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PROGRESS REPORT

TECHNICAL SERVICES DEPARTMENT

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Distribution:-

TITLE: Process Improvement Plan for Aroclors, Pyroclor & Diphenyl

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PROBLEM: To continue presentation of a long range plan to improve the production ofAroclor, Pyroclor and Diphenyl at Newport.

SUMMARY:

a) Aroclors

To meet the Five Year Sales Forecast, Aroclor capacity needs to be expanded above the present 9.35 M lbs per annum standard. The problem is to achieve this increase consistent with improving the quality of the finished product to achieve the Company goals. These apply to the electrical grades of 1242 and 1254 and have been set up for Power Factor, Resistivity, Water Content, Stability and Colour.

Potential chlorination capacity is adequate for the forecast period but the increased gassing rates required will necessitate installation of Brink Mist Eliminators to cut down entrainment and so avoid blockages and maintain yield. The jacket cooling is also inadequate and external facilities will be required. With these additions, operation at the same levels as M.C. will be possible.

A capacity of 13 M lbs/annum has been demonstrated in still trials with batch operation but distillate colour is barely acceptable. It does not meet the quality goal. The provision of improved entrainment separation and heat input facilities are being investigated. Although it is possible that the existing still may be adequate for production beyond 1970 with extensive modifications, the installation of a second system will be required to ensure this. The resulting capacity would be adequate to cover 1972 production with the 25% excess availability recommended at the St. Louis Quality Meeting in February, 1966.

Evaluation of the proposed alternative treatment material (bauxite) for improved electrical properties will be continued , starting with a plant trial under batch conditions.

b) Pyrocler

Production Facilities are adequate for 1967/8 requirements. Minor specification problems will be investigated.

c) Diphenyl

Subject to approval of the C.A.R. the installation of the tubular unit will be proceeded with, to meet diphenyl requirements and avoid the necessity to import M.C. Diphenyl.

RECAPITULATION

Job	Status	Savings S.T. 67	68	69	Capital	Notes
Brink Mist Eliminators	C.A.R. Submission 1st. quarter '67	-	£6000	£6000	£3000	Savings from yield loss elimination. Estd. 2% at high chlorination rates
Santowax Fuel Use	On line Feb. '67	£4000	£4000	£4000	£5000	Savings from reduced oil usage & waste disposal
Diphenyl Tubular Unit	C.A.R. in preperation	-	-	£95000	£305000	Savings from reduced benzene usage & flake imports.
Productivity						
Aroclor		£5000	£10000	£30000	-	
Pyroclor		£4000	£ 7000	£10000	-	
		£13000	£27000	£145000		

A.

CURRENT STATUS & MAJOR PROBLEMS

1. Problem Areas

a) Aroclors

The major process problem area remains, the production of low power factor electrical grade Aroclor, in particular Aroclor 1242. Associated with this problem is the difficulty still encountered in obtaining reliable measurements of this parameter.

The process bottleneck occurs in the distillation step. Capacity is at present limited by the ability of the still to produce a distillate of acceptable colour.

b) Pyroclor

No major problems are involved in Pyroclor production. Some minor difficulties are still associated with retreatment of batches.

c) Diphenyl

There are no major problems associated with Diphenyl.

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2. Process Yield

A) Aroclors

Principle raw materials, chlorine and diphenyl, are made on site apart from flake import required to supplement diphenyl production (at 6% of total requirement in 1966)

No measurement facilities exist at present to permit an accurate estimate of yield.

M.C.L. usages close to those of M.C. have been shown previously.

