Attention: Mr. H. Ricardo

QUOTATION B: TO COVER CONVERSION OF EXISTING 42" SQUARE PRESSLOAD OF POLYPROPYLENE PLATES AND FRAMES FROM THREE WAY VALVE OPEN AND CLOSED DELIVERY SYSTEM TO OPEN DELIVERY BY USING LEVER HANDLE SPIGOT.

1 - NEW head plate, 1-3/16" thick, #1 button, complete with lever handle spigot ----------------------------	$ 112.50
1 - NEW tail plate, 1-3/16" thick, #1 button, complete with lover handle spigot ----------------------------	112.50
26 - #1 button pressure plates - reworked. Operations required - reverse plate: A. Spin weld plug in existing port in existing three-way valve port. B. Drill new discharge port in bottom blank pad. C. Drill pilot holes for spigot and assemble spigot.	
Labor ..... $12.00 each ----------------------------	312.00
New lever handle spigot, $5.50 each ----------------	143.00
27 - #3 button wash plates - reworked. Operations required - reverse plate: A. Spin weld plug in existing port in existing three-way valve port. B. Drill new discharge port in bottom blank pad. C. Drill pilot holes for spigot and assemble spigot. D. Spin weld plug in existing wash port and drill new wash port in opposite.	
Labor ..... $21.00 each ----------------------------	567.00
New lever handle spigot, $5.50 each ----------------	148.50
54 - frames - no labor required ------------------------	---

Replace existing 4" thick adapter currently being used for three way system.

1 - new 42" square connection plate, 1" thick, drilled and counterbored for two 2" dia. pull thru liner pipes.	146.00
2 - new 2" x 12" long liner pipes complete with O-rings and locknuts, $45 each ----------------------------	90.00
Total Sales Price --	$1631.50

Additional if installation of bolt-on handles is desired on all of the above:

26 - #1 button plates	
27 - #3 button plates	
54 - #2 button frames	
107 pieces - labor $12.00 each ----------------------------	$1284.00

E. I. DuPont de Nemours & Co.
Newark, NJ

Feb. 9, 1977

Attention: Mr. H. Ricardo

214 molded polypropylene universal handles (2-bolt design as furnished on 36" pressload) complete with stainless steel lag screws and washers, $3.75 each	802.50
Total Sales Price	$2086.50

Terms: net 30 days
f.o.b Whippany, NJ

Delivery: one week after receipt of goods from you.

Very truly yours,

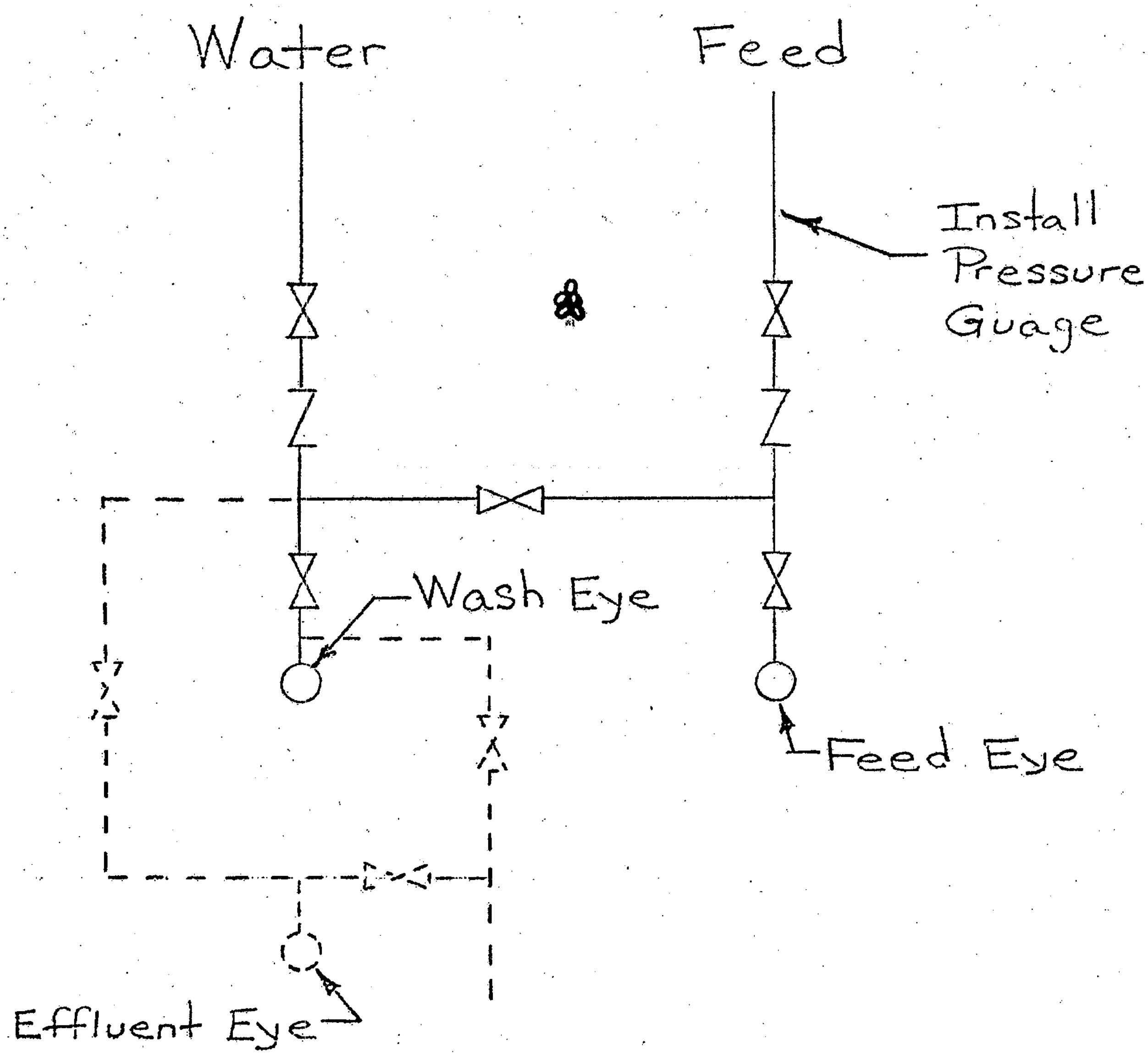
LENSER AMERICA INC.

Allan Whitlock

Allan L. Whitlock

ALW:rsb

Press 25 - Fixed Head Piping



Solid : Existing Piping, to be retained.

Dotted : Existing Piping, to be removed.

JNB 2/16/77

DUP050109001

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KN-76-6A
September, 1976
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Distribution on Last Page

NEWPORT PLANT
PIGMENTS COLORS R & D
E. I. DU PONT DE NEMOURS & COMPANY

ECONOMIC EVALUATION OF PROPOSED PROCESSES FOR BB-CPC

FINAL REPORT

W L Monson L R Valencourt

Work Done By: W. L. Monson & L. R. Valencourt

Previous Related Reports: None

Project Code: 4650-800

Period Covered: 2/1/76 to 9/1/76

Notebook Nos.: N/A

ABSTRACT

High spot evaluation of non-polluting processes for N-8510 (BB) shows that the proposed process for crude manufacture with crude Luwa drying in CPC-II, and semi-finishing by acetone milling in CPC-I is competitive with twelve candidate experimental processes.

TABLE OF CONTENTS

I. Introduction

In an attempt to evaluate the feasibility of several experimental CPC production schemes, the essential material, operative and distributive portions of a standardized mill cost were calculated and compared. Whenever possible, current (1975 composite values) Newport operating expenses were used. Assumptions made regarding yield losses, solvent recovery efficiency, labor requirements and others were made based on Pigments or Orchem Department experience and empirical data.

II. Objectives

The objectives of this study were:

- to evaluate the economics of several potential CPC production routes versus a standard manufacturing technique on a common basis,
- to indicate the approximate new investment required for each scheme, and
- to provide enlightenment about which avenues of experimentation to pursue in greater detail (and conversely which experimental endeavors to abandon).

III. Summary/Conclusions

A high-spot costing of nine experimental routes to semi-finished Blue B was carried out. All costs were compared to the process (synthesis and semi-finishing by acetone milling) as practiced in Plant I.

- Luwa dried Blue B crude entirely produced in Plant II and semi-finished in Plant I is significantly lower in cost.
- An experimental process which involves synthesis in kerosene and subsequent sulfation in TCB is significantly high in cost primarily due to high cost of two solvent losses.
- One process, involving synthesis and sulfation in TCB could be significantly low in cost if two criteria are met; high concentration synthesis and high solvent recovery. Investment is also required.
- The cost differences between most of the experimental processes is less than the uncertainty in cost of individual cases, with the exceptions noted above.

IV. Discussion

As indicated in the charts found in the Appendix (based on W. L. Monson's talk presented at Newark, N.J.) the following bases and assumptions were used in these calculations:

- SF product - N8510.
- Production of 413 cwt/mo. is based on 1976-80 long range forecast.
- Essential material costs were the Newport average costs for 1975 (except for bulk TCB, ODCB and VM&P which were based on E & M estimates).
- Current (IIQ1976) wage rates.
- Newport supervisor, labor, etc. factors were used.
- Used blue book values and usage investments for estimating maintenance and depreciation.
- Assumed that all capacity was in use.
- All yield losses were entirely around filters and stills.

The thirteen cases considered were divided among two standard (Cases 1 and 2: old plant process and the new proposed production method using both Plant I and II respectively) and eleven experimentally proposed cases. The experimentally proposed cases involved breaching BBU processes, active solvent (both ODCB and TCB) sulfation, active solvent synthesis, acid swelling, aqueous milling and breaching (in different volumes and solvents; perclene/ODCB) of BBZ. These cases involved various combinations of both old and new plant equipment (plus some new investment in some cases) and are detailed in the Appendices.

