires are too large to be handled with a fire extinguisher.

Electrical - Pull the switch or shut off the equipment if this can be done quickly, and then fight the fire. Fight electrical fires with a carbon tetrachloride extinguisher. Do not use water or a Foamite extinguisher on an electrical fire, especially if the current has not been turned off.

Notify the Foremen or Night Superintendent any time that an extinguisher is used so that it may be refilled immediately.

Toxicity

Diphenyl and Aroclor are toxic materials. To prevent toxicity a

clean change of clothes is furnished daily to each employee and time is allotted at the end of each shift for bathing. In addition, one should wash his hands and face before eating.

Spare Clothes

A spare change of clean clothes is kept in a case mounted on the east wall of the second floor beside the drinking fountain.

Personal Safety Equipment

The following safety equipment is furnished to each employee in the department, should be maintained in good condition, and should be worn when conditions warrant their use - goggles, spectacles, rubber covered gloves, canvas gloves, rubber shoes and fume respirator.

Stretcher

A stretcher is located on the west outside wall of the lean-to.

Gas Mask

A gas mask is mounted in a case on the south, outside wall, second floor level, between the building and the tourills.

Showers

There are four showers in and around the department working area, as follows:

1 - On the loading dock at track No. 10-A.

2 - On the loading dock at track No. 11.

3 - On the ground beneath the HCl absorption system.

4 - Inside of the building, second floor, beside the door leading to the tourills.

E. Smith

J. Soffranko

as

PART VIII

HAZARDS AND MEANS TO SAFEGUARD MEN, MATERIAL AND EQUIPMENT

VIII. Hazards and Means to Safeguard Men, Material and Equipment

The main hazards of safety and health are fire, explosion and toxicity. In addition, there are the usual hazards involved in a chemical plant such as line breakage, acid leaks, steam burns, etc.

Fires may result from the ignition of leaking gas and from the ignition of toluene, diphenyl, rags, paper, wood, etc. Automatic sprinklers and fire extinguishers have been installed to combat fires. Fire extinguishers are located in strategic locations and consist of two-2½ gallon Foamite and three quart carbon tetrachloride extinguishers.

Explosions may be caused from accumulated gas pockets of natural gas and toluene or too rapid burning of diphenyl in closed containers such as a chlorinator. After an explosion occurs a fire may result which should be fought as any other fire. However, instructions have been issued stating the method to be used in igniting gas jets and how to avoid having back-fires and explosions. Chlorinators are equipped with a 10" diameter pressure relief line in which is a 4-lb. lead rupture disc made to rupture at 22 p.s.i. in case diphenyl within the chlorinator ignites and the burning rate becomes too rapid.

Toxicity does not present a serious problem. However, a complete daily change of clean clothes is supplied to each person and time is allotted at the end of each shift to take a bath. Instructions are also issued to avoid actual contact with diphenyl and Aroclor as much as possible and to wash hands and face before eating.

There are many accidents that can occur that may be classed as safety and health hazards. These accidents may result from such things as broken process lines, gas leaks, acid leaks, steam burns, etc. The following safety equipment is provided:

To each employee:

One pair rubber overall goggles
One pair spectacles
One pair rubber shoes
One pair rubber covered gloves
One pair canvas gloves
One fume respirator

For Department use:

One gas mask
One clean change of clothes
Four safety showers
One stretcher

MONS 055022

A fire alarm and a plant horn call system are installed in the department for reporting fires and summoning aid in case of an emergency.

J. Soffranko

as

PART IX

METHODS USED TO TAKE INVENTORY AND EVALUATE MATERIALS ON HAND

MONS 055023

J.F.Q. - M. III, 67

MONTHLY STOCK REPORT

1

Department _____ Month May 19 [illegible]

RUDE MATERIALS USED	Cls Gas #231	Cls Liquid #232	Cls Total	Toluene #529	Lime #565A	Att. Earth #608	Diphen. #611
No. of Material							
Stock First of Month	(1) 6,400#	0#	6,400#	400#	1000#	225#	(5) 159,17[illegible]
Received +	(2) 375,973	(3) 4,000	379,973	0	(4) 2450	(4) 200	(6) 100,00[illegible]
Total	382,373	4,000	386,373	400	3450	425	259,17[illegible]
Stock Last of Month	(1) 2,348	0	2,348	200	1500	300	102,8[illegible]
Difference	380,025	4,000	384,025	200	1950	125	156,28[illegible]
Required to Finish Previous Month –	2,000	0	2,000	0	150	0	0
Difference	378,025	4,000	382,025	200	1800	125	156,28[illegible]
Required to Finish This Month +	5,000	0	5,000	0	100	0	0
Total	383,025	4,000	387,025	200	1900	125	156,28[illegible]
Credit –							
Net Used	383,025	4,000	387,025	200	1900	125	156,28[illegible]
Per 100 Lbs. Finished Goods	118.86	1.24	120.10	10.00	0.59	0.04	48.50