Current usages are:-

	Theoretical Usage lb/1000 lb F.P.	Standard	Difference Value at 1967 Requirements
Chlorine			
1242	849	904	£4,300
1248	970	1035	490
1254	1090	1165	2,300
1260	1210	1300	1,100
1262	1250	1335	60
		Basis Chlorine 3.0d/lb	
Diphenyl			
1242	592	620	5,700
1248	536	560	500
1254	475	498	1,900
1260	415	437	680
1262	398	417	30
		Basis Diphenyl 7.3d/lb	

Yield losses due to entrainment from the chlorinators will be minimised by installation of Brink Mist Eliminators as part of the expansion programme. The capital cost is approximately £3,000.

b) Pyroclor

The bulk of pyroclor production is Pyrocior P.P.O. (Nominally 60% 1260, 40% T.C.B. with Phenoxy Propene Oxide gas scavenger at the 0.2% level). In addition, a small demand exists for Special Pyroclor(75% 1254, 25% TCB) Aroclor 1260 (& 1254) is transferred on a standard basis of 620 lb/1000 lb F.P. (760 lb/1000 lb in the case of Special Pyroclor)

	1964	1965	1966	Standard
T.C.B. usages lb/1000 lbs F.P.	413	419	402	415

The improvement has resulted from bulk handling of T.C.B. and relaxation of an unnecessarily tight resistivity specification.

c) Diphenyl

Diphenyl requirements are in excess of the capacity of the Lead Pot units. Operation to maximise benzene conversion per pass and hence production has resulted in higher benzene usages.

	1965	1966	Standard
Benzene usage gall/1000 lb F.P.	157	160.2	162

If installation of Tubular Diphenyl Oil is approved, Benzene savings of £17,000 (at the 5:5 M lb level) will accrue from lower conversion level operation.

The existing hydrogen compressor is undersized by approximately 20% and a larger unit will be required to achieve maximum benzene recovery if the Lead pots installation is maintained. The capital cost for a new compressor will be approximately £2,500.

3. EXISTING CAPACITY & FORECASTED FUTURE REQUIREMENTS

a)

Aroclors	1967	1968	1969	1970	1971	1972
Sales requirements * M lb.	10.2	11.5	12.5	14.2	15.8	17.6
Requirements with extra 25% surge availability M lb	12.7	14.4	15.6	17.7	19.7	22.0

* Requirements include transfer to Pyroclor

Present Standard Capacity: 9.35 M lbs
Present relizable capacity: 10.0 M lbs (assumes use of semi-continuous facilities)

Capacity increases are required in the areas of chlorination and distillation to meet the forecast figures. The 25% excess capacity has been recommended for all Aroclor plants (St. Louis Quality Meeting February, 1966) to allow for peak demands.

i) Chlorination

Existing capacity	12 M lb
Potential capacity	20 M lb
Capital	£8000

Installation of a 4" chlorine transfer line in October 1966 allows simultaneous gassing on all three chlorinators at levels currently in operation by M.C. (up to 1500 lb/hr). At the higher chlorination rates the present cyclone separators will be unable to deal efficiently with the increased entrainment load. Design operation has in any case not been achieved due to pluggage problem with ferric chloride. It is proposed to install Brink Mist eliminators to minimise entrainment losses. Preliminary trials at high chlorination rates have shown the cooling system (water jackets) to be inadequate. External cooling will be provided. This will take the form of air coolers similar to M.C. installations. With this application of M.C. technology, chlorination operations will have sufficient capacity for the next 5 years.

ii) Distillation

	Standard Capacity	9.35 M lb/annum
i).	Potential Capacity (existing system)	Intermediate 14 M lb Potential 17 M lb

Plant trials have shown that batch cycle times, giving capacities of up to about 13 M lb per annum of Aroclor 1242 are available with the existing equipment. At levels in excess of 10 M lb, loss of entrainment separation efficiency leads to an increase in product colour. A broad correlation between batch colour and distillation rate exists but with considerable variation between batches. Typical results for Aroclor 1242 are :-

Coil $\Delta T^{\circ}C$	9	10	13
Cycle time hrs.	8.3	7.8	6.2
Capacity (87% O.S.T.) M lb.	9.4	10.0	12.6
Colour hazen	30/40	40/50	40/50

In normal operation a maximum ΔT of 9°C is used on Aroclor 1242 For the higher Aroclors (1260 and 1262) a higher spread is used (up to 14°C) to allow for the greater heat losses associated with the higher temperature of operation.

The quality goals set up in February, 1966 require a finished product colour of 10 APHA. To achieve this, a distillation batch colour of less than 20 APHA is necessary. Thus a more efficient entrainment separator will be required if the still is to give capacities over 10 M lb while still meeting F.P. colour requirements. Estimated capital cost is approximately £2,000.

