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NEWARK PLANT
CHEMICAL DIVISION - COLORS

NEW DRAFT TUBE PROCESSING METHODS

Period Covered August 1949 - October 1950

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NEWARK PLANT

PIGMENT COLOR RESEARCH REPORT

Final Report

Title: NEW DRAFT TUBE PROCESSING METHODS

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DRAFT TUBE PROCESSING

Introduction

Draft tube processing, as applied to phthalocyanine pigments, was first conceived and tried in August 1949, during the development of a process for production of soft texture CPC blue and green toners. In searching for plant equipment to satisfy the requirements of the process for manufacture of GT-674-D, a turbine agitated vat was first selected. Initial results were satisfactory; however, no more than 1/3 of the vat capacity could be utilized without causing serious quality degradation, resulting from a decrease in agitation efficiency. Since the success of the process depended upon the uniform dispersion of a water immiscible treating agent in the pigment slurry, it became obvious that the use of special equipment would be required, to permit realization of the economies of large batch size manufacture. It was estimated that an expenditure of approximately $10,000 would be needed to modify the existing equipment, with no assurance of success; therefore, other means for obtaining the same results was sought. The use of a draft tube unit ultimately was conceived and developed as the answer to the equipment problem.

A semi-works unit was assembled for trial operation, and the results were sufficiently encouraging to justify consideration of a plant installation. A pilot scale unit was then improvised in the plant, using the obsolete and unused chrome yellow continuous manufacture unit, to provide scale-up design information and additional quality data. The quality of the pilot unit products confirmed the semi-works results; therefore, a project was submitted and approved for installation of a plant scale draft tube unit. (See Figure II.)

Standardization of several CPC codes was accomplished without difficulty in the plant unit, and to date the performance of the unit has been entirely satisfactory.

Summary and Conclusions

The draft tube unit was developed to meet the need for equipment to produce optimum quality GT-674-D and BT-284-D at a larger and more economical batch size than could be made in the then available equipment. The quality of material produced in the semi-works unit exceeded expectations; definite quality improvements were obtained, in addition to the goal of increased batch size. For this reason, the scope of the study was increased to include draft tube processing of other CPC products, as well as numerous maroon pigments. (This report is confined to the CPC work; the maroon study will be covered separately.)

The encouraging semi-works results were confirmed in the plant unit. In summarizing the accomplishments to date, it

can be stated that the plant draft tube unit has significantly increased the plant productivity of CPC products of improved quality, with resulting savings in raw material and operating costs. This has been accomplished at a relatively low increase in plant investment and has provided the plant with a unit with much needed operating flexibility. An operating unit is now available that can economically provide the benefits of extremely intense agitation, with no sacrifice in adaptability or limitation of batch size.

The following summarizes the individual accomplishments for each of the products that have been draft tube processed to date. (See Table I for tabulation of these data.)

1 - BT-284-D

The batch size was increased from 400 lbs. to 1,260 lbs., and a 5% strength increase was obtained, thus permitting dilution with an inexpensive inert extender, (blanc fixe*) during draft tube processing to equal standard strength. (See Table II for semi-works and plant quality data.) Significant raw material (CPC) savings have resulted, as well as savings in labor, processing and testing, etc. The plant adopted the BT-284-D (C) formula April 22, 1950.

*Subsequently changed to barium rosinate.

2 - GT-674-D

The batch size was increased from 420 lbs. to 1,260 lbs., and some improvement in ink mill properties was noted. This product was also diluted with 5% inert extender (blanc fixe) by decision of Sales. (See Table III for semi-works and plant quality data.) Raw material (CPC), labor and related savings have been realized. The plant adopted the GT-647-D (D) formula May 12, 1950.

3 - GT-710-D (Originally coded GT-674-D* HM)

A product equal to the semi-works standard was obtained at the large (1,200 lb.) batch size. (See Table IV for semi-works and plant quality data.) The formula was adopted by the plant May 12, 1950.

4 - BL-288-D

Use of the draft tube unit permitted formula modifications that resulted in improved dry lump uniformity, freedom from grit, better dispersion in linoleum and plastics (vinyl), and increased strength. An increase in batch size from 1,585 lbs. to 3,170 lbs. was also accomplished. (See Table V for semi-works and plant quality data.) Aside from the benefits of increased

batch size, the chief advantage of the draft tube process has been the elimination of hard undispersed pigment particles (grit) from the final product. Because of customer insistence on grit-free material, all BL-288-D production has been scheduled for the draft tube unit. The plant adopted the BL-288-D (I) formula June 7, 1950.

5 - BP-173-D & GP-501-D

Draft tube production of these codes was tried primarily to determine whether any strength improvement could be obtained that would permit reduction of the CPC toner content. (The toner content of batch produced as BP-173-D had to be increased from 73.4% to 76.0% to meet standard strength.) During the trial study a simplified formula was introduced, substituting sodium rosinate for the usual separately prepared ammonium rosinate, thus providing a raw material savings and reducing the fire hazard (during pulverization) due to the presence of free rosin.