Presented on the next page (and repeated in the Appendices along with the work sheets) are the resulting mill cost components for the 13 cases considered. R.M. (raw materials including the essential material, i.e., packaging) includes all the known ingredients in each process, and current Pigments or Orchem experience when solvent recovery was considered. Yield losses, considered to be centered around the filters and still, for computational purposes, were also included in the R.M. calculations. The results ranged from a low of $124/cwt. (ODCB breaching of BBZ: processes 21B and 22B) to a high of $209/cwt. which is Process 4. Process 4 (and 5) have such large R.M. costs because both involve synthesis in one solvent (kero) and sulfation in another (4:TCB; 5:ODCB) with solvent losses in both processes.

PROC	\$/CWT RM	OPER	DISTR	MILL COST	OPER LABOR	\$M BOOK VALUE INVEST	NO. MILLS REQ'D PRE	SOLV	\$M NEW INV (BB+BBF)
1	135	178	67	380	40	1453	0.4	3.13	0
2	129	139	64	331	29	1668	0.4	3.13	0
3	139	127	69	335	26	1939	0	0	636
4	209	130	76	415	23	2324	0	0	1136
5	201	129	76	406	23	2326	0	0	1136
6	163	108	62	333	19	1860	0	0	500
7	156	108	62	326	19	1860	0	0	500
8	140	126	68	335	25	1949	.4	0	735
9	133	136	66	335	29	1657	0.84	1.04	0
21A	131	130	68	328	27	1898	0.78	0	636
21B	124	130	68	322	27	1898	0.78	0	636
22A	131	135	75	340	27	2303	0.78	0	905
22B	124	135	75	334	27	2303	0.78	0	905

IV. Discussion (Cont.)

The operative portion of mill cost was considered to be composed of:

- Utilities (used current Newport rates).
- Repair material and labor.
- Operating labor and supervision.
- Waste neutralization.
- Product Services, Environmental Control, Works Lab Quality Control and all other operative expenses not contained above.

Current Newport labor and utility rates were used in all cases. Newport figures were used in cases involving ratios of various costs (i.e., repair material as a ratio of repair cost to total investment). Some processes were high in operating expenses because of large utility requirements (steam for tray drying: Process 1; large electricity usage for a large number of mills: Processes 1, 2 and 9; or labor intensive operations: again Process 1).

Distributive costs involved depreciation, general overhead and non-technical expenses explicitly. All other implicitly contained distributive costs were lumped together as other. Depreciation was assumed to be 10%/year and was based on book value and fractional usage of the equipment involved.

These three components then make up the mill cost. While every attempt has been made to insure accuracy and to avoid errors, the assumptions used to derive these figures can, at best, be no better than ±5%. Probably, ±20% is a more realistic error range, but for the purposes of this study ±5% illustrates the point vividly enough. The mill cost ranged from $322/cwt. (Process 21B) to $415/cwt. (Process 4) while the Newport standard costs for N-8510 is listed as $407/cwt. It should be noted that none of the processes studied here, either standard or experimentally proposed, are currently in use at Newport.

To finish the summarization of the chart on the previous page, operating labor, book value investment, mill usage and estimated required new investment (out of pocket costs) for each of these processes are shown. New investment ranges from none to a high of $1136M for Processes 4 and 5 (both require similar equipment, even though different solvents are involved).

The graph presented on the following page represents the results of this study. Mill cost ±5% is presented for each of the cases studied. As noted earlier, slight modifications in the assumption for solvent recovery or yield will perturb any one case beyond the extent of any of the other cases; in other words, the limits on any one case extend wider than the limits on all the cases together as shown.

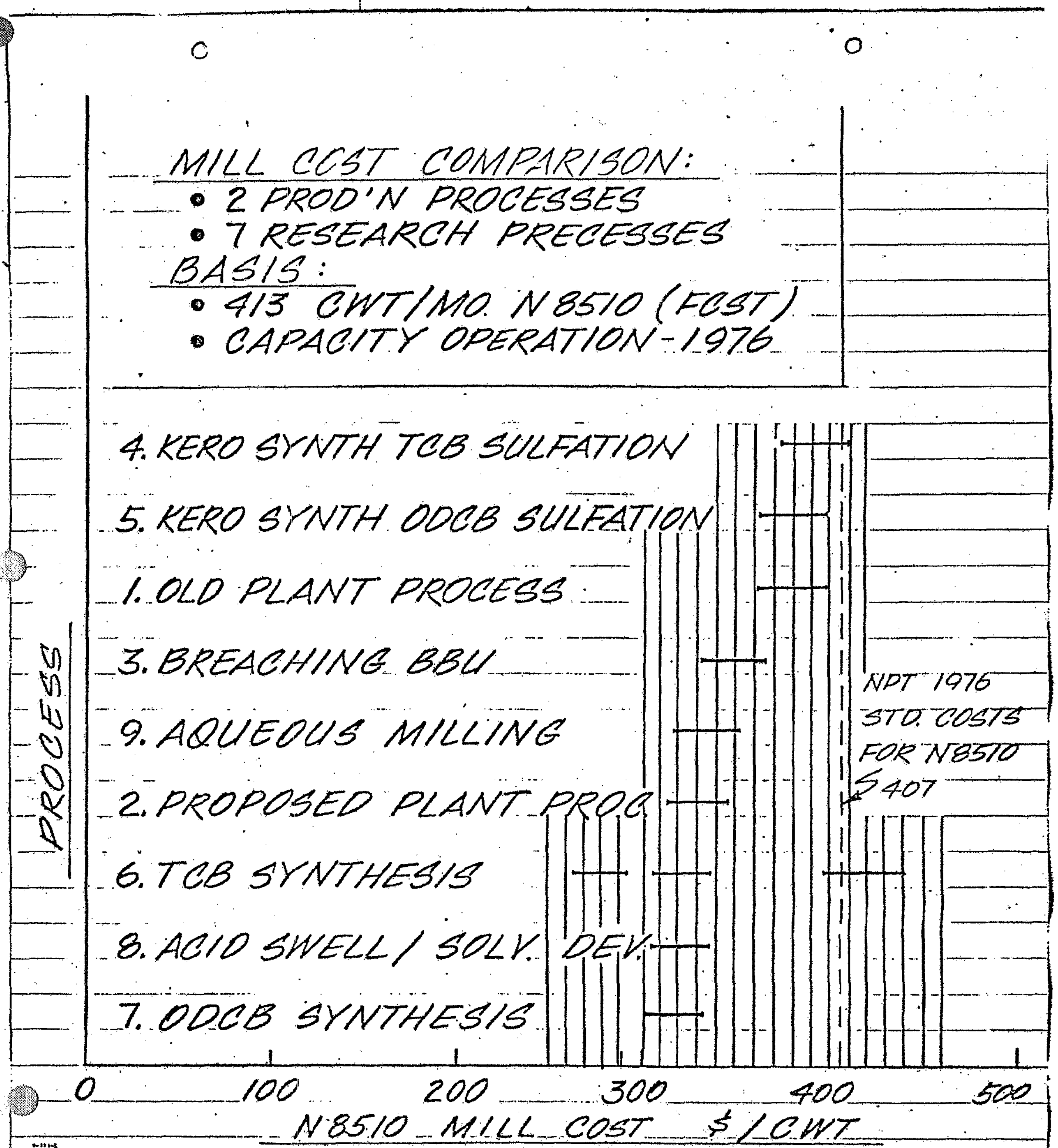
IV. Discussion (Cont.)

As illustrated in the Appendix for the "typical" case (Process 6) the effect of solvent/product volume and solvent losses are calculated. The case used in these calculations was 9% loss with a volume of 3500 gallons; this resulted in a mill cost of \$333/cwt. If, as Orchem experience indicates, one can produce quality product with 1/4th the solvent volume, then at the same solvent loss (9%) there is a net savings of approximately \$45/cwt. This is illustrated in the left hand cost bar on the preceding graph for Process 6. However, if we go to the other extreme, of large solvent volume (3500 gals.) and large solvent losses (24%), there is about a \$100/cwt. cost penalty. This extreme is illustrated by the right-hand cost bar for Process 6 on the preceding graph. Thus by merely varying the solvent volume (3500 to 875 gals.) and the solvent losses (9% to 24%; nb: both are limits of Orchem experience for TCB recovery) we have extended the limits on Process 6 from \$333/cwt. ±5%, to \$290/cwt. to \$430/cwt. ±5%. \$290/cwt., not including the possibility of the -5% error, is lower than the lowest mill cost for all the other Processes: \$322/cwt. The upper limit, \$430/cwt., is also larger than the largest of the remaining process mill costs, \$415/cwt. Thus, the conclusion is drawn that within each process there is room for improvement on the mill cost estimate that is greater than the range between the mill costs of all the cases (i.e., Process 6: \$290 to 430/cwt. vs. low \$322 to high \$415/cwt.).

Thus, before any additional time should be invested in analyzing the effect of various experimental procedures on plant mill cost, better definition of the process variables is necessary. In addition, it appears that the lowest mill cost, with minimum investment, is obtained by the proposed Method 2: Synthesis through Luwa drying in Plant II, followed by milling through press/mixing/and packout in the old plant. New investment required is zero, and the mill cost is near the lower limits of this study (within the error limits established, all these processes are economically the same) \$331/cwt.

In an attempt to gain additional insight into these cost studies a "sort of" sensitivity study of a few variables was run. As illustrated in the Appendix, the effect of solvent type, solvent volume and percent solvent loss on mill cost is graphed. Both ODCB and Perclene were considered as breaching solvents and losses ranged from 0-40%. For example, at 84 gals. solvent/batch, and a 9% loss the difference in mill cost between ODCB and Perclene is about \$3.50/cwt. of product.

Finally, a "mini" decision tree analysis of processes 21 and 22 was constructed and is analyzed here. As illustrated in the Appendix, the mill cost for each proposed process at each indicated solvent loss level was calculated (\$/cwt. on right hand side of chart). The probability that these levels of solvent recovery could be achieved were estimated from previous experience. Using standard decision tree logic, the system was manipulated until the expected mill cost for processes 21 and 22 was obtained.