Installation of increased F.P. storage for Aroclor 1242E is scheduled on-line in April 1967. The provision of this facility will allow increased use to be made of semi-continuous distillation. With improved entrainment separatation to allow realization of the capacity of the existing heating system, a capacity of approx. 14 M lb. will be available. (Assumes 40-50% Aroclor 1242 production made on semi-continuous operation)

Further capacity increase will require new equipment to increase heat input. Although increased coil area (2" to 3") and a higher pumping rate (cost £1,000) will be considered as the first approach, experience at Krummrich has indicated that a simple increase in coil diameter will not give a significantly increased heat input. In this event a new heater will be required at a capital cost of £5000. This step may become necessary at an earlier stage if consistent operation of the present set up with the higher coil temperature differences leads to excessive problems with higher rates of coil pluggage & failure. High temperature differences will also lead to a decrease in yield associated with increased degradation of the still contents in the coil.

Associated equipment (Aroclor condenser, Aroclor cooling water condenser) has capacity up to approximately 16 M lbs/annum. Replacement of these items will involve a capital expenditure of £2,000

2) Potential Capacity (Duplicate system) 20 M lb/annum
Capital £45,000

As an alternative to meet the long term capacity increase, installation of a second distillation unit similar to the existing one, can be installed and space has been left in the plant layout for this. This will give excess capacity over the forecast period and the risk of non-fulfillment of sales requirements will be eliminated.

In view of the expanding sales forecasts, the accent on quality of electrical grade Aroclors with respect to electrical properties and stability together with the high quality aroclor produced by our competitors and the recommendation that each Monsanto location should have 25% surge capacity, it is possible that this should be the recommended course.

iii) Storage

Installation of increased F.P. (12 42E) storage and improved bulk loading facilities is in hand.

Completion : 4/67
Capital : £21,800

Further storage capacity (an extra 12,000 galls) will be required during 1969 to meet increased sales volume. Cost will be approximately £7,500

AVERAGE CAPACITIES CHLORINATOR	Present (Average) operation 1142	1148	1154	1160	1162	Target (Intermediate) 1142	1148	1154	1160	1162	Target (Potential) 1142	1148	1160	1162
Charge lb.	4650	4650	4650	4650	4650		no change					no change		
Chlorination batch lb.	8020	8950	10,100	11620	12220		no change					no change		
Charge time hrs	0.3	0.3	0.3	0.3	0.3		no change					no change		
Chlorination	13.0	15.5	17.5	22.0	23.5	9.2	11.4	14.4	18.2	19.7	7.0	8.5	10.5	13.0	14.(
Discharge time	0.5	0.5	0.5	0.5	0.5		no change					no change		
Cycle time	13.8	16.3	18.3	22.8	24.3	10.0	12.2	15.2	19.0	20.5	7.8	9.3	11.3	13.8.	14.(
Capacity @ 87% O.S.T. $\bar{M}$ lb/ en. (per chlorinator)	4.1	3.9	3.9	3.5	3.5	5.9	5.4	4.9	4.4	4.3	7.5	7.0	6.5	6.0	6.(
Average Capacity (per chlorinator)	3.9 $\bar{M}$lb (1967 product ratio)					5.6 $\bar{M}$ lb (1969 Product ratio)					7.2 $\bar{M}$lb (1972 Product Ratio)				
Total Chlorination Capacity.	11.7 $\bar{M}$ lbs/annum					16.8$\bar{M}$ lbs/annum					21.6 $\bar{M}$ lbs/annum				

Intermediate Cycle times based on 3 hours operation at 600 lb/hr; remainder at 800 lb/hr
Potential " " " " operation as at N.C. 2 hours @ 600 lb/hr
1 hour @ 800 lb/hr
Remainder @ 1200 lb/hr

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DOWNTIME:-

Maintenance	6%
Process	2%
Other	5%

Blow Tanks	1142	1148	1154	1160	1162
Charge: as per chlorinator batch.					
Charge time hrs.	0.5	0.5	0.5	0.5	0.5
Blow time hrs	4.0	4.0	4.0	4.0	4.0
Discharge time hrs.	0.3	0.3	0.3	0.3	0.3
Cycle time hrs.	4.8	4.8	4.8	4.8	4.8
Capacity @ 97% O.S.T. M lb Per blow tank.	14.2	15.7	17.7	20.3	21.4

Average capacity (1967 product ratio) per Blow tank — 15.8 M lb/annum
Total capacity — 47.4 M lb/annum

Down time

Maintenance	1%
Process	1%
Other	1%

Air-blowing capacity is quite adequate for the foreseen requirements and no additions are necessary.