The results were quite encouraging; (See Tables VI and VII for semi-works and plant quality data.) standard strength BP-173-D was produced at 74.4% toner content as compared with 76.0% toner content of batch production, and all other properties were found to be essentially equal. An insufficient number of GP-501-D draft tube batches were made to do more than establish the fact that standard quality material could be made at a lower (72.6% as compared with standard 73.6%) toner content.

Because the draft tube unit was needed for other production, the standardization of these two codes in the unit was not possible.

6 - BT-287-P & GT-689-P

Trial of the draft tube unit for production of these codes was limited to one semi-works batch each, to determine if standard quality material could be made. The 4,000 lb. maximum batch size in the Abbe' Lenart mixer justified these trials. Standard quality material was obtained in each case, and a 20,000 lb. batch size forecast for the plant unit. (See Table VIII for quality data.) Due to the priority of other work, plant trial of these codes has not been made.

Experimental Details

A. - GT-674-D & GT-710-D

As previously stated, the draft tube study was started in the semi-works using the GT-674-D (C) formula. The Green used at this time was the solvent milled eutectic type. After the size and relative dimensions of the semi-works draft tube unit

was established (See Figure I), a variable study was conducted to determine the optimum conditions required to (1) produce material of standard quality, and (2) obtain additional quality improvements. Listed below are the variables evaluated, together with comments regarding their effectiveness.

1 - A 5% concentration of pigment in the final slurry was found to give the best results, when the 5% CCl_4 - 2% TEA-C_{12} ester emulsion treatment* was used. When only 10% CCl_4* was used, a 10% slurry concentration appeared to be most effective; at higher concentrations the slurry became quite viscous and the recirculation rate was measurably reduced, making a longer cycle necessary.

2 - Since the use of CCl_4 and TEA-C_{12} was already well established, no attempt was made to find other agents. The only variable tried was the use of 10% CCl_4 without the TEA-C_{12} ester; the ink mill properties remained essentially unchanged, but weakness in the neighborhood of 5% was disclosed. When tested in plastics (Vinyl), the CCl_4 treated material was found to be superior to the ester emulsion treated products in ease of dispersion; therefore, this treatment was ultimately adopted and coded GT-710-D for sale to the plastic trade.

3 - Addition of the ester emulsion to the pigment slurry circulating through the draft tube at 190° to 195°F, with continued recirculation through the draft tube for at least 1 hour, produced optimum quality material. It was found that the treating agent could be added to the slurry in the holding vat provided adequate agitation was provided to disperse it rapidly. Subsequent circulation through the draft tube was necessary, however, to obtain satisfactory quality.

4 - Heating of the ester emulsion treated slurry at 190°-195°F produced material of superior tinctorial and printing ink properties, as compared with material treated at room temperature. Heat development of the CCl_4 treated slurry (GT-710-D type material) gave no evidence of quality improvement.

5 - Since pan loading the GT-674-D slurry (5% solids) would require an excessive number of dryer cars, the material was pressed (but not washed) before loading onto dryer cars. There were some indications that this filtration step gave a slight improvement in tinctorial properties (strength and intensity). Adjustment of the slurry pH from approximately 8-10 to 5.0-6.0 prior to treatment gave some evidence of improving the pressing characteristics, and possibly causing some improvement in tinctorial properties (See Reference 1.).

*% calculated on a dry pigment basis.

6 - When using the 10% CCl_4 treatment of a 10% pigment slurry (GT-710-D formula), it was found necessary to add the CCl_4 into the vortex of the draft tube during circulation of the pigment slurry at room termperature. Heat development at 190°-195°F gave no quality improvement, and addition of the CCl_4 to the holding vat caused a noticeable quality degradation. The final slurry was heavy enough to permit pan loading, which was also preferable for optimum quality.

7 - Comparison of the draft tube processed material with products made in the Abbé Lenart mixer disclosed a 5% strength advantage for the draft tube products. To compensate for this strength increase blanc fixe was added as an inert extender. Addition of the extender to the holding vat, following the emulsion treatment and recirculation period, was found to be satisfactory provided the agitation was adequate to prevent settling before it became dispersed (satisfactory in the plant D.T. unit).

8 - High speed (instead of regular speed) pulverization of the CCl_4 treated produced for use in Vinyl, measurably improved properties such as ease of dispersion, strength, texture, etc.

Standardization of GT-674-D and GT-710-D (coded GT-674-D* HM at the time, to identify it as material for use in plastics) in the plant draft tube unit was started on April 4, 1950, and accomplished without difficulty. Twelve consecutive 1,260 lb. batches of GT-674-D were made (previous maximum batch size was 4.0 lbs.), all containing the 5% inert extender; the average quality was slightly superior to standard (See Table III for a tabulation of the results.), thus exceeding expectations. (See Reference 2.) Excellent duplicability of results and the absence of any operating problems prompted the plant to accept the GT-674-D (D) as standard on May 12, 1950. (See Appendix II for formula and notes.)