	High Boiler Crude	High Boiler Distilled			Labor Operating	Labor Repair	Labor Packing	Labor Tot[illegible]
Material	618	619						
Stock First of Month	0#	0#			0	0	0	[illegible]
Received +	0	0			1150	120	130	14[illegible]
Total	0	0			1150	120	130	14[illegible]
Stock Last of Month –	0	0			0	0	0	[illegible]
Difference	0	0			1150	120	130	14[illegible]
Required to Finish Previous Month –	0	0			200	0	0	2[illegible]
Difference	0	0			950	120	130	12[illegible]
Required to Finish This Month +	0	0			150	0	0	1[illegible]
Total	0	0			1100	120	130	13[illegible]
Credit –							0	[illegible]
Net Used	0	0			1100	120	130	13[illegible]
Per 100 Lbs. Finished Goods					0.34	0.04	0.04	0.[illegible]

REMARKS:

(1) In scrubber liquor

(2) From Dept. 231

(3) " " 232

(4) " " 363

(5) 1178# in scrubber liquor

(6) Purchased

(7) 8401# in scrubber liquor

MONS 055024

Signed _____ Date 6-3-45

Approved _____ Date _____

W. 111.
J. F. Q. 60

MONTHLY STOCK REPORT

PRODUCTION Department 246 Month May 1936

1. Products or By-Products		Aroclor		Montar #4		100% EC1
2. Stock Last of Month	(1)	31,479#		0#		0 Tons
3. Del'd. to Pack. Rm. or Shipped		560,385		0		0
4. Del'd. 363 Rm. Storage		250,131		0		0
5. Delivered to Departments	(2)	52,109		0	(3)	93.00
6. Total 2, 3, 4 & 5		894,104		0		93.00
7. Rec'd. from Packing Room		0		0		0
8. Rec'd. from 363 Rm. Storage		540,000		0		0
9. Rec'd. from Departments		0		0	(4)	4.65
10. Stock first of Month	(1)	31,365		0		0
11. Total 7, 8, 9 & 10		371,365		0		4.65
12. Produced		322,239		0		88.35
13. Per Cwt. Main Product						

YIELDS TRANSFERS DISTRIBUTION

Products or By-Products						
Yield on. Chlorine	83.26	(93.08%)			93.00	(90.43%)
Yield Last Month	81.93	(92.30%)			92.79	(90.22%)
Standard Yield	83.05	(92.35%)			92.56	(90.00%)
Theoretical Yield	89.45	(100.00%)			102.84	(100.00%)
Yield on 311	206.18	(93.24%)				
Yield Last Month	208.87	(92.98%)				
Standard Yield	205.52	(92.95%)				
Theoretical Yield	221.12	(100.00%)			Aroclor	Produced
Yield on					1148	2003
Yield Last Month					1248	32,485
Standard Yield					1154	300
Theoretical Yield					1254	187,107
					1260	97,147
					1262M	2,000
					1271	3,000
					Total	322,239