Distillation (i) Batch Operation

	Present Average Operation					Target (Intermediate)				
	1242	1248	1254	1260	1262	1242	1248	1254	1260	1262
Charge (Average 875 gall) lb	11000	11700	12400	13100	13400			same		
Distillation Batch lb	10700	11400	12100	12400	12700			same		
Time cycle (times in hours)										
Charge/heat up	2.0	2.2	2.6	3.0	3.0	1.5	1.7	2.0	2.5	2.5
Recycle	0.25	0.25	0.25	0.25	0.25	0.15	0.15	0.2	0.2	0.2
Distillation	6.0	6.1	6.2	6.3	6.4	3.75	4.0	5.0	6.0	6.1
Bottoms withdrawal *	0.15	0.15	0.2	0.3	0.3	0.15	0.15	0.2	0.3	0.3
Cycle time	6.4	6.7	9.25	9.65	9.95	5.55	6.0	7.4	9.0	9.1
Capacity @ 87% O.S.T. $\bar{M}$ lb/annum	9.3	9.6	9.6	9.3	9.3	14.1	13.9	12.0	10.2	10.2

Actual Distillation Capacity $\bar{M}$ lbs/annum — 9.35 (1967 Product Ratio) — 13.3 (1968 Product Ratio)

* Bottoms withdrawal time has been distributed through batches in run. Normally approximately 6 batches are distilled before drawing bottoms on 1242, decreasing to 2-3 batches on 1260 - 1262. Capacity increase obtained by operation at maximum temperature differences with efficient entrainment separation to prevent product colour degradation.

(ii) Semi-Continuous Operation (on 1242 only)

	Present	Target
Initial charge lb	11000	11000
Recovery per cycle lb	65000	65000
Time cycle (times in hours)		
Charge/heat up	2.0	1.5
Recycle	0.25	0.15
Distillation *	36.0	30.0
Bottoms withdrawal	0.5	0.5
Cycle time	38.75	31.15
Capacity @ 87% O.S.T. $\bar{M}$ lb/an.	12.3	15.4
50% 1242 on semi-continuous $\bar{M}$ lb/annum	10 (1967 Product Ratio)	14 (1968 Product Ratio)

* Assumes 6 receivers collected before boil-down and bottoms withdrawal.

TREATMENT

Charge as per Distillation Batch.

	1242	1248	1254	1260	1262
Charge time hrs	0.2	0.2	0.2	0.2	0.2
Cool/earth addition	0.3	0.3	0.3	0.3	0.3
Treatment time	2.7	2.7	2.7	2.7	2.7
Filtration	0.4	0.4	0.4	0.4	0.4
Transfer to head tank	1.0	1.0	1.4	1.5	1.5
Cycle time	4.6	4.6	5.0	5.2	5.2
Capacity @ 98% 0.9.T M lb	19.2	20.4	20.0	19.6	20.0

With the present method of operation (single earth treatment) capacity is adequate for the forecast period. The whole subject of treatment is under review and Perocel trials may result in recommendations for a process amendment. In the light of this development, modifications to the system will be considered.

b) Pyrocler

	1967	1968	1969	1970	1971	1972
Sales Forecast M lb	1.45	1.90	2.35	2.90	3.40	3.65

Standard capacity: 2.4 M lb.

Pyrocler bleeding operations will be transferred to one of the internal Aroclor storage tanks which will be equipped with agitation. The increase of batch size will give capacity past 1972.