The process for draft tube manufacture of GT-674-D* HM (see above) was also accepted by the plant on May 12, 1950. (See Appendix I for formula note) Despite the fact that prior draft tube development work was limited to one semi-works run and complete operating data were not available, the first plant batch was fully equal to standard in all properties, as were all subsequent batches; no operating problems were encountered. (See tables III and IV for results.)

B. - BT-284-D

The semi-works draft tube unit developed for GT-674-D was used for the development of a process for BT-284-D, using the (B) formula. Since this basic formula was quite simple the variable study was quite limited; investigations were restricted to finding the optimum operating conditions. The following summarizes the variables tried and the respective effects.

1 - A 10% solids content slurry was found to be optimum; slurries of higher concentration required longer recirculation times and were difficult to pump.

2 - As in the case of GT-710-D, the addition of the CCl_4 other than into the vortex of the draft tube during circulation of the pigment slurry, caused some quality degradation (poor ink mill texture and "separation" on the rolls).

3 - The use of TEA-C_{12} ester with the CCl_4 (as for GT-674-D) gave no quality improvement.

4 - A comparison of pressed and panned material disclosed some evidence of a strength loss (2-3%) attributable to pressing; therefore, direct pan loading was adopted.

5 - In the plant unit the batch size was increased from 1,260 lbs. (400 lbs. was the maximum batch size in the Abbe' Lenart mixer) to 2,520 lbs., and the treating agent (CCl_4) reduced from 10% to 5% (of the pigment weight) with no discernible loss of quality. The only operating problem encountered at this larger batch size was the excessive demand on dryer cars; therefore, the 1,260 lb. batch size was adopted as standard.

6 - Evaluation of the draft tube processed material disclosed it to be at least 5% stronger than Abbe' Lenart products (Lot 71505 vs 71457 and Lot 15712 vs 15644) and BT-284-D standard; therefore, 5% inert extender (blanc fixe) was added to reduce the strength to standard. The addition of the blanc fixe to the holding vat, following the CCl_4 treatment and recirculation period, was allowable provided the agitation was adequate to disperse it (satisfactory in the plant D.T. unit). Addition of the extender through the draft tube was found to be undesirable because it had to be added slowly to prevent excessive settling in the low velocity zones outside the tube.

Final standardization of BT-284-D in the plant draft tube unit was started April 22, 1950, and on May 12, 1950, the plant accepted the process as BT-284-D (C). (See Appendix III for formula and notes.) During the plant development period more than a dozen batches were made with excellent duplicability of results; the average quality (with the extender included) was slightly better than standard in strength as well as in printing ink properties. (See Table II for tabulation of results.)

C. - <u>BL-288-D</u>

Development of a draft tube process for manufacture of BL-288-D was prompted by (1) the possibility of improving quality (strength improvement such as obtained for BT-284-D), or reducing the toner content, (2) the hope of increasing the batch size, with resulting labor savings, and (3) the unique provisions of the draft tube unit for screening the N-623 and the final prod-

uct (see Figure II). Item (3) was most important because of customer complaints of streaking--probably attributable to dry lump non-uniformity, due to the presence of hard undispersed granules of pigment.

Small scale development work was restricted by equipment limitations; therefore, after a few semi-works runs to confirm the feasibility of the process, the development work was continued in the plant unit starting May 3, 1950. The following variables were evaluated, using the basic (H) formula.

1 - Since the draft tube unit had the facilities for heating the slurries being processed, the effect of heat development was investigated. Heat development at 185°- 195°F, following the addition of Resinous Oil X-1 and a subsequent recirculation cycle, was found to improve the dry lump uniformity as well as strength. The heat treated material contained no undispersed extender (Abbe' product was full of white particles) and was 3-5% stronger than the cold samples (See S.W. lot 2099 and plant lot 71366).

2 - A comparison of pan loading vs. pressing was made, and the pan loaded material (from the same D.T. batch) was found to be 5% stronger and more intense than the pressed portion. Because of the excessive demand on dryer cars, however, pan loading was not adopted.

3 - The batch size was increased from 1,585# to 3,170# (twice the Abbe' batch size) with no evidence of any quality loss, and no operating problems were encountered.

Following this rather limited development study, during which it had been demonstrated that excellent quality material could be produced by the draft tube process (See Table V for a tabulation of results), the plant Quality Control Group accepted the problem. On June 7, 1950, the plant adopted the draft tube process as BL-288-D (I). (See Appendix IV for formula and notes.) Subsequent to adoption of the (I) formula, the Sales Department requested that all BL-288-D be made in the draft tube to insure minimum "grit" in the product.

