PROGRESS REPORT
TECHNICAL SERVICES DEPT. - W. G. KRUMMRICH PLANT

JOB NO. 91370:3690 | REPORT NO. 2 (Final) | DATE 5, 6, 70

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TITLE: AROCLOR: INCREASE AROCLOR CAPACITY

PERSONNEL: W. A. Krull (T. E. Greenman)

PROBLEM: Verify Design Capacity of Aroclor Expansion

SUMMARY During a capacity check, the design rate of the equipment installed in the Aroclor expansion was exceeded for about a two day period. This verifies that the Aroclor production capability at WGK is about 70 M pounds per year provided we have sufficient operator force and storage. To reach 70 M pounds, three more 22,000 gallon storage tanks and one or more operators would be needed. The 1970 cost standard indicates a capacity of 57.6 M pounds per year. The storage limitation is the lower restriction.

The 1973 and 1974 forecasts are for 55 and 59 M pounds respectively. This indicates a need for additional storage in 1973 and that before this, no changes or additions are necessary. The capacity of the drowning jet will be checked to see if HCl pollution could be a problem at full rate. Quarterly capacity checks will be made to discover any restrictions that could develop due to wear.

Future Work: This job will be closed.

Wayne A Krull

W. A. Krull
Technical Services Department

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DETAILS:

I. BACKGROUND

A. In 1968 the Aroclor Department was expanded by a CED project, CEA 1800, which was continuous and rated at 40 M pounds/year. At the time the new facility was added, the existing batch plant was rated at 30 M pounds/year.

B. The sales forecast dated 2/15/70 forecasts an Aroclor production for coming years in millions of pounds per year as follows:

1971 - 46.5
1972 - 50.9
1973 - 55.5
1974 - 59.2

C. Aroclor is presently produced using the continuous chlorinators for 1242. All other Aroclors are produced in the batch chlorinators from Biphenyl. Aroclors 1248 and 1254 are distilled in one continuous still and 1242 in the other. The two batch stills are used for other products (#1) and boiling down still bottoms (#2). All numbers in this report were arrived at assuming this type operation would continue.

II. WORK DONE AND RESULTS

A. The actual operating capacities of the major process steps were found by running the equipment at high rates. By material balances the actual rates were compared to instrument readings and the instruments found to be correct. The rates do not reflect maximums in all cases. The still rates in particular are some unknown amount less than maximum.

B. The following table gives the rated and measured capacities of the steps of the continuous expansion. Both figures use 93% on stream time. The #4 still actual capacity was based on the 1248-1254 product split.

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DETAILS:

COMPARISON OF RATED AND ACTUAL CAPACITIES

Equipment	Product	Rated Capacity M pounds/year	Actual (M pounds/year)
Chlorinators	(1142)	40	46
#3 Still	(1242)	25	33
#4 Still	(1248,1254)	25	36
#1 Absorber	(1242)	27	53
#2 Absorber	(1254)	27	35
#3 Absorber	(1248)	27	38
#4 Absorber	(1260)	27	62

C. The expansion equipment has been demonstrated to rated capacity. In the next table a comparison between demonstrated rates and forecasted requirements shows the excess capacity available. This table includes the batch plant as well as the continuous expansion.

REQUIRED AND DEMONSTRATED CAPACITY

Product	Process Step	Demonstrated M #/year	1971 Forecast	1973 Forecast	Forecasted % Rate in 1973
1242	Chlorination	46	27	33	70
1242	Distillation	33	27	33	100
1242	Absorption	53	27	33	60
Other Aroclor	Chlorination	26	19	23	90
1248,1254	Distillation	22	16	19	85
1260,1262,1232	Distillation	9	3	4	45
1248	Absorption	38	8	9	25
1254	Absorption	35	8	10	30
1260	Absorption	62	3	4	5

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DETAILS:

II. WORK DONE AND RESULTS (Continued)

D. The production department has indicated that one or more additional operators would be necessary if a high rate is to be maintained for a longer period of time. Also, additional storage would be necessary to run at high rates These factors restrict the capacity to 58 M pounds/year with storage being the lowest restriction. The forecast indicates a need for additional storage in 1974.