MILL COST COMPARISON:
• 2 PROD'N PROCESSES
• 7 RESEARCH PRECESSES
BASIS:
• 413 CWT/MO. N8510 (FCST)
• CAPACITY OPERATION-1976
4. KERO SYNTH TCB SULFATION
5. KERO SYNTH ODCB SULFATION
1. OLD PLANT PROCESS
3. BREACHING BBU
9. AQUEOUS MILLING
2. PROPOSED PLANT PROC
6. TCB SYNTHESIS
8. ACID SWELL / SOLV. DEV.
7. ODCB SYNTHESIS
NPT 1976
STD. COSTS
FOR N8510
$407
PROCESS
0
100
200
300
400
500
N8510 MILL COST $/CWT

IV. Discussion (Cont.)

In this case the most probable mill cost for Process 21 is \$328/cwt. and for Process 22 is \$341/cwt. These estimates are, of course, sensitive to the probabilities attached to the possible attainment of the solvent loss levels indicated. Additional work could alter these results significantly (as illustrated earlier).

In conclusion, while all these costs are to be considered equivalent and that additional laboratory work is necessary to further define some of the process limits, the components that make up a mill cost estimate should be recalled.

The mill cost is directly dependent on:

- What you make (we made N-8510)
- How you make it (standard formula/receipts)
- How much you make (413 cwt/mo.)
- What equipment you make it in
- When you make it
- How many people make it
- What other porcesses use the same equipment
- How do you distribute in direct costs.

/lvs

APPENDICES

APPENDIX I

LETTERS

C. W. Anderson to E. E. Jaffe	2/3/76
J. Jackson to E. E. Jaffe	2/3/76
J. Jackson to C. F. Rolle	1/22/76

K-13073 REV. 10-63

E. I. DU PONT DE NEMOURS & COMPANY
INCORPORATED
NEWPORT, DELAWARE 19804

PIGMENTS DEPARTMENT

1. What about BBF?

CC: N. J. Kane - Newport
A. P. Smith - "

February 3, 1976

E. E. JAFFE
NEWPORT

There are five process schemes which could potentially be used to finish BB products in CPC III. It would be very useful in guiding our research efforts to have these routes evaluated against the process for BT-284-D. The evaluation should include equipment availability and cost. The alternates are outlined below:

1. BT-284-D Process (N-8510 precursor)

- Synthesis of BB crude
  SOP-1-Q (4-CPA)
  SOP-2-W (BB crude)
- Premill 1100 lbs. - 6 hr.
  SOP-21-C
- Acetone mill 552 lbs. - 20 hr.
  SOP-4-Q
- Distill acetone, filter, wash, dry
  SOP-5-O

AXB

2. BT-449-D Process

A. To make N-8500
- Synthesis of BB crude
  SOP-1-Q (4-CPA)
  SOP-2-W (BB crude)
- Premill 1200 lbs. - 15 hr.
  SOP-34-A
- Breach 1400 lbs. in Perclene
  SOP-49-B

B. Experimental (XOP-241-B)
- Synthesis of BB crude - As above, except particle size and phase is controlled in sulfation and hydrolysis to give product equal to BBZ
- Breach 1400 lbs. in ODCB
  Replace Perclene with ODCB in SOP-49-B

? Same ratio on larger batch?

3. Isolation of Crude BB

- Synthesis of BB crude
  SOP-1-Q (4-CPA)
  SOP-2-W (BB crude to step 23)

- Filter off kerosene from slurry and dry free of kero
  5 (?) hrs. filter
  31 hrs. drying too little?

- Add 106 gal. ODCB or TCB to full CPC dried charge.
  (Before or after sulfuric acid addition - not yet determined)

- Sulfation as per CPC-BB normal without decanting (SOP-2-W, #23-2

- Hydrolysis (SOP-2-W, #27-32)

- Caustic addn. and ext. (SOP-2-W, #33-38)

- Steam distill to remove ODCB - 7 hrs.

- Filter and wash with water as normal (step #40 and 41, SOP-2-W, BB crude syn.) but to alkaline free

- Follow steps #22 to 34 SOP-5-0 for finishing N-8510 to make N-8510 slurry

4. TCB or ODCB Process

A. TCB Price, toxicity, availability
- Synthesis of BB crude
  SOP-1-Q (4-CPA)
  SOP-2-W (BB crude to step 40)
  Run as usual except substitute TCB for kerosene
  Water hydrol., basify
- Steam distill to remove TCB Decant?
- Filter, wash and dry
  SOP-2-W (steps 40-58)
  SOP-5-O

B. ODCB
- As above except replace TCB with ODCB

5. Aqueous Milling (Per J. Jackson)

- Synthesis of BB crude
  SOP-1-Q (4-CPA)
  SOP-2-W (BB crude)

- Premill 1200 lbs. - 15 hr.
  SOP-34-A

5. (Continued)

- Aqueous ball mill the 15 hr. BBZ assuming a 20X scale-up of the Newark semi-works charge:

	Lbs. BBZ	Gal. H_2O	Gal. VMP Naphtha	Lbs. As Surfactant
Arquad 16/50 type	736	443	27.6	73.6
Aerosel OT/75 type	736	443	27.6	49

- Filter, wash and dry the ball mill discharge

6. Acid Swelling Who is doing? BT-481-P only?

- Synthesis of BB crude HM
  SOP-1-Q (4-CPA)
  SOP-2-W (BB crude).

- Premill 1100 lbs. - 6 hr. 2100
  SOP-21-C

- Acid swell as per BRA process
  SOP-28-F

* Perclene development.

C. W. Anderson
C. W. ANDERSON
RESEARCH SUPERVISOR

/tmj

E. I. DU PONT DE NEMOURS AND COMPANY
Pigments Department

CC: W. S. Struve, Pigm., Newark
C. W. Anderson (3), Pigm., Newport
A. P. Smith, (3), Pigm., Newport

Newark, New Jersey
February 3, 1976

E. E. Jaffe
Pigments
Newport

STATUS ''AQUEOUS'' MILLED BLUE B STUDIES

As per your request, I am outlining below the state of my studies in this area.

Essentially the basic process is the same as that outlined for LCZ aqueous milling, with the exception of the change in crude.

The largest millings to date have been made as follows: Mill size .41 gals.

95 grs BBZ - 15 hrs (shorter cycle should be tested)
480 gs Water
30 cc (22.6 grs) VMP/Naphtha*
6.4 gr Aerosol OT/75%
Mill 24 hrs/4000 gr 1/8'' shot/220 RPM

We would expect that XOP 441 conditions would be applicable with the decrease in water usage to the above ratio. Work up would be via distillation and acid extraction as per XOP 441.

The basic plant milling charge would be 736 lbs BBZ (15 hr) 443 gals H_2O - 27.6 gals VMP/Naphtha/49 lbs Aerosol OT with an expected milling cycle of ± 7 1/2 hrs.

By means of these procedures, we have prepared toner pigments from several lots of BBZ (15 hrs) which are darker in masstone - stronger and greener and more intense than BT-284-D - 80920 (N8540/N8600 - no extender) see E6124-99; 104; E6147-40A.

We have also converted this type pigment to a BT-425-D counterpart.

We have tested these materials in paint as follows:

E6124-104B (BT-425-D Type) vs BT-425-D 96582

Ball mill - Ford Thermosetting acrylic
Metallic - Red intense better twotone-strg-red tint
Viscosity - Higher

* Reduction or elimination under study

E6147-40A Ball Milled 927 Lacquer vs BT-284-D (80920 - Toner Type)

Metallic - Red, intense, better twotone
Strong - red tints
Viscosity - vv slightly higher

An attempt to duplicate BT-481-P has been made (E6147-49A) utilizing the above process except that the mill contains:

96 gr BBZ - 15 hrs
480 cc H_2O
No solvent
.2 gr Carbopol 941
7.2 grs Siponic L25

This product compares quite well with BT-481-P lot 1153 in an ''All Aqueous'' type textile ink test (Sherwin Williams). A small amount of the sample has been submitted to Phil Krape at Chestnut Run for evaluation in universal colorants.

Julius Jackson

Julius Jackson
R and D Division

JJ/cjg

E. I. DU PONT DE NEMOURS AND COMPANY
Pigments Department

CC: W. S. Struve, Pigm., Newark
E. E. Jaffe, Pigm., Newport
C. W. Anderson, Pigm., Newport
A. P. Smith, Pigm., Newport
A. F. Lewis, Pigm., Newport

Newark, New Jersey
January 22, 1976

C. F. ROLLE
PIGMENTS
WILMINGTON

AQUEOUS MILLED β PHASE CPC - COSTING

Ref: 1) XOP-441
2) C.F.Rolle-A.F.Lewis 10/7/75
3) A.F.Lewis-C.F.Rolle 10/23/75

As you are aware, we are actively working with Inmont in an attempt to develop a ''semi-finished β phase CPC'' for sale to supplement their viscous salt milling capacity (see JJ-WSS 10/13/75).

Such sales might replace future sales of products such as BT-487-P. However, Inmont has stated that they have approached our competitor's with the same request, with the objective of lowering their β phase CPC costs. It is also distinctly possible that this approach might lead to considerably larger sales to Inmont since their total CPC use is much larger than our sales to them.

We have submitted an aluminum sulfate mill powder N8700 which was unsatisfactory in their processing. Additional N codes containing other surfactants will be submitted, but it is the writer's opinion they will be rejected because of the high electrolyte content.

Because of the above failure, we have submitted two forms of aqueous ball mill slurry taken directly from the ball mill without any further distillation or extraction, etc.

After considerable work, both forms (SW75-00734 - 18 hr LCZ/H_2O/VMP-Naphtha/Arquad 16-50 and SW75-00745 - 18 hrs LCZ/H_2O/VMP-Naphtha/Aerosol OT) have been successfully converted to inks at Inmont. Tinctorial properties remain to be ascertained.

Assuming satisfactory technical results at Inmont the question of economics will immediately arise. It seems that our costs of such a product should be realistically determined. The basic process outline is similar to XOP 441:

15

a) Synthesis of LC crude
b) Premill 1200 lbs - Maximum of 18 hrs - shorter time cycles are under study.
c) Aqueous ball mill the 18 hr LCZ assuming a 20X scale up of the 58 gallon Newark semi-works charge:

	lbs LCZ	Gals H_2O	Gals VMP/Naphtha	Lbs As is Surfactant
Arquad 16/50 type*	736	443	27.6	73.6
Aerosol OT/75 Type	736	443	27.6	49

for a cycle of 6-9 hrs with a probable cycle of 7 1/2 hrs.