D. - BP-173-D

A draft tube process for BP-173-D was developed in an attempt to meet standard strength using less CPC toner than the batch process. Plant batch production required the use of approximately 76% toner as compared with 73.4% for standard.

The development study was started in the semi-works using the (D) formula (lots 2227, 2228). The experience gained prompted the use of a sodium rosinate solution to replace the

separately prepared ammonium rosinate, and this "simplified formula" was tried (lot 2229) with success. Since the (D) formula products were weaker than standard, further trials were made at increased toner content (lots 2232, 2233, 2267). The results of the semi-works study indicated (1) the draft tube products to be slightly stronger at equal toner content, and at least equal in all other properties to batch products prepared as controls, and (2) standard quality was reached using the simplified formula with 74.6% toner; therefore, a plant study was started.

Six plant batches were made in the new draft tube unit, and portions of each were set aside for a new standard (see Tables VI and VII for detailed data). The proposed standard (NS-865) was ultimately rejected because of weakness (See letter JCN to FEB, 4/3/51).

During the semi-works and plant studies the following variables were evaluated:-

1 - A 5% increase in toner content gave a 5% strength increase.
2 - Draft tube processed material sampled before heat development was fully equal to the final (heated) product. The "cold process" was considered more desirable because it reduced operating time and permitted slightly larger batch sizes to be processed.
3 - The use of sodium rosinate instead of separately prepared ammonium rosinate was found to simplify the operation and produce material superior in paint properties and fully equal in all others. (See Tables VI and VII.)
4 - The standard solution and slurry concentrations were considered optimum for good draft tube performance.

E. - GP-501-D

The experience gained during the draft tube processing of BP-173-D was applied to GP-501-D to determine whether 1) a reduction of toner content would be possible, and 2) if formula improvements (increased batch size, reduced cycle, etc.) could be realized.

Only two semi-works batches (2269, 2270) and one plant draft tube batch (18857) were made, and the following conclusions were reached:

1 - As in BP-173-D, the "cold" material was fully equal to the heat developed (std.) material.

Use of the "cold" formula simplified the process (3 hour shorter cycle) and permitted use of larger (+ 1,500 lbs. vs 1,180 lbs.) batches

2 - The simplified formula (sodium rosinate instead of ammonium rosinate) gave material fully equal to standard at slightly lower toner content (72.4% vs 73.2%; see Table VIII).

3 - The hue of standard could be matched by adding a small quantity of N-623 (Blue LB) to the N-624 (CPC Green) before processing.

Following the above brief study, GP-501-D was considered ready for restandardization in the draft tube unit; however, the work was deferred until standard quality N-624 could be spared for this purpose.

F. - GT-689-P

The semi-works draft tube unit was used to prepare one batch of GT-689-P to determine if any strength improvement could be gained and/or the process simplified. The results of the single batch (2105) indicated that material at least equal to standard could be produced at a greatly increased (20,000 lbs.) batch size. Nothing more has been done.

G. - BT-287-P (and BT-321-P)

A single draft tube batch (2111) was made and evaluated. A product fully equal to standard was obtained and, in the plant unit, a considerable increase (to 20,000 lbs.) in batch size should be possible. Nothing more has been done.

DESIGN DATA

The #6 building (Newark) draft tube unit was primarily designed around the available 3 H.P. variable speed D.C. motor, (used in the draft tube) and the 3000 gal. turbine agitated vat 240; however, the following basic relationships (developed in the semi-works) were kept in mind and followed as closely as possible:

1. Turbine agitation was considered most suitable for the holding vat.

2. The capacity of the holding vat is largely dependent upon the capacity of subsequent processing equipment. For example, if pressing capacity is limited to 1,200 lbs. of color, there would be no advantage in designing a D.T. unit to process 3,000 lbs. Therefore, the pressing and drying requirements must first be established and capacity determined, then the holding vat designed to fit into the production pattern.

3. Having determined the volume of the holding vat, conventional design data may be used to calculate the turbine size, etc. Selection of the circulating pump is the next item. Semi-works and plant experience has emphasized the desirability of using a positive displacement pump for circulation (preferably a piston pump) because of the heavy consistency of the slurry during treatment of the pigment. The centrifugal pump used with the plant unit performed satisfactorily with CPC products, but was incapable of handling some of the maroon slurries. The minimum pumping rate can be calculated as follows:

$$\frac{\text{Batch size (gallons)} \times 3^{(1)}}{\text{Processing cycle (minutes)}^{(2)}} = \text{Rate (gal./min.)}$$

(1) The factor 3 was empirically established in the semi-works unit as the required number of times the entire contents of the holding vat should be pumped through the draft tube to insure at least one passage of each particle through the intense agitation zone.

(2) The processing cycle referred to is the total time required to add the treating agent (also equal to the time required to insure homogeneity of the material after treatment). In general, this figure will be arbitrarily established; for example, if available equipment time is limited to 4-1/2 hours, and if loading and other preparations take 3 hours, then 1-1/2 hours is left for treatment and subsequent agitation for uniformity, or 3/4 of an hour for the processing cycle.