Completion: 1/69
Capital " £1,000

c) Diphenyl

	1967	1968	1969	1970	1971	1972
Diphenyl Requirements M lbs.	7.8	8.6	9.4	10.5	11.5	12.5

The existing capacity of the lead pot units is 5.5 M lb. Installation of the proposed tubular unit is under review. Operation to produce 14 M lb annum at minimum Benzene usage (approximately 10% conversion) is envisaged. Increased capacity is available at the expense of yield. Capital cost for the project is £305,000. Savings available (over operation of lead pots at 5.5 M lb level with purchase of excess from M.C.) are:-

1969	1970	1971	1972
£96,000	£123000	£146000	£171000

4. QUALITY

a) Aroclors

Production of Aroclor of sufficient quality for the European export market (in particular, Scandinavian & Italy) continues to be a matter of concern. Although improvement of power factor is the most important goal, in general the properties of M.C.L. material are inferior to competition. The principle competition is from Bayer, Germany (Clophen A 30 and A 50 equivalent to 1242 and 1254 respectively) and Prodelec, France (Pyralene 1499 and 1476) of the two Bayer produces the superior material with power factor 0.002

Quality goals set up at the St. Louis Quality Meeting (Feb. 1966) These are considerably in excess of current production capability.

Property	Goal	Newport (typical)	Competition
Power Factor 100°C 50 c/s	0.002	0.015	0.002
Volume Resitivity $\times 10^9$	10,000	7,000	5000 -15,000
Water Content ppm	20	30	20
Colour	10	30	≤ 5
Stability (TCC)	0.1	-	0.07 - 0.2

Three areas in which effort is being made to improve electrical quality are involved.

(1) Manufacture of Aroclor of low PF in storage.

Major Newport effort is concentrated on improving earth treatment technique. Following M.C. findings on the effectiveness of Perocal treatment (activated Bauxite) lab. tests were conducted at Newport. Results confirmed that Perocal is superior to Fullers Earth.

	Untreated Aroclor 1242	Perocal Treatment	Earth Treatment
Power Factor 50 C/S 100°C	0.057	0.006	0.045

Tests on another type of Alumina (Spence) showed no significant improvement over earth treatment.

An extended plant trial is scheduled to be run in February 1967 using 30/80 mesh Porocel in the present treatment procedure.

In line with the policy of handling electrical Aroclors in aluminium, increased Aroclor 1242 storage requirements are being installed in this material. The equipment consists of a twin compartment 12,000 gallon tank served by a new aluminium piping system. Replacement of the batch treatment tank, head tank and process piping in aluminium (at a capital cost of £6,000) will be progressed if found necessary to meet quality goals.

(2) Prevention of degradation during loading and shipping.

Phased with the installation of the increased storage are improved loading facilities to handle the Tote Bins and tanker traffic. A sheeted building is scheduled for erection in February 1967 which will eliminate contamination introduced during loading in poor weather conditions.

(3) Improvement of measurement precision.

An M.T.S. designed cell suitable for testing material in drums or Tote Bins has been shown to function satisfactorily in lab. trials on a drum of Aroclor 1242. A C.A.R. is in preparation for the provision of a new measuring bridge. Testing of out-going material in situ is expected to yield greater precision due to elimination of contamination during sampling. A reliable temperature correlation will be required to make full use of the installation.

M.C. results have indicated that stability improvements are also gained from Porocel treatment. Alternative methods proposed include KOH washing of the crude and fractionation. No work at Newport in this direction is proposed at present.

(b) Pyroclor

There are no major quality problems associated with the Pyroclor output.

(c) Diphenyl

No quality problems are involved.

5. & 6. Pollution and Safety

There are no major pollution problems in operations associated with these products.

The materials involved in Diphenyl, Aroclor and Pyroclor Production do present safety considerations. Hydrogen produced from the conversion units is at present compressed and exhausted to atmosphere. Although flame arrestors are installed, this represents a potential hazard. Hydrogen produced in Tubular Unit operations will be burned in the furnace.

Minor benzene leaks are associated with the inadequate capacity of the hydrogen compressor. Benzene has a toxic rating. This problem will also be eliminated by installation of the tubular unit.

The installation of facilities to burn Santowax for steam generation will reduce the present handling risks associated with open pans of the molten material.