The ball mill discharge would be pumped into a suitable container for direct shipment to Inmont. No wash out of the mill is contemplated.

This process would completely eliminate any sewer effluent problems or distillation or extraction, etc. problems, and should make possible the sale of higher quantities of CPC. Profitability should be determined assuming several price levels.

*Arquad 16/29 water type under study.

Julius Jackson

Julius Jackson
R and D Division

JJ/cjg

APPENDIX II

REDUCED WALL CHARTS

W. L. MONSON'S PRESENTATION AT NEWARK

NOTE TO APPENDICES AND SUBSEQUENT CALCULATIONS:

The mill costs calculated earlier and presented in the Table summarizing mill cost, et.al., includes the increased distributive and operating expenses necessitated by the required new investment (Column 10). However, the raw data sheets, the graphical presentation of mill costs, and the sensitivity/ decision tree calculations do not include these increases. The necessary conversion is a simple mathematic manipulation, summarized here.

Each Δ \$M of investment is equivalent to a Δ of \$16.5422/cwt. of N-8510 product (ca \$.04/lb.). However, due to product distribution only 52% of this new investment is carried over into our calculations.

42% of this carryover goes into increased operating expenses, and 58% goes into increased distributive expenses.

i.e. X_i = New investment for process i — \$M

$.52X_i$ = New investment added to process i — \$M

$.52X_i$ (16.5422/413).42 = increment to add to process i's operating expense — \$/lb.

$.52X_i$ (16.5422/413).58 = increment to add to process i's distributive expense — \$/lb.

BASES AND ASSUMPTIONS

- SF PRODUCT - N8510
- PRODUCTION
  - \+ FROM 1976-80 LONG RANGE FORECAST NEWPORT DEMAND IS 413 CWT/MO.
    - 65 % OF TOTAL BB
    - 52 % " " BB + BBF
    - 18 % " " BLUE
    - 11 % " " CPC
  - \+ N8510 USED IN:
    - 12 BLUE CODES
    - 7 GREEN CODES
  - \+ TOTAL BB + BBF CRUDE DEMAND IS ~ 850 CWT CRUDE/MO.
- ESSENTIAL MAT'L PRICES AVE FOR YR. 1975 (EXCEPT FOR BULK TCB, ODCB AND VM&P.)
- CURRENT WAGE RATES.
- NPT FACTORS FOR SUPV/LABOR, ETC.
- BOOK VALUE AND USAGE INVEST. (FOR MAINT, DEPREC)
- ALL CAPACITY IN USE.
- YIELD LOSSES ENTIRELY AROUND FILTERS & STILLS

N8510 PROCESSES		PLT. I PLT. II
OLD PLT.	1.	SYNTH-SULF-EXTR-PRESS-TRAY DRY PREMILL-SOLV MILL-DISTIL-EXTR-PRESS-MIX-PACK
PROPOSED PLT.	2.	SYNTH-SULF-EXTR-FILTER-LUWA DRY PREMILL-SOLV MILL-DISTIL-EXTR-PRESS-MIX-PACK
BREACH BBU	3.	SYNTH-SULF-EXTR-FILTER-LUWA DRY ODCB BREACH-DISTIL-PRESS-MIX-PACK
ACTIVE SOLV SULF.	4. 5.	SYNTH-EXTR-FILTER-LUWA DRY TCB/ODCB SULF-EXTR-DISTIL-PRESS-MIX-PACK
ACTIVE SOLV SYNTH.	6. 7.	TCB/ODCB SYNTH-SULF-EXTR-DISTIL-FILTER-MIX-PACK
ACID SWELL-DEVEL.	8.	SYNTH-EXTR-FILTER-LUWA DRY PREMILL-ACID SWELL-PERCL.DEVEL-DISTIL-PRESS-MIX-PACK
AQ. MILL	9.	SYNTH-SULF-EXTR-FILTER-LUWA DRY PREMILL-AQ.MILL-DISTIL-PRESS-MIX-PACK

N 8510 VIA

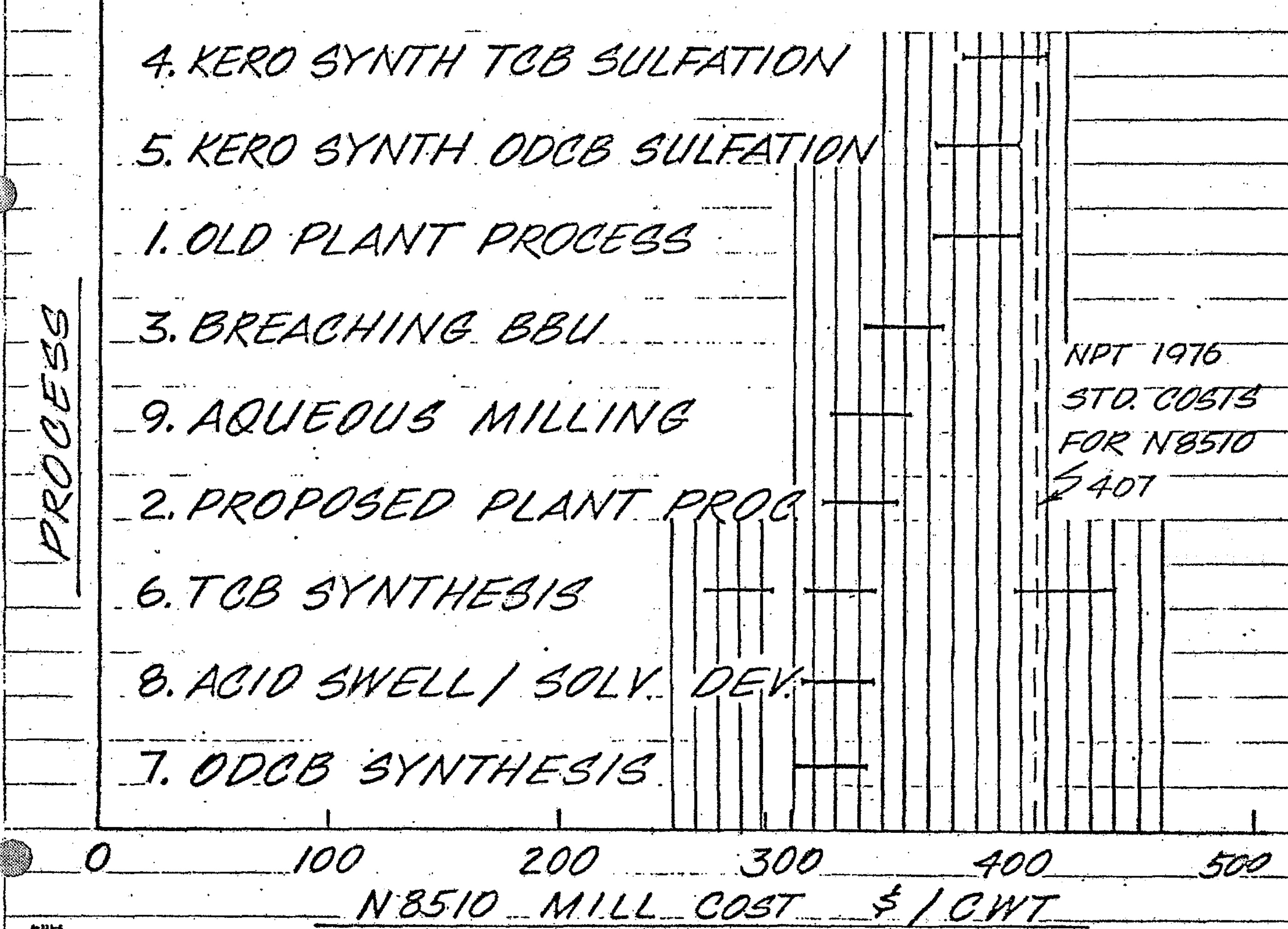
BREACHING BBZ		PLT I	PLT II

PERCLENE	21A.	SYNTH - SULF - EXTR - FILTER - LUWA DRY PREMILL - BREACH - DISTIL - PRESS - MIX - PACK
ODCB	21B.	SYNTH - SULF - EXTR - FILTER - LUWA DRY PREMILL - BREACH - DISTIL - PRESS - MIX - PACK
PERCLENE	22A.	SYNTH - SULF - EXTR - FILTER - LUWA DRY PREMILL - BREACH - DISTIL - PRESS - MIX - PACK
ODCB	22B.	SYNTH - SULF - EXTR - FILTER - LUWA DRY PREMILL - BREACH - DISTIL - PRESS - MIX - PACK

PROC	RM	OPER	DISTR	MILL COST	OPER LABOR	$M BOOK VALUE INVEST	NO. MILLS REQ'D. PRE	NO. MILLS REQ'D. SOLV	$M NEW INV (BB+BBF)
	$/CWT								
1	135	178	67	380	40	1453	0.4	3.13	0
2	129	139	64	331	29	1668	0.4	3.13	0
3	139	127	69	335	26	1939	0	0	636
4	209	130	76	415	23	2324	0	0	1136
5	201	129	76	406	23	2326	0	0	1136
6	163	108	62	333	19	1860	0	0	500
7	156	108	62	326	19	1860	0	0	500
8	140	126	68	335	25	1949	.4	0	735
9	133	136	66	335	29	1657	0.84	1.04	0
21A	131	130	68	328	27	1898	0.78	0	636
21B	124	130	68	322	27	1898	0.78	0	636
22A	131	135	75	340	27	2303	0.78	0	905
22B	124	135	75	334	27	2303	0.78	0	905