4. The capacity of the draft tube vat may be determined as follows:

gal./min. minimum pumping rate (see above) x 2 min.$^{(3)}$ = Capacity(gals.)

The usual ratio of diameter to height may be used.

(1:1.2 was used in semi-works and plant.)

(3) The 2 min. figure was established in the semi-works as the desirable retention time of an average particle in the draft tube vat.

5. Design of the draft tube itself plus specification of the propeller size and locations within the tube is probably the most controversial item to be con-

sidered; however, reference to engineering design data (DG-3.1E, etc.) plus the following should permit fairly accurate specification of these pieces of equipment.

In the plant unit two 5" diameter marine pitch propellers rotating at 2000 RPM in a 10" diameter tube situated in a 36" diameter tank, satisfactorily agitated and circulated (within the tank itself), fairly thick (4) pigment slurries being pumped into the draft tube at approximatly 50 GPM. (For actual relative dimensions refer to the appended drawing #1.)

(4) Some of the slurries (BT-284-D, BP-173-D, BL-288-D) attain a consistency of heavy cream. No accurate or significant viscosity data have been accumulated to date.

The following modifications are recommended for future draft tube unit installations:

1. Future installations should include two agitated steel tanks, approximately 400 gal. capacity, equipped with steam and water lines. These tanks to be used for preparation of the treating agent, etc., and the discharge lines should discharge, through rotameters, into the draft tube.

2. The discharge line from the draft tube tank into the holding tank should be as short as possible (space must be allowed for the control valve) and preferably vertical. These provisions will facilitate flow of heavy consistency slurries and minimize clean-out problems.

3. All controls (rotameters, agitators, switches, etc.) should be mounted on a panel close to the draft tube vat to permit most efficient operation of the unit.

4. Two screens in parallel should be provided in the pump discharge line, to permit clean-out of one while the other is in use. This will eliminate delays due to screen plugging.

5. With regard to approximate unit size, calculations based upon the #4 (1950) sales forecast indicate that a unit the size of the present one in #6 building (Newark plant) would be adequate. Although 90% of the #6 building unit time is currently being scheduled for only four of the eight codes (BT-284-D, BP-173-D, BL-288-D, and GT-674-D), the fact that at least 1/3 to 1/2 of the making time for each batch

is devoted to dumping N-623 or N-624 from drums into the unit would seem to indicate ample processing is available, provided the loading step could be simplified. Installation of a draft tube unit at Newport would accomplish this simplification, since slurry could be pumped directly to a storage tank and thence to the D.T. unit as needed, thereby eliminating all drum loading or unloading.

OPERATING DATA

Operation of this type of unit has been found to be relatively simple, and excellent quality material has been consistently produced when the following basic principles were followed:

1. The level of slurry in the draft tube tank must never drop below the upper edge of the draft tube and, for maximum efficiency, should be maintained (1) sufficiently higher (± 3 inches) than the critical level to cause the slurry to flow into the draft tube from the annular space. The slurry level at which this flow into the draft tube is at a maximum is almost independent of the range of viscosity encountered thus far, and does not vary significantly between codes.

2. Ingredients (or treating agents, etc.) specified to be added to the draft tube must be introduced into the draft tube itself and not merely into the vat; otherwise, standard quality material cannot be produced.

3. Best results have been obtained when the rate of addition of material into the draft tube (during circulation) did not exceed two times the ultimate percentage of the ingredient in the final batch. For example, if CCl_4 is to be added to a batch of color to give a 5% ultimate treatment, and the pumping (circulation) rate is approximately 50 GPM into the draft tube, the CCl_4 should be added into the draft tube at a rate not exceeding 5 GPM. (2 x 0.05 x 50 = 5 g./min.).

The following tables (IX to XIII, incl.) contain a tabulation of the operating data collected to date for each code processed in the plant draft tube unit.

(1) Liquid level in the draft tube tank is controlled by operation of the valve on the outlet line from the draft tube tank into the holding vat. Generally this valve needs little or no attention once the proper level has been established.

TABLE I

PLANT DRAFT TUBE UNIT PERFORMANCE DATA

Code	Plant Development Goals	Batch Size (Lbs.) Previous	Batch Size (Lbs.) D.T.	Quality (Str.) Previous	Quality (Str.) D.T.	% Toner Content Previous	% Toner Content D.T.	Subsequent Processing Panned Out	Subsequent Processing Pressed
BT-284-D	Increased batch size, and 5% strength increase	400	1260 (1)	Std.	+ 5% (2)	100	95	✓	
GT-674-D	Increased batch size	4[illegible]0	1260 (1)	Std.	+ 5% (3)	100	95		✓
GT-710-D	Match semi-works prepared standard	None	1200 (1)	S.W. Std.	Std.	100	100	✓	
BL-288-D	Increased batch size	1585	3170	Std.	+[illegible]% (4)	+26 (5)	+26 (5)	✓ (6)	✓ (6)
BP-173-D	Process simplification and lower toner content	1370	1340	Std.	Std.	73.4 (7)	74.4 (7)		✓ (8)
GP-501-D	Process simplification and lower toner content but 5% stronger than Std.	1180	2000 (9)	Std.	Std.	73.6 (10)	72.6 (10)		✓ (8)
BT-287-P	Increased batch size	4500 (pulp)	22000 (11)	Std.					
GT-689-P	Increased batch size	4000 (pulp)	20000 (11)	Std.					