Finished Goods Stock

(1) Process Goods Stock (4) From Dept. C-248

(, To Dept. A-246 - 48,509#
To Dept. D-246 - 3,600
Total 52,109#

(3) To Dept. D-218 - 90.00 tons
To Dept. 217 - 3.00 tons
Total 93.00 tons

MONS 055025

Dept. 246
Month

SUMMARY OF MONTHLY REPORT

	Month	March	April	May
Production:				
Products	1. Aroclors Liquid	400,000#	350,000#	319,230#
	2. Aroclors Solid	0	0	3,000
	3. Aroclor Total	400,000	350,000	322,230
	4. Muriatic Acid 100%			
Yields:				
Raw Materials	1. Diphenyl	94.20%	93.28%	[illegible]
	2. Chlorine	94.50	93.43	[illegible]
	3. Chlorine (HCl)	91.00	90.75	[illegible]
Inventory:				
Raw Materials	1. Diphenyl	150,000#	220,000#	[illegible]
	2. Chlorine	5,000	2,000	[illegible]
	3.			
Process Goods	1. Aroclor 1254	3,000#	25,500#	0
	2. Aroclor 1260	7,500	0	11,479#
	3. Aroclor 1271	10,000	0	0
	4.			
	5.			
Finished Goods	1. Aroclor	0	0	0
	2. Mur. Acid	0	0	0
	3.			
Liquidation Reserve:				
Raw Materials	1. Diphenyl	5,000#	1,000#	[illegible]
	2. Chlorine	2,000	3,000	1,000
	3.			
Process Goods	1. Aroclor	0	0	[illegible]
	2. Mur. Acid	0	0	0
	3.			
Goods of "No Value"				
	1.			
	2.			
	3.			

Comments: (See attached report for detailed remarks.) Signed: _____

Operating Supt. _____

Brief Comments Inserted.

MONS 055026

DEPT. 246

OPERATION REPORT

MAY 1946

Rate of Operation

Year	1945	1	9	4	6
Month	12	5 to date	April	May	June [illegible]
Liquid Arcolors	5,400,000#	1,500,000#	300,000#	3[illegible],239#	505,0[illegible]
Solid Arcolors	300,000	50,000	0	[illegible],000	50,0[illegible]
Total Arcolors	5,700,000	1,550,000	300,000	3[illegible],239	555,0[illegible]
100% by Produce HCl	2,200.0 Tons	500.0 Tons	90.0 Tons	[illegible],31 Tons	190

Brief comments on:

(1) Number of days operated
(2) Reason for rate of production
(3) Reason for estimated rate of production

Crude Materials and Yields
Crude Materials/cwt Arcolors

Year	1945	1	9	4	6
Month	12	5 to date	April	May	
#231	118.0	117.0	117.5	[illegible]3.86	
#232	4.0	3.5	4.2	1.24	
Total Chlorine	122.0	120.5	121.7	120.10	
#611	47.2	47.0	46.9	48.30	
#618	0.2	0.2	0.2	0	
#6179	0	0	0	0	
#565A	0.5	0.6	0.4	0.59	
#529/cwt 1262 mix	11.6	11.0	11.5	10.00	
#608	0.03	0.03	0.03	0.04	
Hours labor phg.	0.03	0.02	0.02	0.04	
Hours labor oper.	0.34	0.32	0.38	0.38	
Hours labor repair	0.02	0.02	0.02	0.04	
Hours labor total	0.42	0.39	0.45	0.42	

Percent Yields (Theory 100%)

Year	1945	1	9	4	6
Month	12	5 to date	April	May	
Arcolor					
on Chlorine	93.24%	92.74%	92.80%	93.08%	
on #611	92.17	94.46	92.98	93.24	
100% by-prod.HCl					
on Chlorine	94.38	95.51	97.61	90.43	

Brief Comments on Yield.

Service Charges/cwt Arcolor

Year	1945	1	9	4	6
Months	12	5 to date	April	May	
Steam M lbs.	0.22	0.42	0.35	0.53	
KWH Power	2.14	3.09	2.40	2.47	
KWH Lights	1.00	1.40	1.27	1.55	
KWH Total	3.14	4.49	3.67	4.02	
Comp.AirMCu.Ft.	3.01	.14	0.10	0.11	
City WaterCu.Ft.	0.11	21.90	24.50	24.00	
Well Water M Gals.	26.00	.42	0.44	0.47	
Fuel Gas M Cu.Ft.	0.05	.56	0.03	0.42	

Stocks

Stocks as of	5-1-46	6-1-46
Warehouse	532,000	100,000
Department	571,000	250,131
	1,103,000	350,131

Brief comments on present stock and amount shipped.