MILL COST COMPARISON:
- 2 PROD'N PROCESSES
- 7 RESEARCH PRECESSES

BASIS:
- 413 CWT/MO. N8510 (FCST)
- CAPACITY OPERATION - 1976



EFFECT OF SOLVENT ASSUMPTIONS ON PROCESS 6 – TCB SYNTHESIS

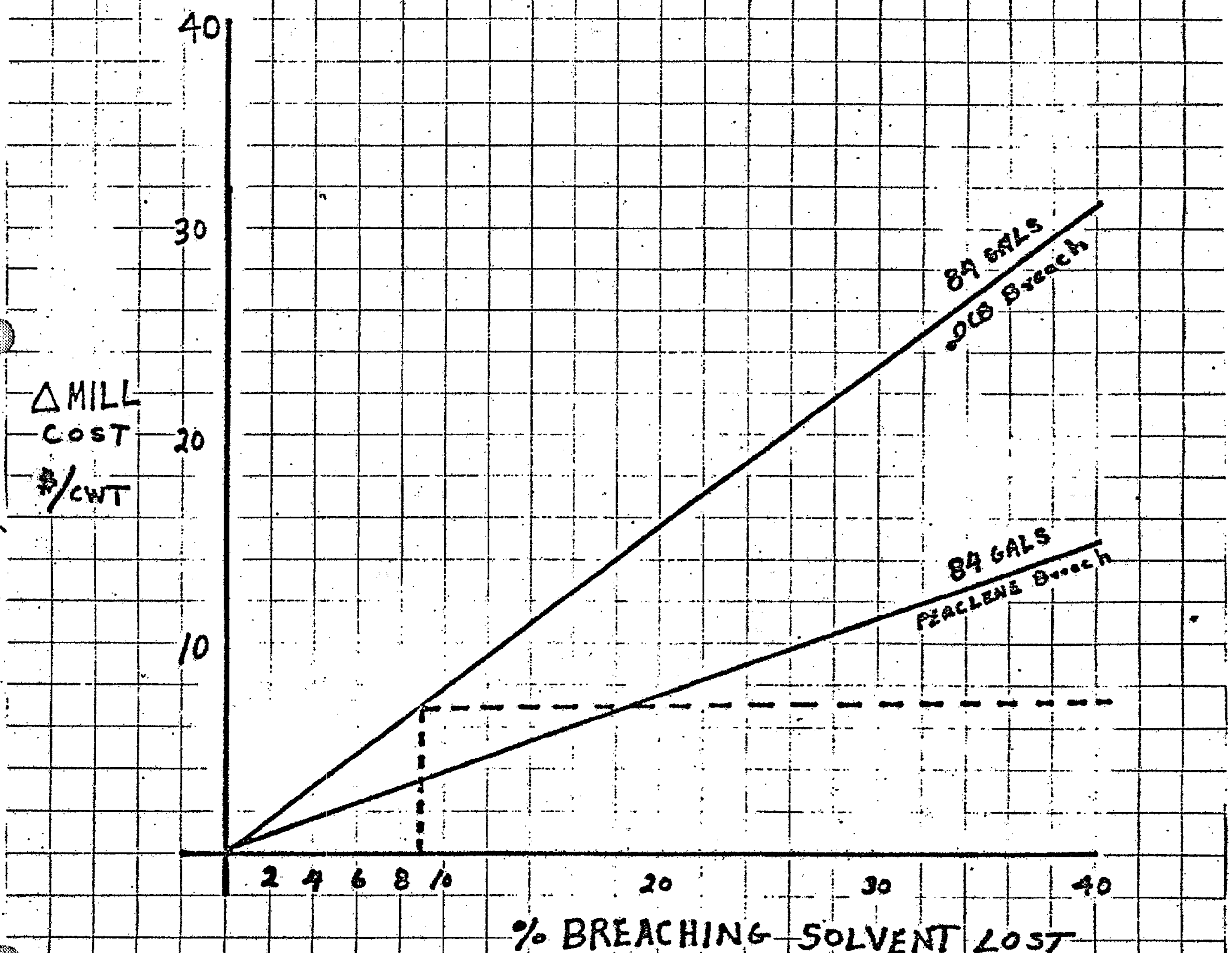
$/CWT COST OF TCB LOSSES

		GAL TCB USED IN SYNTHESIS:	
		3500	875
% SOLVENT LOSS	9	58.18	14.55
	24	155.15	38.79

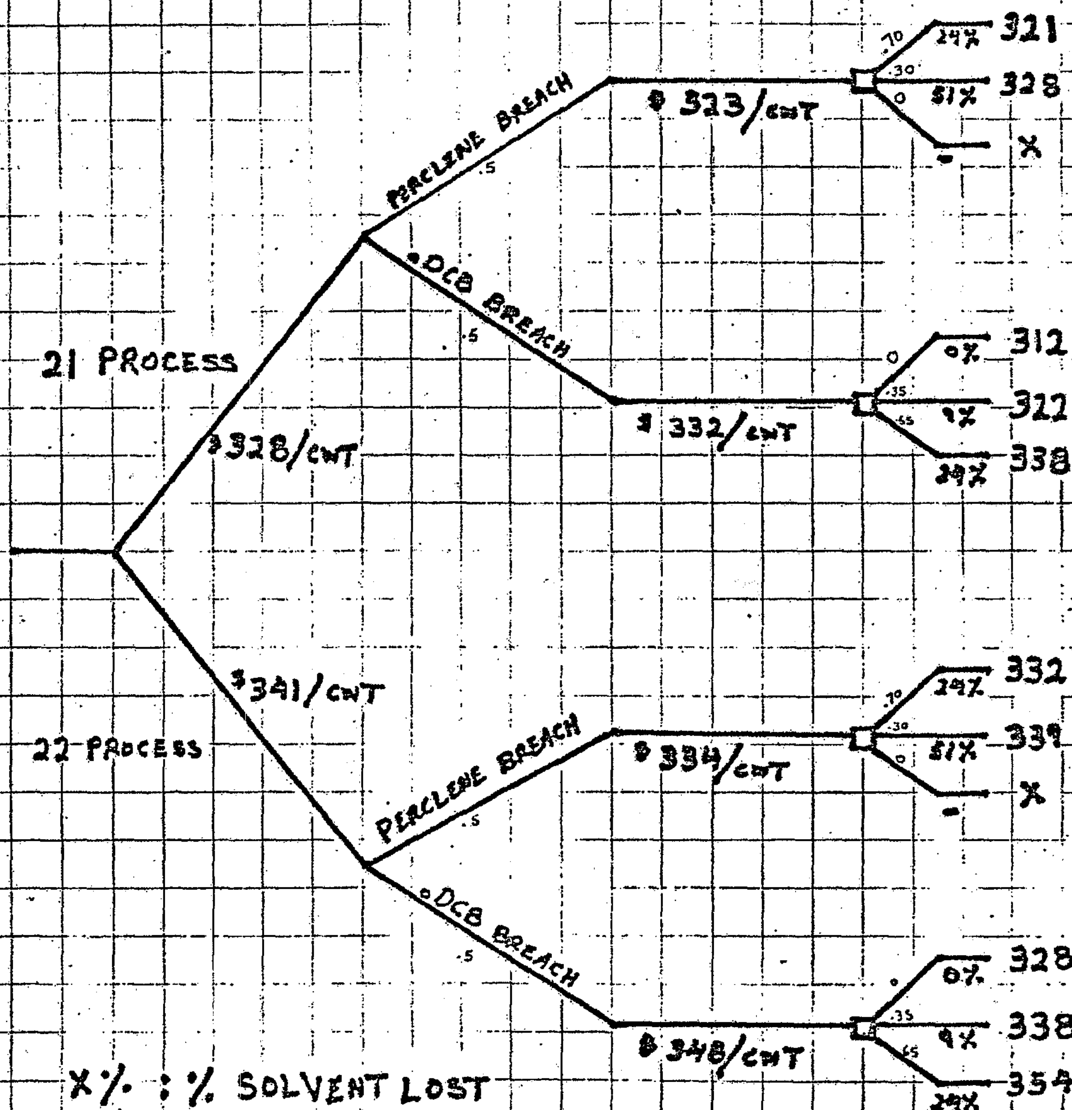
SOLVENT COST	MILL COST NO NEW INV. (INCLUDING NEW INV)
14.55	279 (290)
58.18	322 (333) $/CWT N8510
155.15	419 (430)

DUP050109028

EFFECT OF SOLVENT ASSUMPTIONS ON PROCESSES 21/22: A/B



DECISION TREE



X% : % SOLVENT LOST

XXX : $/CWT N8510

.XX : PROBABILITY.

MILL COST DEPENDS ON:

- WHAT YOU MAKE
- HOW YOU MAKE IT (FORMULA)
- HOW MUCH YOU MAKE
- WHAT EQPT. YOU MAKE IT IN
- WHEN YOU MAKE IT
- HOW MANY PEOPLE MAKE IT
- WHAT ELSE USES SAME EQPT.
- HOW YOU DISTRIBUTE INDIRECT COSTS
- ETC.

APPENDIX III

RAW DATA WORK SHEETS

LINE NO	PROCESS / BATCH OPN. COST CENTER	SOP/EP	1 (HR)	2 (FR)	3	4 (#)	5 (#)	6 (FR)	7 (FR)	8 (#/HR)	9 (BATCH)	10	11
A													
B													
C	MFR. 4CPA	1Q	13.5	0.78	19.3	—	[illegible]	D	1.00	[illegible]	7.46	[illegible]	1.00
D	SYNTHESIZE BB	2X	8.5	0.70	12.1	.013	.012	C	1.00	11.98	[illegible]	452.5	1.03
E	SULFATE	2X	5.5	0.85	6.47			C	1.00	[illegible]	21.96	45.6	0.39
F	EXTRACT	2X	4.0	0.60	5.00	—		D	1.00	[illegible]	[illegible]	149.8	[illegible]
G	PRESS	2W	6.8	0.68	8.29	1113	1040	.111	0.979	131.5	31.96	[illegible]	0.43
H	TRAY DRY	2W	24.3	0.87	33.7	1.90	1055	.15	0.975	32.2	21.96	[illegible]	1.75
I													
J	PREMILL	21C	7.0	1.10	7.78	1085	1085	.015	.975	141.5	31.96	[illegible]	0.40
K													
L	SOLVENT MILL	4Q	21.5	0.815	27.6	447	447	.015	0.975	18.00	37.39	[illegible]	[illegible]
M	DISTIL - 4 STILL	50 DOUBLE BATCHES	8.5	[illegible]	10.6	994	974			46.98	41.45	[illegible]	[illegible]
N	EXTRACT [illegible]	50	12.25	0.90	13.6	—	—	.015		36.54	41.45	[illegible]	[illegible]
O	PRESS, MIX, PACK (STd 24L PRESS)	50	6.0	0.80	7.5	994	960	.058	0.942	128.0	41.45	[illegible]	[illegible]
P													
Q													
R													
S	TOTAL $												
T	$/CWT - N8510												