Prolonged exposure to Aroclors can lead to skin disorders. To eliminate risks from spillages protective clothing is provided.

The P.P.O. gas scavenger used in Pyroclor production is a skin irritant. Addition to the blend tank is at present a manual operation. Facilities are being installed for transferring the material from Carboys to the blend vessel which will eliminate the risks of contact to the operator.

8. Breakdown of Production Costs.

(a) Arnolers:

(i) Conversion Cost.

	Standard Unit Cost (d/000 lb)	Total Cost for 1967 at Standard rate.	% of Total Conversion Cost.
Steam	257	£9,932	15.3
Electricity	32	1,237	1.9
Process Water	44	1,700	2.6
Cooling Water	18	696	1.1
Fuel Oil	96	3,710	5.7
	447	17,273	
Labour	216	8,348	12.9
Labour Overheads	43	1,662	2.5
Supplies	10	387	0.6
Containers	5	194	0.3
Supervision	61	2,357	3.6
Mechanical Expense	336	12,985	20.0
Analytical Lab	39	1,507	2.3
T.S.D.	25	966	1.5
TOTAL DIRECT	1,182	45,679	
INDIRECT	335	12,946	20.0
DEPRECIATION	163	6,299	9.7
TOTAL INDIRECTS	498	19,245	
TOTAL CONVERSION COST.	1,682	64,926	

(ii) PRODUCTION COST BY GRADE

	1242			1248			1254			1260			1262		
	(a)	(b)	(c)	(a)	(b)	(c)	(a)	(b)	(c)	(a)	(b)	(c)	(a)	(b)	(c)
Earth	12	£310	0.13	12	£31.3	0.13	12	£110	0.13	12	£10	0.14	12	2.5	0.14
Lime	3	77.5	0.03	3	7.8	0.03	3	27.5	0.03	3	2.5	0.03	3	0.63	0.03
$FeCl_3$	5	129	0.06	5	13.0	0.06	5	45.8	0.06	5	4.17	0.06	5	1.04	0.06
Chlorine	2716	70488	30.4	3109	8096	35.0	3500	32083	39.6	3905	3252	44.5	4010	835	45.8
Diphenyl	4515	116	50.5	4078	10620	45.9	3626	33238	41.1	3182	2652	36.2	3037	633	34.8
Conversion	1682	43451	18.9	1682	4380	18.9	1682	15418	19.1	1682	1402	19.1	1682	350	19.2
Total twe. Cost	8933	230490		8889	23148		8828	80922		8789	7325		8749	1822	
HCl Credit	414R	10695R	4.6	474R	1234R	5.3	533R	4886R	6.0	595R	496R	6.8	610R	127R	7.0
Total Prod. Cost	8519	219795		8415	21914		8295	76036		8194	6829		8139	1695	

Column (a) Standard Unit Cost d/000 lb

Column (b) Annual cost for 1967 at the standard rate

Column (c) Percentage of Total Positive Cost

(b) Pyroclor P.P.O.

	Standard Unit Cost (d/000 lb)	Total Cost for '67 at Standard Rate	% of Total Production Cost
Earth	2	9	0.02
Alumina	34	154	0.3
TCB	4386	19882	40.2
1260	5080	23027	46.5
PPO	300	1360	2.7
	9802	44432	
Steam	167	757	1.5
Electricity	4	18	0.04
	171	775	
Labour	186	843	1.7
Labour Overheads	38	172	0.4
Supplies	18	82	0.2
Supervision	23	104	0.2
Mech. Exp.	73	331	0.7
Anal. Lab.	125	567	1.1
T.S.D.	48	218	0.4
TOTAL DIRECT	10,484	47,524	
INDIRECT	319	1,446	3.0
DEPRECIATION	115	521	1.0
TOTAL INDIRECTS	434	1,967	
TOTAL COST	10,918	49,491	

b) Special Pyrocl[illegible]