CONCLUSIONS:

The capacity check and previous production records have shown that the department will be running at reduced rates through 1973. The 1242 still will be nearing capacity in 1973 even though the additional demonstrated capacity is not maximum. Storage and operators may be needed in 1973. From the data in the Appendix, it appears that the off-gas condensate rate is doubled when the continuous chlorinators are increased from 70% to 100%.

RECOMMENDATIONS:

1. Evaluation of drowning jet be made to determine pollution level at full rate.

2. No other capacity related TSD work be done until 1973 when storage should be evaluated, unless sales exceed the present forecast.

3. Quarterly checks be made to discover rate restrictions that occur.

APPENDIX:

The remaining pages of this report consist of data taken during capacity checks. The temperatures, pressures and levels should be typical of conditions at the various rates.

W. A. Krull
Technical Services Department

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Att:

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APPENDIX:

CONTINUOUS CHLORINATOR DATA

Biphenyl Feed Rate (%)	Cat. Mix Ratio Min-Sec.	Bi Ø Temp °C	% Cl_2 Flow				Cl_2 Pressure PSIG	Specific Gravity				#9 Densitrol %	Densitrol Set Point	Densitrol Reading
			#6	#7	#8	#9		#6	#7	#8	#9			
55	6 - 7	99	44	43	53	70		1.096	1.165	1.252	1.346	80		
65	6 - 7	100	44	55	46	60		1.092	1.191	1.275	1.355	83	1.356	1.359
65	6 - 7	96	44	55	45	64		1.092	1.190	1.270	1.352	81	1.355	1.358
75	6 - 7	100	45	60	47	70	25	1.082	1.186	1.266	1.339	65	1.343	1.344
75	6 - 7	100	45	60	50	70	27	1.088	1.184	1.258	1.343	67	1.345	1.346
85	6 - 7	100	50	62	59	92	27	1.088	1.182	1.258	1.345	78	1.353	1.352
85	6 - 11	99	65	71	75	68		1.098	1.190	1.286	1.354	94	1.360	1.369
85	6 - 11	99	66	73	74	70	25	1.096	1.186	1.279	1.340	88	1.359	1.361
100	6 - 14	100	99	100+	99	72	26	1.124	1.217	1.248	1.358	72	1.350	1.350
100	6 - 14	99	75	70	75	83	26	1.109	1.204	1.295	1.351		1.343	1.343
100	6 - 14	101	90	90	90	71	26	1.110	1.198	1.282	1.352	68	1.345	1.348
100	6 - 14	100	90	90	85	57	27	1.116	1.222	1.306	1.347	46	1.347	1.347

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APPENDIX:

Biphenyl Feed Rate (%)	Chlorinator Temp (°C)				Off-Gas Temp (°C)		Int. Stor. Temp °C	Blow Tank Temp °C
	#6	#7	#8	#9	Header	Condensate Tank		
55	136	155	175	193	89	44	174	145
65	137	159	174	192	77	38	180	145
65	136	158	174	192	83	45	174	115
75	153	167	175	192	88	41	168	130
75	156	167	175	192	92	43	168	145
85	155	167	185	194	100	43	170	147
85	157	168	187	192	91	40	184	148
85	157	170	186	193	93	41	176	145
100	164	170	193	193	101	41	175	160
100	154	167	183	195	102	41	178	125
100	155	169	184	194	107	42	180	120
100	155	169	184	192	100	40	180	110

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APPENDIX:

Bi-phenyl Feed Rate (%)	Cooler Settings								Cooler Outlet Temp (°C)				Sparger Temp (°C)			
	#6		#7		#8		#9									
	Speed	Air Press	Speed	Air Press	Speed	Press	Speed	Press	#6	#7	#8	#9	#6	#7	#8	#9
55	Slow	11	Slow	12	Slow	12	Slow	12	135	152	172	190	136	153	173	191
65	Slow	10.5	Slow	12	Slow	12	Slow	12.5	136	155	173	190	136	157	173	190
65	Slow	11	Slow	12	Slow	12.5	Slow	12.5	136	156	172	190	136	157	172	190
75	Slow	Close	Slow	11.5	Slow	11.5	Slow	13	153	164	173	190	153	166	172	190
75	Slow	Cld	Slow	10	Slow	11	Slow	13	156	164	173	191	156	166	173	190
85	Slow	9.5	Slow	10.5	Slow	10	Slow	10	155	164	182	191	155	166	183	191
85	Slow	11	Slow	8.5	Slow	8	Slow	13	155	164	183	190	157	167	185	190
85	Slow	9.5	Slow	Open	Slow	7	Slow	13.5	155	166	182	190	157	169	184	192
100	Slow	Open	Fast	12.5	Slow	Open	Slow	13	161	164	189	191	164	168	191	191
100	Fast	13	Fast	14	Fast	13	Slow	13	151	164	180	191	154	166	181	193
100	Fast	12	Fast	12.5	Fast	12.5	Slow	13	152	164	180	192	155	168	183	192
100	Fast	12.5	Fast	13	Fast	13	Slow	15	151	164	180	192	155	168	183	190

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APPENDIX:

#3 STILL DATA

Absorber Feed Rate %	Surge Tank Level %	Still Level %	Still Press (mm Hg)	Circulating Pump Press psig	Therminol Flow Rate %	Therminol Set Point °C	Therminol Temp To Ex °C	Therminol Temp Out Ex °C	Still Temp °C	Product Temp °C Out Of Ex.	Product Temp °C Vapor Into Cond.	Product Temp °C Out Condenser	Product Temp °C Rec	Condenser Water Temp °C In	Condenser Water Temp °C Out
47	52	55	40	50	23	265	264	235	227	223	223	50	61	48	54
61	43	53	40	58	70	255	253	241	231	238	225	55	65	53	60
64	48	53	42	58	73	255	256	243	233	241	226	56	64	54	61
70	46	55	39	58	40	270	270	247	235	243	228	63	71	59	68
71	51	54	42	50	40	270	268	245	233	241	228	65	73	61	70

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APPENDIX:

ABSORBER DATA

Absorber	Rate Gal/Min	Temp °C	Pump Press. psig	Press. Into Absorber psig	Press. Out Absorber psig
#1 (1242)	4	65	83		9.5
#1 (1242)	7	65	83		10.0
#1 (1242)	10	65	83		10.5
#1 (1242)	Open	65	83		11.5
#2 (1254)	4	100	83	40	11.0
#2 (1254)	6 (Open)	100	83	62	11.5
#3 (1248)	4	87	79	34	10.5
#3 (1248)	7 (Open)	87	79	56.5	10.5
#4 (1260)	4	136	78		8.0
#4 (1260)	7	137	77		8.5
#4 (1260)	10	135	78		9.0

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APPENDIX:

ABSORBER DATA

Absorber	Rate Gal/Min	Temp °C	Pump Press. psig	Press. Into Absorber psig	Press. Out Absorber psig
#1 (1242)	4	65	83		9.5
#1 (1242)	7	65	83		10.0
#1 (1242)	10	65	83		10.5
#1 (1242)	Open	65	83		11.5
#2 (1254)	4	100	83	40	11.0
#2 (1254)	6 (Open)	100	83	62	11.5
#3 (1248)	4	87	79	34	10.5
#3 (1248)	7 (Open)	87	79	56.5	10.5
#4 (1260)	4	136	78		8.0
#4 (1260)	7	137	77		8.5
#4 (1260)	10	135	78		9.0

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