(1) Limited to 1260# by subsequent processing capacity.
(2) The 5% strength increase compensated for by addition of blanc fixe (during D.T. processing) to equal standard strength.
(3) The 5% strength increase was anticipated but not claimed, and is compensated for as in BT-284-D (2).
(4) This [illegible]% strength increase was obtained in a limited number of runs.

(5) Due to inaccurate control of the extender, the % toner varies between 25 and 28%. Corrective measures have been taken and eventually a more accurate comparison can be made.
(6) It has been conclusively demonstrated that pressed material is approximately 5% weaker than panned material; however, because pressed material requires fewer dryer cars, all production is pressed.
(7) Although the standard contains 73.4% toner, current batch manufacture is formulated to contain 76% toner to meet standard strength. Draft tube processed material, therefore, requires less toner than batch processed material to meet standard strength.
(8) Due to formula simplification and modification less pressing volume is required than for standard type (batch) material.

(Cont'd on Page 13-A)

(9) This 2000# figure is subject to confirmation, since it represents an approximation from one smaller previous batch.
(10) Current batch production is stronger than standard using 73.6% toner, therefore re-standardization is in progress. The figures presented are from a limited number of batches and should not be considered final.
(11) These figures represent an estimation based upon data from a single semi-works batch. No plant development work has been done.

TABLE II

BT-284-D
DRAFT TUBE BATCHES

Lot	Type	Rub Out			Texture	
		MT	Str.	Tint	3L	5X
15644	400# - Abbe'	Lt.	101	vs dull	-	-
15712 (1)	1200# D.T.(5)	S. dk. & int.	95	vs grn.	-	-
15772	40# from 15712					
15737 (2)	1236# (5)	vvs dk.	99	int.	-	-
15795 (2)	1236# (5)	s. lt.	OK	vs int.	14- 14	18 17+
15862 (2)	1236# (5)	s. lt.	OK	vs red	14 14	17+ 17+
16013 (2)	1236#	vvs lt.	101	vs red	-	-
15831 (2)	1236# (5)	lt., red	OK	s int.	14- 14	18- 17+
15996 (2)	1236#	OK, s red	99	vvs red	-	-
15997 (2)	1236#	vvs lt.	99	vs int.	-	-
15998 (2)	1236#	lt.	101	vs dull	-	-
16305 (3)	1260#	OK, s int.	98-99	vs int.	-	-
17305 (3)	2520#	s dk., int.	97	int.	-	16+
71505 (4)	170# 6 Bldg. Cont.Yel.Unit	OK	94	s int.	-	17+
2005	S.W. - CCl_4	-	-	-	-	-
2006	S.W. - CCl_4 TEA-C_{12}	-	-	-	-	-
2044	S.W. - CCl_4 - Cont. add	OK	95	s int.	-	17+
2045	S.W. - CCl_4 - Batch add	OK	93	s int.	-	17+

(1) Contains no extender (see page 2); same N-623 as lot 15644.
(2) Contains 3% blanc fixe (see page 2).
(3) Contains 5% blanc fixe (see page 2); also only half the standard amount of CCl_4.
(4) 5-8% stronger than Abbe' batch 71457.
(5) Average gd. yield for the 5 D.T. batches was 99.4%.