	Standard Unit Cost (d/000 lb)	Total Cost for 1967 at standard rate £	% of T[illegible] Produc[illegible] Cost.
Earth	46	69	0.4
TCB	2,748	4,144	25.8
1254	6,304	9,506	59.2
	9,098	13,719	
Steam	112	169	1.1
Electricity	15	23	0.2
	127	192	
Labour	265	400	2.5
Labour Overheads	53	80	0.5
Supplies	30	45	0.3
Supervision	34	51	0.3
Mechanical Expense	110	166	1.0
Analytical Lab	190	287	1.8
T.S.D	72	109	0.7
TOTAL DIRECT	9,979	15,049	
Indirect	486	733	4.6
Depreciation	175	264	1.6
TOTAL INDIRECT	661	997	
TOTAL COST	10,640	16,046	

C) Diphenyl

	Standard Unit Cost (d/000 lb)	Total Cost for 1967 at standard rate £	% of Total Production cost
Benzene	3,842	88,047	52.7
CO_2	23	527	0.3
Lead	26	596	0.4
Acetone	38	870	0.5
	3,929	90,040	
Steam	234	5,363	3.2
Electricity	44	1,008	0.6
Process Water	18	413	0.2
Cooling water	73	1,673	1.0
Fuel Oil	594	13,883	8.2
	963	22,870	
Labour	363	8,319	5.0
Labour Overheads	73	1,673	1.0
Supplies	33	756	0.5
Containers	8	183	0.1
Supervision	73	1,673	1.0
Mechanical Expense	607	13,911	8.3
Analytical Lab	33	756	0.5
T.S.D	105	2,406	1.4
TOTAL DIRECT	6,187	141,787	
Indirect	517	11,848	7.1
Depreciation	580	13,292	8.0
TOTAL INDIRECT	1,097	25,140	
TOTAL COST	7,284	166,927	

C. WORK PLAN FOR 1967

	Project	Capital	Savings p/a	T.S.D. Effort Man-days	Comp. on
1.	Improve Quality	-	Quality	40	6/67
2.	Install increased storage & bulk loading facilities	£21,800	Quality/ meet requirements	20	4/67
3.	Install Brinks & External cooling facilities on chlorinators	£ 8,000	£6,000	60	1/68
4.	Increase distillation capacity Alternate (1) Alternate (2)	£9,500 £45,000	Meet requirements	80	4/67 (Intermed). (i) 1/68 (ii) 6/68
5.	In-line testing facilities	£ 1,000	-	20	4/67
6.	Improved Pyreeler handling facilities	£ 500	Safety	10	4/67
7.	Tubular Reactor	£305,000	£95,000	20 230	

D. REPORT ON PREVIOUS GOALS

1) Quality Improvement

A plant trial of double earth treatment yielded no significant increase in quality. An EVOP programme run on single earth treatment did show improved product quality and the optimum levels established are now being operated.

As a result of trials on drums, two modifications to the F.P. package have been introduced.

(1) A superior lacquer based on a 30% epoxy 70% phenolic resin has been introduced which combines resistance to power factor degradation with greater mechanical strength. This will prevent deterioration of the product as a result of flexing of the lining through maltreatment in shipment.

(2) Addition of earth to the F.P. package as a short term method of guaranteeing the quality of material on arrival at the customer. Trial drums were sent to I.C.A.R. Sales Department report that the customer has found this material satisfactory.

2) Tubular Reactor

C.A.R. submission was delayed due to re-evaluation by C.E.D. of the capital requirements.

3) Increase Arochlors production capacity to 10 M lb

Installation of a 4" chlorine supply line in November has allowed operation of chlorinators at the required level.

4) Increase diphenyl capacity to 5.5 M lb

1966 production figures show that a capacity of 5.33 M lbs was achieved in 1966 compared to 5.13 M lbs. in 1965.

5) Increase diphenyl capacity to 6.5 M lb

This project was for installation of sojourn pots on the two existing units. This project was not carried out owing to likelihood of approval being given to the Tubular Unit Project.

6) Hydrogen Recovery

Investigation showed hydrogen recovery to be non-feasible. No methods exist for an economic clean-up to levels at which use could be made of the hydrogen by other plants.

7) Plant Resistivity Meter

A cell suitable for in-line resistivity and power factor measurements was designed by M.T.S. Successful in-drum tests were carried out in December.

CJBP/EM. 3.2.67

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G. J. S. Perry.