LINE NO	12	13 INV ($M)	14 ($M)	15 INSR ($)	16 INSR ($/MO)	17 (#)	18 ($/MO)	19 ($/MO)	20 STEAM ($/MO)	21 REPR MAT'L	22 L PER LAB	23 REPR LAB	24 DEC	25 WASTE MGMT	26 SAL	27 ELEC
C		[illegible]	[illegible]	128.77	4867			[illegible]		[illegible]	[illegible]	[illegible]		[illegible]		[illegible]
D		[illegible]	[illegible]	100.5	44896			[illegible]		[illegible]		[illegible]		[illegible]		[illegible]
E		[illegible]	[illegible]						[illegible]	[illegible]		37				[illegible]
F		[illegible]	[illegible]							[illegible]		[illegible]				[illegible]
G		[illegible]	[illegible]							[illegible]		[illegible]				63
H		[illegible]	[illegible]						[illegible]	[illegible]		[illegible]				[illegible]
I																1260*
J		[illegible]	[illegible]							[illegible]	[illegible]	[illegible]				[illegible]
L		[illegible]	[illegible]	15.84	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]				[illegible]
M		[illegible]	[illegible]							[illegible]	[illegible]	[illegible]				[illegible]
N		[illegible]	[illegible]	12.53	519			[illegible]	[illegible]	[illegible]		[illegible]		[illegible]		65
O		[illegible]	[illegible]	18.44	764			[illegible]		[illegible]		[illegible]		[illegible]		55
S			[illegible]		52299		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
T					126.68		7.70		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

LINE NO	28 PROD SVCS	29 ENVIR CONTR	30 MAKS LAB	31 QUAL CONTR	32 OTHER OPER	33 TOT OPER	34	35 DEPREC	36 GEN OHEAD	37 NON TECH	38 OTHER DISTR	39 TOT DISTR	40	41 MILL COST ($/MO)	42 MILL COST (FR)
C								[illegible]							
D								[illegible]							
E								[illegible]							
F								[illegible]							
G								[illegible]							
H								[illegible]							
J								[illegible]							
L								[illegible]							
M								[illegible]							
N								[illegible]							
O								[illegible]							
S	[illegible]	770	[illegible]	160	1787	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	1.0
T	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	

* [illegible] C-H.

MILL COST
$/MO
$/CWT

MFG. INVEST. $
EXISTING
NEW
TOTAL

CPC LOSS
$/CWT
% OF PROD.

BALL MILLS REQ'D.

413 CWT N8510/MO ≈ 18% FCST GRP 20
≈ 11% FCST CPC

FLOWSHEET BASIS

413 CWT N8510 (398 CWT CPC) PER MO.
1976 FCST AVE NPT DEMAND

N8510 PROCESS I - OLD STD. PROD. PROCESS

PROJ NO
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APPROVED BY

REVISIONS

TITLE COST ELEMENT - COST CENTER MATRIX

NPT WORKS | DUPONT CONFIDENTIAL INFORMATION — PIGMENTS DEPARTMENT | DATE | FLOWSHEET NO

DUP050109033

Line No.	Process		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
			[illegible]	PA	Cl_2	NaCl	[illegible]	[illegible]	[illegible]	Urea	Cu_2Cl_2	MoO_3	DBC	[illegible]	Acetone	[illegible]	N			
A	SOP	$/lb	.162	.060	.073	.072	.063	.085							.065					
B		Units	#	#	#	#	#	[illegible]	#	#	#	#	#	#	[illegible]	#				
C	NFR ACPA	1B	600	175	360	300	178										[illegible]			
D	SYNTHESIS RX	2X	3230	1100			2621	[illegible]	2073	2000	229	6	1				[illegible]			
E	SULFATE	2N																		
F	EXTRACT	2N																		
G	PRESS	2N																		
H	TRAY DRY	2N																		
I																				
J	PREMILL	2C																		
K																				
L	SOLVENT MILL	4A						1380						0.1	130					
M	DISTIL	5-B Double																		
N	EXTRACT	5-0 "					454													
O	PRES, MIX, PACK	5-0 "														244	[illegible]			
P																				
Q	TOTALS																[illegible]			
R																				
S																				
T																				

Line No.	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
	Drums		50% [illegible]	PA	Cl_2	[illegible]	98% Acid	N_2	[illegible]	Urea	Cu_2Cl_2	MoO_3	DBC	Triton X-100	Acetone	[illegible]		TOT $/Batch															
A		[illegible]/100	[illegible]	25.07	6.07	3.06	2.76	[illegible]	10.25	11.11	[illegible]	[illegible]	[illegible]	[illegible]	9.17	[illegible]																	
B			[illegible]																														
C			[illegible]	[illegible]	21.85	[illegible]	4.91											[illegible]															
D			[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	11.83					[illegible]															
E																																	
F																																	
G																																	
H																																	
I																																	
J																																	
K																																	
L								9.66						0.06	11.92			[illegible]															
M																																	
N							12.53											12.53															
O																18.44		18.44															
P																																	
Q																																	
R																																	
S																																	
T																																	

1975 AVE. EM PRICES

N 8510 - PROCESS 1

PROJ NO
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REVISIONS

FLOWSHEET BASIS:

TITLE:

WORKS | DUPONT CONFIDENTIAL INFORMATION | PIGMENTS DEPARTMENT | DATE | FLOWSHEET NO.

LINE NO.	PROCESS MATERIAL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
		STD CYCLE	STD UTIL	EFF CYCLE	CPE CHGD	CPE DISCH	CPE LOST	[illegible]	CAP. DESIGN	[illegible]	EQUIP NO.	EP		EP INV.	INV USED	LABOR [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	STEAM	REPR MATL
A		HR	FR	HR	#	#	FR	FR	#/HR.					$M	$M	#	#/100	#	#/100	[illegible]	#/100	
B																						
C	ATR. 4CPA DEHYDR	13.5	.40	23.5	—	2145		120		1461	441			[illegible]	[illegible]	15.14	524			264		[illegible]
D	SYNTHESIZE BB	11.0	.90	17.2	2145	—					239			[illegible]	[illegible]	[illegible]	1297			635		[illegible]
E	COOL/TEMPER	4.5	.74	6.25							123			[illegible]	[illegible]							[illegible]
F	SULFATE/EXTRACT - S.TK			11.5							226			[illegible]	[illegible]						[illegible]	[illegible]
G	HOLD - N. DEV. TK.													[illegible]	[illegible]							[illegible]
H	FILTER - BAG FILTERS			12.73	2145	2100		.979	153	1461	269			[illegible]	[illegible]							[illegible]
I	LUWA DRY				2100	2100		.979	250	1461		3.6		[illegible]	[illegible]						[illegible]	[illegible]
J																						
K	PREMILL	[illegible]	[illegible]	[illegible]	1035	1035		.979		37.96	[illegible]	[illegible]		[illegible]	[illegible]							[illegible]
L																						
M	SOLVENT MILL	[illegible]	[illegible]	[illegible]	497	497				41.45	[illegible]	[illegible]		[illegible]	[illegible]	15.84	1313				[illegible]	[illegible]
N	DISTIL	[illegible]	[illegible]	[illegible]	994	994				41.45	[illegible]	[illegible]		[illegible]	[illegible]							[illegible]
O	EXTRACT	[illegible]	[illegible]	[illegible]				0.979		41.45	[illegible]	[illegible]		[illegible]	[illegible]	12.53	519			1442	[illegible]	[illegible]
P	PRESS, MIX, PACK	[illegible]	[illegible]	[illegible]	994	960		0.946		41.45	[illegible]	[illegible]		[illegible]	[illegible]	11.44	764		[illegible]			[illegible]
Q																						
R																						
S	TOTAL													[illegible]	[illegible]		[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
T	$/CWT. N8510																[illegible]		7.00		[illegible]	[illegible]

LINE NO.	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
	CHEM LAB	REPR LAB	DEC	WASTE NEUTR	SAL	ELEC	PROCESS SVCS	[illegible]	[illegible] LAB	QUALITY CONTR	OTHER OPER	TOT OPER		DEPREC	GENL [illegible]	NON TECH	OTHER DISTRIB	TOT. DISTR.		MILL COST	MILL COST									
A																				$/100	FR									
C	[illegible]	[illegible]		[illegible]										[illegible]																
D		[illegible]		12.93										[illegible]																
E		[illegible]				[illegible]								[illegible]																
F		[illegible]												[illegible]																
G		[illegible]												[illegible]																
H		[illegible]												[illegible]																
I		[illegible]												[illegible]																
J						[illegible]																								
K	[illegible]	[illegible]												[illegible]																
L						[illegible]								[illegible]																
M	[illegible]	[illegible]												[illegible]																
N		[illegible]												[illegible]																
O	[illegible]	[illegible]		[illegible]		[illegible]								[illegible]																
P		[illegible]																												
S	[illegible]	[illegible]	[illegible]	2326	[illegible]	7730	[illegible]	770	[illegible]	[illegible]	1907	[illegible]		[illegible]	[illegible]	[illegible]	566	[illegible]		[illegible]	1.0									
T	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]										

N 8510 PROCESS 2

FLOWSHEET BASIS:

PROJ NO					
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CHECKED BY					
APPROVED BY	REVISIONS				
TITLE					
WORKS	DUPONT CONFIDENTIAL INFORMATION — PIGMENTS DEPARTMENT	DATE	FLOWSHEET NO		