TABLE III

GT-674-D
D. T. BATCHES* - QUALITY

Lot #	Size	Yield (Gd.)			Rub Out			Ink Eval.				Wedge Grit	
										Hegman			
		Lump	Gd.	%	MT	Tint	Str.	Sep.	Tailing	3 L	5 T	3 L	5 T
15251	1260#	1216	1226	97 1/2	Lt., Yel.	VS-s bl.	OK (R-0)						
						s int.	95 (ink)	= std.	= std.	6 1/4	7 1/4	11+	18
451	Std.	--	--	--	--	--	--	--	--	6 1/4	7	11+	17+
15252	1260	1235	1242	98.6	OK Yel.	vs yel.	95 (RO)						
						s int.	95 (ink)	=	=	6 1/2	7	12	18
451	Std.	--	--	--	--	--	--	--	--	6 1/4	7 1/4	12	17+
15533	1260	1278	1286	102	Lt. Yel.	vs yel.	99 (RO)						
						s int.	98 (ink)	=	=	6 1/4	7 1/4	11+	17
451	Std.	--	--	--	--	--	--	--	--	6 1/4	7 1/4	12	17+
15534	622	655	653	105	Lt. Yel.		97 (ink)	=	=	6 1/2	8 -	13-	18+
451	Std.	--	--	--	--	--	--	--	--	6 1/4	7 1/4	12	17+
16096	1260	1164	1165	92.5	Lt., Int.	Yel., int.	97 (RO)						
16148		722	721	--	Lt.	Blue, Int.	97 (RO)						
16770	1260	1302	1298	103	OK, Int.	Int.							
						S. Yel.	OK (RO)					12+	18+
16788	1260	1262	1272	101	OK, Int.	S. Yel.	OK (RO)					12+	19-
16856	1260	1275	1278	101.4	Lt., int.	Int.							
						vvs bl.	101 (RO)					13	19
16873	1260	1274	1274	101	Lt.	S. Yel.							
						Int.	OK (RO)					12+	18
17223	1260	1237	1292	103									
			Avg.	100.4									

*All contain 5% extender (see page 2)

TABLE IV

GT-710-D
QUALITY DATA

Lot	Rub Out				Ink Eval.						Vinyl	
	Size	MT	Str.	Tint	Tailing	1 T Sep.	1 T	3 T	5 T		MT	Tint
Std. (451)	--				vs	7-	5-1/2	7-1/4	8-		--	--
SW 2257		--	--	--	--	--	--	--	--	int.	s transp.	str.
15174	610#	=	vvs str.	vvs yel.	vvs	8+	6-1/2	7	8-		=	=

TABLE V

BLUE LAKE - BL-288-D

Lot	Type	Yields Est.	Yields Packed	Analysed % Toner*	R.O. Strength	Processing	N-623 Lots Used
Plant							
18665	D.T.	3170#	3142#	24.97	102	Pressed	803, 805
19540	"	"	3230	25.12	OK	"	718, 831, 832
20049	"	"	3312	24.39	OK	"	865, 866, 867
19181	Abbé	1585#	1571	24.54	101	Panned	821, 822, 824
19358	"	"	1634	25.83	OK	"	830, 833
19593	"	"	1540	26.59	OK	"	840, 844, 848
71312	"	"	--	--	=	"	) Same lot of
71366**	D.T.	--	--	--	95	"	) N-623

DEVELOPMENT BATCHES

Semi-Works

2076	Batch
2077	First draft tube batch
2098	Batch
2099**	D.T. - increased concentration
2100	D.T. - no blancol.

Average Toner content: (*All samples were moisture free.)

Standard = 26.52
Batch (Abbé) = 25.65
Draft Tube = 24.83

**Samples were taken before and after heat development; the cold samples were 3-5% weaker than the final samples by rubout and linoleum evaluation.

TABLE VI

BP-173-D DATA

Lot	Type	R.O. Strength (Versus SD-86957)	% CPC
Std		100	73.4
2227	S.W.-batch (D formula)	105	70.8
2228	" -D.T. (D formula)	105	71.3
2229	" -D.T. (simp. formula*)	101	74.6
2232	" -batch (F formula)	102	--
2233	" -D.T. (F formula)	100	75.7
2267	" -batch (simp. formula)	101	--
G-53454	Imperial-Franconia blue	103	77.6
16698	Plant - batch	103	76.0
18182**	" - D.T. (Simp. formula)	100	74.4
19983(NS-795)	" - D.T. (" ")	See below	74.5 See below
20011(NS-762)	" - D.T. (" ")		
20990(NS-792)	" - D.T. (Simp. formula)		
21028(NS-793)	" - D.T. (" ")		
21085(NS-794)	" - D.T. (" ")		

*Sodium rosinate soln. used instead of separately prepared amm. rosinate.
**Toner content calculated for 74.5% to equal standard strength.

Mix A - NS - 792, 793, 794, 795	101	72.5
" B - NS - 762, 792, 793, 794, 795	101	72.6
" C - NS - 793, 795	100	73.2

TABLE VII

BP-173-D DATA (cont'd)

Lot	Texture 1T	3T	5T	Vinyl Tint	Vinyl Tramp	Alkyd. Str.	Alkyd. Flocc.
Std (1)	6-1/2	7-1/4	8	Std	Std	Std	Std
2227	6-1/2	8	8	=	=	=	
2228	7-1/2	8	8	=	=	=	
2229	7-1/2	8	8	=	=	s str.	
2232	6-1/2	8-	8	str.	=	=	
2233	7-1/4	8	8	str.	=	vvs str.	
C-53454*	5	5-1/2	6-1/2				
16698	7	7-1/4	8				
18182	7	7-3/4	8				
	Rubout (Versus SD-86957)						
Mix-865**	100	vs red	vvs dull	=	=	wk.	good
" -963***	100	vvs red	vvs dull	=	=	wk.	poor
Standard	100	--	--	--	--	--	slight

(1) SD-86957 (10% wk. by R.O., and 5% wk. by ink vs old std. 48542.)