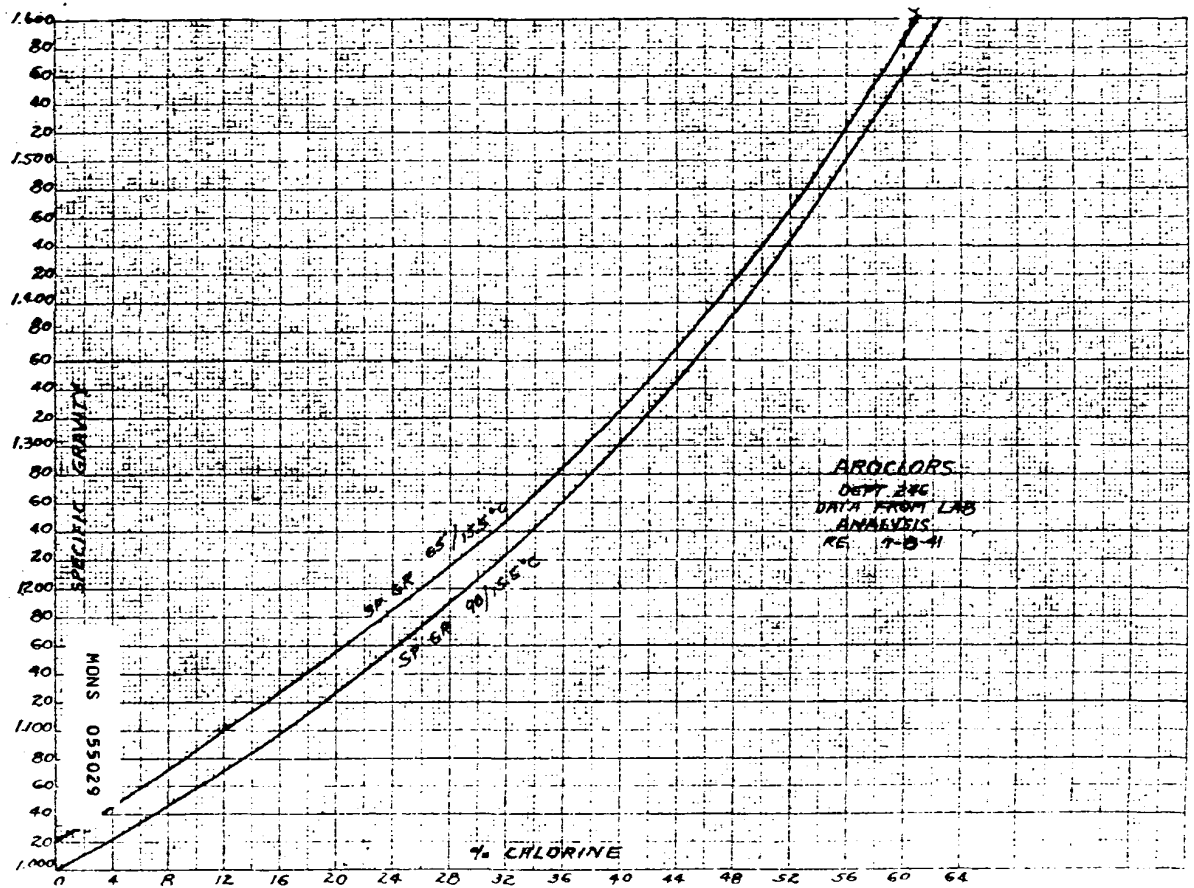
Operation

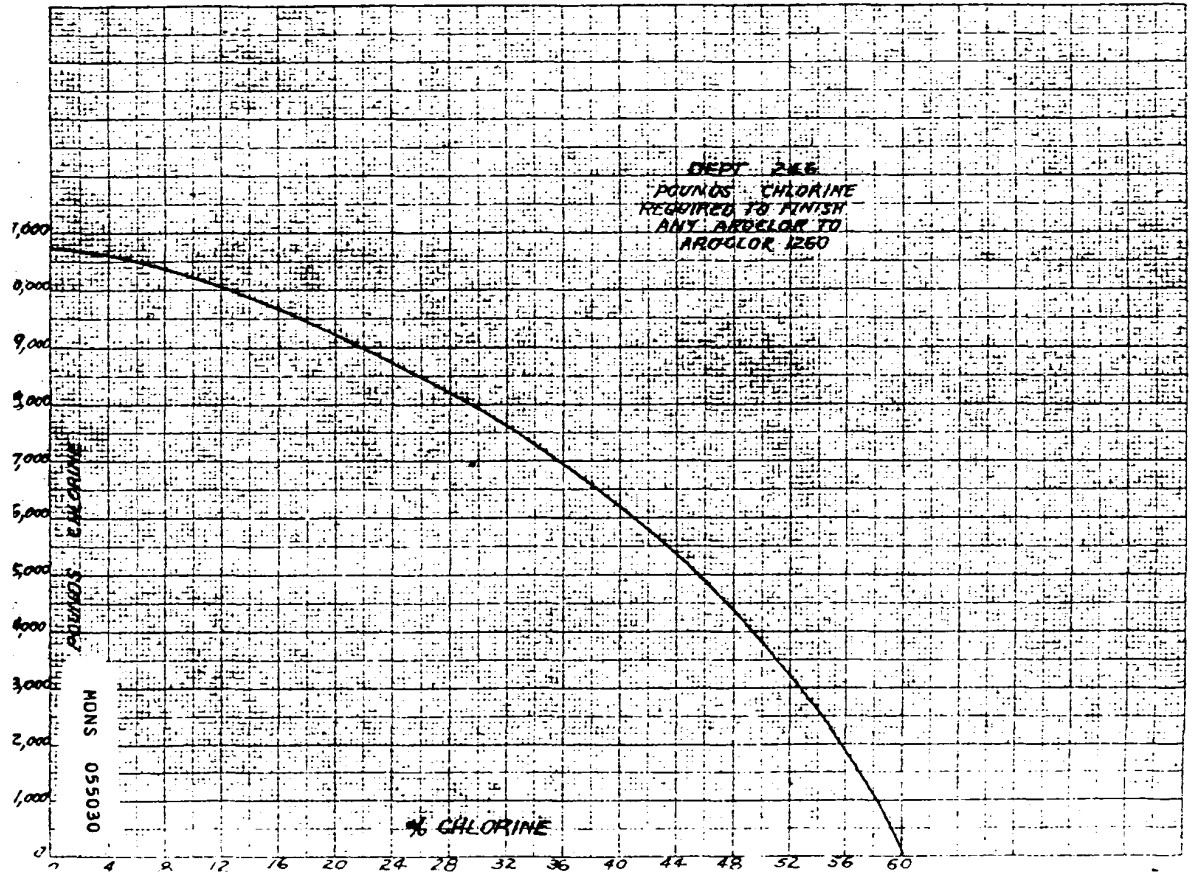
Brief comments on

(1) Operating difficulties
(2) Operating changes or unusual occurrences
(3) Major repairs.
(4) Future changes or major repairs contemplated.

Personnel

Note changes in personnel.


SPECIFIC GRAVITY
1.600
80
60
40
20
1.500
80
60
40
20
1.400
80
60
40
20
1.300
80
60
40
20
1.200
80
60
40
20
1.100
80
60
40
20
1.000
0 4 8 12 16 20 24 28 32 36 40 44 48 52 56 60 64
% CHLORINE
SP. GR. 65/15.5°C
SP. GR. 90/15.5°C
AROCLORS
DEPT. 276
DATA FROM LAB
ANALYSIS
RE. 1-8-41
MONS 055029


DEPT 266
POUNDS CHLORINE
REQUIRED TO FINISH
ANY AROCLOR TO
AROCLOR 1260
POUNDS CHLORINE
1,000
8,000
9,000
3,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
0 4 8 12 16 20 24 28 32 36 40 44 48 52 56 60
% CHLORINE
MONS 055030

IX - METHODS USED TO TAKE INVENTORY & EVALUATE MATERIALS ON HAND

Taking inventory on the first day of each month in the Aroclor Department does not differ appreciably from that of any other department in that gravities, temperatures and measurements are taken of tanks and physical counts are made of packaged materials. Calculation of the yields, however, differs in the respect that the standard and theoretical yields of Aroclors differ from month to month and therefore have to be calculated each time that an inventory is taken.

Tank measurements, temperature and gravity readings are taken on the following tanks:

Blow tank
New and old blending tanks
New and old finished product tanks
Storage tanks 3, 4 and 5
Scrubbers 1, 1A, 2, 3 and 4.

If the new and old stills are in operation, measurements are not taken when other tank measurements are made. Instead, the charging measurement and the gravity and temperature of the blow tank at the time of charging are used.

The diphenyl storage tanks, Nos. 1 and 2, are measured and a weight of 8 lbs. per gallon used for calculating the total weight.

The gravity and temperature of the chlorinators are taken. A known amount of diphenyl is charged to each chlorinator. Using this information and the curve and the table attached, the amount of chlorine required to complete a batch and the amount of finished aroclor that will be produced become known quantities.

A physical count is made of all containers. Part containers are weighed.

From the above information the quantity of each type of aroclor and raw material on hand is computed. In the case of materials in process an allowance is made for processing as shown on the sample sheets.