LINE NO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
PROCESS MATERIAL	[illegible]	PA	Cl_2	NaCl	[illegible]	N_2	H_2O	[illegible]	[illegible]	[illegible]	DBC	Triton X-100	[illegible]	[illegible]	[illegible]		[illegible]	
A	#		#			SCF	#		#					#	#			
B																		
C AFF. ACID - DEWATER	1200	550	720	600	556										-131			
D SYNTHESIZE HB	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	18	5			[illegible]	[illegible]			
E COOL/TEMPER																		
F SULFATE/WASH - S.TK.																		
G HOLD - N.TK.																		
H FILTER - ROTARY FILTERS																		
I LUWA DRY																		
J																		
K PREMILL																		
L																		
M SOLVENT MILL 4-B						1320						0.1	130					
N DISTIL 5-D DOUBLE																		
O EXTRACT 5-D "					454										+445			
P DRESS/MIX/PACK 5-D "																		
Q																		
R																		
S																		
T																		

LINE NO	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
PROCESS MATERIAL	Drums		[illegible]	PA	Cl_2	NaCl	[illegible]	N_2	H_2O	[illegible]	[illegible]	[illegible]	DBC	Triton X-100	[illegible]	[illegible]		[illegible]															
A		[illegible]	1.89	25.07	6.47	1.06	2.76	.38	11.25	.11	72.63	16.76	103.4	.28	9.17	9.46																	
B			BATCH →																														
C AFF. ACID - DEWATER			46.66	131.[illegible]	13.70	[illegible]	9.52											[illegible]															
D SYNTHESIZE HB			[illegible]	[illegible]			134.11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5.16					[illegible]															
E COOL/TEMPER																																	
F SULFATE/WASH - S.TK.																																	
G HOLD - N.TK.																																	
H FILTER - ROTARY FILTERS																																	
I LUWA DRY																																	
J																																	
K PREMILL																																	
L																																	
M SOLVENT MILL 4-B																		15.84															
N DISTIL 5-D DOUBLE																																	
O EXTRACT 5-D "																		12.93															
P DRESS/MIX/PACK 5-D "																		[illegible]															
Q																																	
R																																	
S																																	
T																																	

FLOWSHEET BASIS

N8510 PROCESS 2

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TITLE

WORKS | DUPONT CONFIDENTIAL INFORMATION — PIGMENTS DEPARTMENT | DATE | FLOWSHEET NO

DUP050109036

	LINE NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
	PROCESS MATERIAL	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	F.P.		F.P. INV	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	STEAM	[illegible]	DIRECT LAB	REPR LAB	AIR	WASTE NEUTR	SOL	ELEC	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		MILL COST	MILL COST									
A		HR	FR	HR	#	#	FR	FR	#/HR					$/M	$/M	$	[illegible]	$	[illegible]	[illegible]	[illegible]											[illegible]										[illegible]	FR									
B																																																				
C	MFG SCRA - DEWBER	[illegible]	[illegible]	[illegible]	-	[illegible]		[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]			[illegible]		[illegible]	[illegible]	[illegible]		[illegible]		[illegible]								[illegible]																
D	SYNTHESIZE 88	[illegible]	[illegible]	[illegible]	[illegible]						[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]			[illegible]		[illegible]		[illegible]		[illegible]										[illegible]																
E	COOL/TEMPER	[illegible]	[illegible]	[illegible]							[illegible]	[illegible]		[illegible]	[illegible]							[illegible]		[illegible]												[illegible]																
F	SULFATE/EXTRACT - S.T.P.			[illegible]							[illegible]	[illegible]		[illegible]	[illegible]						[illegible]	[illegible]		[illegible]												[illegible]																
G	HOLD - N. TANK											[illegible]		[illegible]	[illegible]							[illegible]		[illegible]												[illegible]																
H	FILTER - ROT. FILTERS			[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]							[illegible]		[illegible]												[illegible]																
I	LUWA DRY				[illegible]	[illegible]		[illegible]	[illegible]	[illegible]		[illegible]		[illegible]	[illegible]						[illegible]	[illegible]		[illegible]												[illegible]																
J																												[illegible]																								
K	28 STILL	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]				1	[illegible]	[illegible]	[illegible]				[illegible]								[illegible]																
L	476 TANK	[illegible]	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]						[illegible]	[illegible]		[illegible]												[illegible]																
M	241 PRESS/MIX/PACK	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]							[illegible]		[illegible]												[illegible]																
N																																																				
O																																																				
P																																																				
Q																																																				
R																																																				
S	TOTALS													[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	1.0									
T	#/CWT N8510																[illegible]		[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]										

N8510 PROCESS 3

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FLOWSHEET BASIS

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PIGMENTS DEPARTMENT

DATE

FLOWSHEET NO

DUP050109037

LINE NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
PROCESS MATERIAL	NaOH	PA	Cl_2	[illegible]	[illegible]	[illegible]	Borax	Urea	$C_6H_4Cl_2$	MoO_3	DBPC	[illegible]	[illegible]	NH_4OH	oDCB	N			[illegible]
A /CWT																			
B UNITS	#	#	#	#	#	SAF	#	#	#	#	#	#	#	#	#	#			
C [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]											[illegible]			
D SYNTHESIZER	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	18	5			[illegible]		[illegible]			
E CAKE/TEMPER																			
F SULFATE/EXTRACT - ETN.																			
G HOLD - N. TANK																			
H FILTER - AUT. FILTERS																			
J WASH DRY																			
K [illegible] MILL															[illegible]				
L [illegible] TANK																			
M [illegible] PRESS/MIX/PACK														[illegible]					
N																			
O																			
P																			
Q																			
R																			
S TOTALS																[illegible]			
T $/CWT N8610																			

LINE NO.	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
PROCESS MATERIAL		NaOH	PA	Cl_2	[illegible]	H_2SO_4	N_2	Borax	Urea	$C_6H_4Cl_2$	MoO_3	DBPC	[illegible]	Acetone	NH_4OH	oDCB		TOTAL $/BATCH														
A /CWT	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4.17	[illegible]	[illegible]																
B UNITS								$/BATCH																								
C [illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]												[illegible]														
D SYNTHESIZER		[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]			[illegible]														
E CAKE/TEMPER																																
F SULFATE/EXTRACT - ETN.																																
G HOLD - N. TANK																																
H FILTER - AUT. FILTERS																																
J WASH DRY																																
K [illegible] MILL																[illegible]		[illegible]														
L [illegible] TANK																																
M [illegible] PRESS/MIX/PACK																																
N																																
O						[illegible]																										
P																																
Q																																
R																																
S TOTALS																		[illegible]														
T $/CWT N8610																																

FLOWSHEET BASIS:

N 8610 - PROCESS 3

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LINE NO. / PROCESS MATERIAL	1	2	3	4	5	6	7	8	9	10	11	12	13 EP INV	14 INV USED
A								$/M					$M	$M.
B														
C MFR. ECPA - DEWATER	13.5	.60	19.5		1945?		1.00		14.8				[illegible]	[illegible]
D SYNTHESIZE PB	8.0	[illegible]	12.8?	285?									[illegible]	[illegible]
E CRK/TEMPER	8.5	.16?	6.8?										[illegible]	[illegible]
F EXTRACT - S DEK TK	[illegible]	.70?	5.0										[illegible]	[illegible]
G HOLD - N TK													[illegible]	[illegible]
H FILTER - ROTARIES			11.73	2945?	2120?		[illegible]	153?	18.26?	266	.145?		[illegible]	[illegible]
I LUNA DRY													233.8	14.1?
J														
K SULF/HYDR/BASIFY	9.2	.80	11.5	1150	1050?				36.71	445?	6.08?		[illegible]	232.8?
L STEAM DIST	7.0	.50	8.75							539	.162?		107.2?	49.5
M														
N PRESS, MIX, PACK	6.0	.60	7.5	1050	1028		0.653?		36.71	200?	.596?		38.5?	24.?
O														
P														
Q														
R														
S TOTALS													[illegible]	1178.?
T														

LINE NO.	15	16	17	18	19	20 STEAM	21 REPL MATL	22 OPER LAB	23 REP LAB	24	25 WASTE NEUTR	26 SAL	27
A	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]							
C	[illegible]	[illegible]			[illegible]		650?	3431?	546		273?		
D	[illegible]	[illegible]			[illegible]		672?		578?		872?		
E							357		347?				
F						416?	133?		449?				
G							427		347				
H							3314?		1151?				
I						586?	278		235?				363.57?
J													184.97?
K	[illegible]	[illegible]					1318?	1403?	1095?			447?	[illegible]
L	[illegible]	[illegible]				1160?	162		190				[illegible]
M								1462?					
N							66		57				34.86?
S TOTALS	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
T		[illegible]		17.98?		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

LINE NO.	28	29	30	31 QUAL CONTR	32 OTHER OPER	33 TOT OPER	34	35 DEPREC	36 GENL & ADM	37 NON TECH	38 OTHER DISTRIB	39 TOT DISTRIB	40	41 MILL COST	42 MILL COST	43	44	45	46	47	48	49	50	51
A				$/M										[illegible]	FR									
C								1675																
D								1718?																
E								906																
F								1339?																
G								1427?																
H								3346																
I								780?																
K								3162?																
L								413?																
N								166																
S TOTALS	[illegible]	769?	[illegible]	700?	1787?	[illegible]		[illegible]	[illegible]	1465	966?	[illegible]		[illegible]	1.0									
T	12.67	1.86?	345?	2.37?	9.33?	[illegible]		37.38?	[illegible]	3.10?	2.39?	61.61?		[illegible]										

64154 : 200.67

[illegible]

FLOWSHEET BASIS

N8510 PROCESS 4

PROJ NO	REVISIONS
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TITLE	
WORKS	DUPONT CONFIDENTIAL INFORMATION PIGMENTS DEPARTMENT
DATE	FLOWSHEET NO.

LINE NO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
PROCESS MATERIAL	[illegible]	PA	Cl_2	NaCl	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	DRPC	4-TCB			N_2					
A																				
B																				
C MFR. 4CAC - DEHYDR.	1729	580	728	600	316										131					
D SYNTHESIS BB	1180	2180			0	[illegible]	2967	1100	445	18	5				4773					
E COOL/TEMPER																				
F EXTRACT - S. DEV. TK																				
G HOLD - N. TK																				
H FILTER - ROTARIES																				
I LUWA DRYER																				
J																				
K SULFATION/HYDR/BASIFY	6025				7051															
L STEAM DIST.												2196								
M																				
N PRESS, MIX, PACK																				
O																				
P																				
Q																				
R																				
S																				
T																				

LINE NO	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
PROCESS MATERIAL	[illegible]	PA	Cl_2	NaCl	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	DRPC	TCB				[illegible]			
A																			
B	#/BATCH →											#/BATCH							
C MFR. 4CAC - DEHYDR.	[illegible]	[illegible]	[illegible]	[illegible]	9.8											25.4			
D SYNTHESIS BB	12.71	36.21			0	46.6	54.4	46.2	52.8	23.4	5.6					186.8			
E COOL/TEMPER																			
F EXTRACT - S. DEV. TK																			
G HOLD - N. TK																			
H FILTER - ROTARIES																			
I LUWA DRYER																			
J																			
K SULFATION/HYDR/BASIFY	242.8				132.4											311.9			
L STEAM DIST.												725				725.4			
M																			
N PRESS, MIX, PACK																			
O																			
P																			
Q																			
R																			
S																			
T																			

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TITLE:

WORKS

	LINE NO. / PROCESS MATERIAL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
A		[illegible]	PA	[illegible]	#	#	PA	PA	[illegible]					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]							[illegible]													[illegible]	PR									
B																																																				
C	[illegible]	[illegible]	[illegible]	11.5		[illegible]		[illegible]		[illegible]				[illegible]	[illegible]	[illegible]	[illegible]			[illegible]		[illegible]	[illegible]	[illegible]		[illegible]		[illegible]								[illegible]																
D	[illegible]	[illegible]	[illegible]	[illegible]	2145									[illegible]	[illegible]	[illegible]	[illegible]			[illegible]		[illegible]		[illegible]		[illegible]										[illegible]																
E	[illegible]	[illegible]	[illegible]	[illegible]										[illegible]	[illegible]							367		[illegible]												[illegible]																
F	[illegible]	[illegible]	[illegible]	[illegible]										[illegible]	[illegible]						[illegible]	[illegible]		[illegible]												[illegible]																
G	[illegible]													[illegible]	136.4							[illegible]		[illegible]												[illegible]																
H	FILTER - ROTARIES			[illegible]	2145	2100		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]							[illegible]		[illegible]												[illegible]																
I	[illegible]													[illegible]	[illegible]						[illegible]	[illegible]		[illegible]				[illegible]								[illegible]																
J																												[illegible]																								
K	[illegible]	[illegible]	[illegible]	11.5	1050	1050				[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]					[illegible]	[illegible]	[illegible]				[illegible]								[illegible]																
L	[illegible]	7.0	80	[illegible]							[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]		[illegible]				[illegible]								[illegible]																
M																							[illegible]																													
N	[illegible]	6.0	[illegible]	7.5	[illegible]	[illegible]		[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]							[illegible]		[illegible]				[illegible]								[illegible]																
O																																																				
P																																																				
Q																																																				
R																																																				
S	TOTALS $													[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]										
T	$/CWT N8510																[illegible]		[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]										

FLOWSHEET BASIS:

N8510 PROCESS 5

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TITLE				
WORKS	DUPONT CONFIDENTIAL INFORMATION — PIGMENTS DEPARTMENT	DATE	FLOWSHEET NO.	

	LINE NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
	PROCESS MATERIAL	[illegible]	[illegible]	Cl_2	[illegible]	[illegible]	N_2	[illegible]	[illegible]	[illegible]	H_2O_2	DBPC	oDCB			N_2						[illegible]	[illegible]	Cl_2	[illegible]	[illegible]	N_2	[illegible]	[illegible]	[illegible]	H_2O_2	DBPC	oDCB				TOTAL $/BATCH															
A	[illegible]																				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]																			
B	UNITS	#	#	#	#	#	SCF	#	#	#	#	#	#			#						←					$/BATCH					→																				
C	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]										[illegible]						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]											[illegible]															
D	[illegible]	[illegible]	[illegible]			0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				[illegible]						[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]					[illegible]															
E	COOL./HEATER																																																			
F	EXTRACT - [illegible]																																																			
G	[illegible]																																																			
H	FILTER - AUXILIARIES																																																			
I	LIQUOR [illegible]																																																			
J																																																				
K	[illegible] / STOR. / SAFETY	[illegible]				[illegible]																[illegible]				[illegible]											[illegible]															
L	STEAM DIST.												[illegible]																				[illegible]				[illegible]															
M																																																				
N	PRESS. AIR, [illegible]																																																			
O																																																				
P																																																				
Q																																																				
R																																																				
S	TOTALS																																				[illegible]															
T	$/CWT N8510																																																			

FLOWSHEET BASIS

N8510 PROCESS 5

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TITLE		
WORKS	DUPONT CONFIDENTIAL INFORMATION PIGMENTS DEPARTMENT	DATE	FLOWSHEET NO.

LINE NO	1	2	3	4	5	6	7	8	9	10	11	12	13	14
PROCESS MATERIAL	STD CYCLE	STD [illegible]	[illegible]	CHG'D	CYC DISCH	CYC LOST	CYC [illegible]	CYC DISCH	[illegible] MD	EQUIV MD	E.P.		EP INV	INV USED
A								#/HR					[illegible]	[illegible]
B														
C NEU. 4CPA - DEWATER	11.5	.60	71.5	–	2145		1600		17.95	334	2,466		[illegible]	[illegible]
D SYNTHESIZE BR	11.0	.40	47.2	2145									[illegible]	[illegible]
E COOL/TEMPER	4.5	.14	6.15										[illegible]	[illegible]
F SULFATE/DECANT/HYDR. - S.TK.	5.5	.35											[illegible]	[illegible]
G STM. DISTIL./HOLD - N.TK.			17.0										[illegible]	[illegible]
H FILTER - ROTARIES			5.89	2145	6100		0.478	365					[illegible]	[illegible]
I REPULP/PACK							0.478	36.5	17.95				[illegible]	[illegible]
J														
K														
L														
M														
N														
O														
P														
Q														
R														
S TOTAL $													[illegible]	[illegible]
T $/OUT N8510														

LINE NO	15	16	17	18	19	20	21	22	23	24	25	26	27	28
PROCESS MATERIAL	[illegible]	[illegible] MD	[illegible]	PROD MD	[illegible] MD	STEAM	[illegible]	OTHER LAB	REPR LAB	MISC	WASTE NEUTR	SAL	ELEC	[illegible]
A	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]					
C NEU. 4CPA - DEWATER	[illegible]	[illegible]			2682		[illegible]		[illegible]		[illegible]		[illegible]	
D SYNTHESIZE BR	[illegible]	[illegible]			[illegible]		[illegible]		[illegible]		[illegible]			
E COOL/TEMPER							[illegible]		[illegible]					
F SULFATE/DECANT/HYDR. - S.TK.							[illegible]		[illegible]				[illegible]	
G STM. DISTIL./HOLD - N.TK.						[illegible]	[illegible]		[illegible]				[illegible]	
H FILTER - ROTARIES							[illegible]		[illegible]				[illegible]	
I REPULP/PACK							[illegible]		[illegible]				[illegible]	
S TOTAL $		[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
T $/OUT N8510		[illegible]		[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

LINE NO	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
PROCESS MATERIAL	[illegible]	WKS LAB	QUAL CONTR	OTHER OPER	TOT OPER		DEPREC	GEN'L OVERHD	MAN TECH	OTHER DISTR	TOT DISTR		MILL COST	ANNL COST									
A		[illegible]								[illegible]			[illegible]	[illegible]									
C NEU. 4CPA - DEWATER							2140																
D SYNTHESIZE BR							[illegible]																
E COOL/TEMPER							[illegible]																
F SULFATE/DECANT/HYDR. - S.TK.							[illegible]																
G STM. DISTIL./HOLD - N.TK.							[illegible]																
H FILTER - ROTARIES							[illegible]																
I REPULP/PACK							[illegible]																
S TOTAL $	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]									
T $/OUT N8510	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]										

* ASSUMES COMBINED
N.TK. STM. DISTILLATION
+ FILTRATION IS LIMITING
CYCLE AT 17.88 HRS.

FLOWSHEET BASIS

N8510 PROCESS 6 91% TCB RECOVERY

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WORKS	DUPONT CONFIDENTIAL INFORMATION ___ PIGMENTS DEPARTMENT	DATE	FLOWSHEET NO	

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H FILTER - [illegible]			[illegible]	[illegible]	[illegible]		[illegible]	[illegible]					[illegible]	[illegible]							[illegible]		[illegible]				[illegible]								[illegible]																
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FLOWSHEET BASIS

H8510 PROCESS 7

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WORKS	DUPONT CONFIDENTIAL INFORMATION — PIGMENTS DEPARTMENT
DATE	FLOWSHEET NO.

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	LINE NO	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
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	LINE NO	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
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[illegible]	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	857	.99		68.9	[illegible]						[illegible]	[illegible]		[illegible]												447																
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STEAM : 122.70

Change in paint + solv mill # + cycles

FLOWSHEET BASIS

NBSIO Process 9

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TITLE			
WORKS	DUPONT CONFIDENTIAL INFORMATION — PIGMENTS DEPARTMENT	DATE	FLOWSHEET NO.

LINE NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
PROCESS MATERIAL	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]														
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FLOWSHEET BASIS

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WORKS	DUPONT CONFIDENTIAL INFORMATION PIGMENTS DEPARTMENT	DATE	FLOWSHEET NO.		

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LINE NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
PROCESS MATERIAL	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]									
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FLOWSHEET BASIS

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TITLE				
WORKS	DUPONT CONFIDENTIAL INFORMATION — PIGMENTS DEPARTMENT	DATE	FLOWSHEET NO.	

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D [illegible]	[illegible]	[illegible]	[illegible]	[illegible]						[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
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M [illegible]	20	.85	29.53	[illegible]	[illegible]	[illegible]	[illegible]		32.97	[illegible]	.1575		295.6	34.0	[illegible]	[illegible]	
N [illegible]	8	.80	10.0	[illegible]						137.7	[illegible]		40.4	31.5			
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PROCESS MATERIAL	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]									
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FLOWSHEET BASIS

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WORKS	DUPONT CONFIDENTIAL INFORMATION PIGMENTS DEPARTMENT
DATE	FLOWSHEET NO.

	LINE NO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
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