When reported yields are above the standard yields, small quantities of chlorine and diphenyl are held in reserve to compensate for any discrepancies that may appear in the following month's inventory.

Theoretical and standard yields are calculated each month for all aroclors produced. A set of factors, determined by past experience, is used for calculating the theoretical and standard amount of chlorine and diphenyl that should be used

for each type of arocolor produced. From the quantities of raw materials that should be used and those that are used the yields are calculated.

Calculating the yield of muriatic acid on chlorine is done in a normal manner. All HCl is transfered immediately to Dept 217 as HCl gas or to Dept. D-218 as muriatic acid. It should be noted that one-half of all chlorine received, not used, during the month is used for making HCl.

A complete set of filled-in inventory sheets and sheets showing the method used to calculate yields are attached.

From the inventory sheets the Monthly Stock Report sheets are prepared to which are attached the Summary of Monthly Report and Operation Report sheets. A prepared copy of each is attached.

DEPT. 246

Sheet #
6-1-46

MONTHLY INVENTORY

8 A.M.

Goods In Process - Arochlor

Chlor. No.	Batch No.	Dif Lbs. Charged	Sp. Gr.	Temp. °C	Equivalent Arochlor	Finished Arochlor To Be	Lbs. Cl2 Required Finish	Equiv. Lbs. of Finish Arochlor
1	Empty							
2	641	3600	1.366	90	1145	1260	(1) 5000	(2) 7800
3	Empty							
4	Empty							

(1) From curve attached.
(2) From table attached.

Tank No.	Batch No.	Type Arochlor	Ins. Outage	Gals.	Sp.Gr. Temp. °C	Lbs. Per Gallon	% Recovery	Total Lbs. Recovery
Blow-Tank	640	1160	23"in	651	1.525 @ 120	12.7	95	7854
Old-Still	Empty							
New-Still	894	1160	114	784	1.535 @ 110	12.8	95	9593
Old-Blend-Tank	Empty							
New-Blend Tank	893	1160	73	706	1.545 @ 100	12.9	95	8952
							Total	26,399
							Less 10% contingency	2,639
							Difference	23,679
							In Chlorinator	7,800
							Total goods in process	31,479

Finished Goods - Arochlor

Tank	Type Arochlor	Sp. Gr.	Temp. °C	Lbs. Per. Gal.	Inches In Tank	Gallons	Lbs. Finished Arochlor
Old-F.P.Tk.	Empty						
New-F.P.Tk.	1260	1.555	90	12.96	30" outage	1725	22,356
#3 Stg.	1260	1.555	90	12.96	53	6492	84,156
#4 Stg.	1254	1.495	70	12.46	52	6587	82,072
#5 Stg.	Empty						
Cars	MONX 809 Empty						

DEPT. 246

Sheet #2
6-1-46

MONTHLY INVENTORY

8 A.M.

Tank	Batch No.	Lbs. Di Chg'd.	Hold Point	Equiv. Arcolor	Fin. Arcolor To Be	Lbs. Cls Req'd.To Finish	Lbs. Crude	% Rec'd	Lbs. Fin. Arc
#1 Chlor. Stg.Pot	Empty "								

Still Pot-Empty

Pre Runs- None

Finished Goods - Arcolor

North Hopper

Empty Inches out = _____Cu.Ft. x_____#1 Cu.Ft. = _____#

South Hopper

Empty Inches out = _____Cu.Ft. x_____#1 Cu.Ft. = _____#

Lots 0 No.Bags 50 No. Lbs._____Lbs. in container

DEPT. 246

Sheet #3
6-1-46

MONTHLY INVENTORY

8 A.M.

Raw Materials

Diphenyl

In Scrubber Liquor (See sheet #4)	8431
In Measuring Tank	3600
In #1 Storage Tank 82 inches in. = 11736 Gals. x 8 #/Gal.	93888
In #1 Storage Tank 0 Inches in = _____ Gals. x _____ #/Gal.	
In Cars - None	
	105889
Less Reserve	3000
Reported Total	102889

Chlorine

Pounds

Liquid in cylinders - 0
Gas in Scrubber Liquor (See Sheet #4)

Crude High Boilers	0
Distilled High Boilers	0
Arcolor Trappings	0
Lime	30 bags at 50# each = 1500#
Attapulgus Earth	6 bags at 50# each = 300#
Toluol	1 drum = 200#

DEPT. 246

Sheet #4
6-1-46

MONTHLY INVENTORY

8 A.M.

Scrubber Liquor

Scrubber No.	Inches Innage	Gals.	Sp Gr.	Temp. °C	Equiv. Arcolor	#/Gal.	Lbs. Cl_2 (1)	Lbs. Di (2)	Lbs. Total
1	10	172	1.200	65	1126	10.00	447	1273	1720
2	10	172	1.230	65	1130	10.25	529	1234	1763
3	20	271	1.200	65	1126	10.00	706	2004	2710
4	20	271	1.230	65	1130	10.25	833	1945	2778
1A	20	271	1.230	65	1130	10.25	833	1945	2778
							3348	8401	11749
					Less Reserve		1000	0	
					Total reported		2348	8401	

Note:

(1) Lbs. total x % Cl_2 = lbs. Cl_2
(2) Lbs. total - lbs. Cl_2 = lbs. diø

DEPT. 246

MONTHLY INVENTORY

8 A.M.

Crude Arcolor

1142	Lot	R-2	= 1	part	drum	258#
1148	"	T-2	= 1	"	"	485
1154	"	T-1	= 1	"	"	492
1160	"	T-1	= 1	"	"	530
1162	"	T-1	= 1	"	"	597
1168	0					
1169	0					
1170	Lot	R-1	= 1	part	drum	170#
1171	"	T-1	= 1	"	"	220
4065	0					
5060	0					
2565	0					
300	0					
301	0					

DEPT. 246

Sheet #6
6-1-46

MONTHLY INVENTORY

8 A.M.

Distilled Arochlors

1242 Lot S-1 = 1 part drum 400#

1248 (Lot T-1 = 42 drums at 500# = 21,000#
" T-1 = 1 part drum = 100
21,100#)

1254 (Lot T-1 = 21 drums at 500# = 10,500#
No. 4 strength - Sheet #1 = 82,075
Total 92,575#)

1260 (Total goods in process - 31,479
Finished Prod.Tank - 22,356
No.3 storage tank - 84,136
Total 137,971)

1262 Lot S-1 = 1 part drum 292#

1262 Mix Lot S-2 = 1 part drum 205#

1268 0

1269 0

1270 0

1271 Lot T-1 = 1 part drum 142#

4465 0

5460 Lot T-2 = 44 drums
T-3 = 21 "
T-4 = 33 "
T-5 = 32 "
150 drums at 200# ea. - 26,000#
T-5 = 1 part drum 175
26,175#

MONS 055038

DEPT. 246

MONTHLY INVENTORY 8 A.M. 6-1-46

Aroclor	On Hand 5-1-46	Produced	Net Rec'd	Total To Account For	To 363 Net	To A-246	Total Transfer	On Hand 6-1-46 by Diff.	On Hand 6-1-46 by Inventor
1119	0	0	0	0	0	0	0	0	0
1132	0	0	0	0	0	0	0	0	0
1142	260	0	0	260	2	0	2	258	258
1148	285	200	0	485	0	0	0	485	485
1154	194	300	0	494	2	0	2	492	492
1160	530	0	0	530	0	0	0	530	530
1162	598	0	0	598	1	0	1	597	597
1168	0	0	0	0	0	0	0	0	0
1169	0	0	0	0	0	0	0	0	0
1170	170	0	0	170	0	0	0	170	170
1171	220	0	0	220	0	0	0	220	220
4065	0	0	0	0	0	0	0	0	0
5060	0	0	0	0	0	0	0	0	0
2565	0	0	0	0	0	0	0	0	0
									2710
1242	400	0	0	400	0	0	0	400	400
1248	415	32,485	0	32,900	11,800	0	11,800	21,100	21,100
1254	230,818	187,107	0	417,925	325,352	0	325,352	92,573	92,573
1260	307,296	97,147	0	404,443	217,963	48,509	266,472	137,971	137,971
1262	440	0	0	440	148	0	148	292	292
1262M	205	2,000	0	2,205	2,000	0	2,000	205	205
1268	0	0	0	0	0	0	0	0	0
1269	0	0	0	0	0	0	0	0	0
1270	116	0	0	116	116	0	116	0	0
12708	0	0	0	0	0	0	0	0	0
1271	143	3,000	0	3,143	3,001	0	3,001	142	142
4465	0	0	0	0	0	(1) 3,600	3,600	0	0
5460	29,775	0	0	29,775	0	0	0	26,175	26,175
300	0	0	0	0	0	0	0	0	0
301	0	0	0	0	0	0	0	0	0
TOTAL	571,865	322,239	0	894,104	560,385	52,109	612,494	281,610	281,6
								In process -	31,4
								Finished	250,1

(1) To Dept. D-246

DEPT. 246

MONTHLY INVENTORY 8 A.M. 6-1-46

Determination of Theoretical Yields

Type Arcolor	Pounds Arcolor Produced	Cl_2 Factor	Di# Factor	Cl_2 Required To Finish	Di# Required To Finish
1148 & 1248	32,685	0.9664	0.5304	31,587	17,335
1154 & 1254	187,407	1.0972	0.4669	205,623	87,500
1260	97,147	1.20	0.4038	116,576	39,238
1262M	(1) 1,800	1.2270	0.3930	2,209	707
1271	3,000	1.4190	0.3200	4,257	960
			TOTAL	360,252	145,731

Determination of Standard Yields

Type Arcolor	Produced	Cl_2 Factor	Di# Factor	Cl_2 Required	Di# Required
1148 & 1248	32,685	1.040	0.5687	33,992	18,588
1154 & 1254	187,407	1.181	0.5011	221,328	93,910
1260	97,147	1.2952	0.4375	125,825	42,502
1262M	(1) 1,800	1.3225	0.4210	2,381	758
1271	3,000	1.4995	0.3436	4,499	1,031
			TOTAL	388,025	156,789

(1) Use 90% of total 1262 mix produced or 1800#

MONS 055040

DEPT. 246

MONTHLY INVENTORY 8 A.M. - 6-1-46

CHLORINE

Theory $\frac{322\ 239}{360\ 252} \times 100 = \frac{89.45}{89.45} \times 100 = (100.00\%)$

Standard $\frac{322\ 239}{388\ 025} \times 100 = \frac{83.05}{89.45} \times 100 = (92.85\%)$

Actual $\frac{322\ 239}{387\ 025} \times 100 = \frac{83.26}{89.45} \times 100 = (93.08\%)$

DIPHENYL

Theory $\frac{322\ 239}{145\ 751} \times 100 = \frac{221.12}{221.12} \times 100 = (100.00\%)$

Standard $\frac{322\ 239}{156\ 789} \times 100 = \frac{205.42}{221.12} \times 100 = (92.95\%)$

Actual $\frac{322\ 239}{156\ 289} \times 100 = \frac{206.18}{221.12} \times 100 = (93.24\%)$

100% HC 100% HCl

$\frac{\text{Tons 100\% HCl prod.}}{\text{Tons Cl}_2 \text{ received} \div 2} = \frac{88.34}{94.99} \times 100 = 93.00$

$\frac{93.00}{102.84} \times 100 = 90.43\%$

AROCLOR BATCH DATA

DEPT. 246

Aroclor	Dig Charge	Wt. Crude per Chlor.Batch	Cl_2 Requ'd 96%	Tons HCl 96%	Wt. Dist. per Chlor.Batch	REC.
1142-1242	4000	6483	5735	1.24	6165	95
1148-1248	4000	6600	6890	1.43	6336	96
1154-1254	3600	7571	8555	2.05	7200	95.3
1160-1260	3600	8227	10160	2.22	7845	95
1162-1262	3600	8850	11089	2.43	8517	96
1168-1268	2800	7800	10678	2.31	7000	90
1169-1269	2800	8000	11466	2.01	7200	90
1170-1270	2800	8100	11950	2.67	6800	84
4065-4465	(1800 / (1200 (DHB)	7725	10205	2.23	6950	90
5060-5460	3600 (DHB)	7800	10062	2.20	6200	80
2565	(1800 / 600 (CHB)	6560	8849	1.93		

Aroclor	Sp. Gr.	Lbs/Gal.	°C	Sp.Gr. Coefficient
1242	1.343	11.2	65°C	0.0009
1248	1.409	11.7	65°C	0.0009
1254	1.500	12.5	65°C	0.00095
1260	1.555	13.	90°C	0.0010
1262	1.577	13.	90°C	0.0010
1268	1.49	12.3	300°C	
1269	1.49	12.3	300°C	
1270	1.95	16.2	25°C	
4465	1.59	13.2	130°C	
5460	1.733	14.	25°C	
2565	1.733	14.4	25°C	
1482	1.555	13.	90°C	
1488	1.564	13.	155°C	
1495	1.566	13.	65°C	