*Imperials Franconia Blue.

**Mix of 5 D.T. lots 19983, 20011 (weak because of operating error), 2C 990, 21028, 21085.

***Mix of 5 batch lots.

TABLE VIII

GP-501-D Data

Lot	Type	% CPC	Strength (R.O.)	Texture	Vinyl
Std.		73.6	Std	Std	Std
2268	S.W. batch (C formula)	--	97	=	Str
2269	S.W. D.T. (C formula)	--	95	=	Str
2270	S.W. D.T. (Simp. formula*)	75.6	95	=	Str
18831	Plant batch (C formula)	73.2	98	=	--
18857	Plant D.T. (Simp. " *)	72.4	93	=	--

*Sodium rosinate solution used instead of separately prepared ammonium rosinate.

TABLE IX

DRAFT TUBE UNIT CAPACITY DATA

Code	Forecast (lbs.) (1)	Preferred (2) Batch Size (lbs.)	Required Batches	Overall Draft Tube Unit Cycle (3) Hrs./Batch	Total Hrs.
BT-284-D	141,535	1260	113	4.5	495
BL-288-D	691,540	3200	216	5	1080
BP-173-D	187,545	1400	134	5	670
BL-282-D	137,210	700	196	4	784
BL-220-D	29,318	5000	6	7	42
BT-321-D	17,255	4000	4	3.5	14
GT-674-D(4)	261,840	1260	210	6	1260
GP-501-D	126,370	1200	105	6	630
GM-534-D	67,890	5000	14	5	70
GT-689-F	50,500	5000	10	3.5	350
				Total	5395 (5)

(1) Pounds of product, not pounds of CPC, taken from 1951 Sales Forecast.

(2) Batch size most suitable for the D.T. unit and subsequent processing facilities.

(3) Actual time unit is occupied; at the end of the cycle the next batch could be started.

(4) This includes GT-710-D.

(5) 75% of the unit time available in a 300 day year.

TABLE X

DRAFT TUBE PROCESSING DATA

Code	Newark Batch Size (lbs.) Minimum	Maximum(2)	Preferred	Time Cycle (Hrs.) (1) Preparation	Processing	Total
BT-284-D	400	3000	1260(4)	2	2.5	4.5
BL-288-D	800	3200	3200(2) (3)	1.5	3.5	5.0
BP-173-D	350	1400	1400(2)	1.5	3.5	5.0
BL-282-D	150	700	700(6)	0.6	3.5	4.1(6)
BL-220-D	5000	20000	5000(6)	3.2	4.0	7.2(6)
BT-321-D	4000	24000	4000(5)	1.5	2.0	3.5(5)
GT-674-D(7)	400	1260	1260(2) (3)	1.5	4.5	6.0
GP-501-D	300	1200	1200(2)	1.5	4.5	6.0
GM-534-D	5000	20000	5000(6)	1.0	4.0	5.0(6)
GT-689-P	5000	20000	5000(5)	1.5	2.0	3.5(5)

(1) The times indicated are for preferred batch size only. Prepation time includes handling drums to site of D.T. unit, weighing raw materials, preparation of solutions, etc.

(2) Limited by vat capacity.

(3) Limited by pressing capacity.

(4) Limited by drying.

(5) Based upon single semi-works draft tube batch.

(6) Based entirely upon batch data. Never tried in draft tube unit.

(7) Includes GT-710-D.

TABLE XI

FILTRATION DATA

Code	Preferred (3) Batch Size	Press Data Type	Press Data Ft 3/100#	Time Cycle Per Press Load(Hrs.) Load	Wash	Dump	Total
BL-288-D (1)	3200 lbs.	No Wash	2.0	4	0	2	6
BP-173-D	1400 "	Wash	5.9	1	2	1	4
BL-282-D	700 "(2)	"	5.3	1	2	1	4
GT-674-D	1260 lbs.	No Wash	5.3	3	0	1	4
GP-501-D	1200 "	Wash	5.0	1	2	1	4

(1) Can be pan loaded as well. Presently pressed (at some strength sacrifice) to ease demand on dryer cars.

(2) Based entirely upon batch data.

(3) See Table I.

TABLE XII

DRYING DATA

Code	Preferred (2) Batch Size	Cars	Dryer Data Pans	Dryer Data Temp. (°F)	Type	Time Cycle Per Batch(Hrs.) Pan Load	Time Cycle Per Batch(Hrs.) Drying
BT-304-D	1000 lbs.	10	440	220	H.V.	6	16
BT-284-D	1260 "	14	616	220	H.V.	10.3	16
BL-288-D	3200 "	4(1)	176(1)	180	L.V.	12(1)	24
BP-173-D	1400 "	5	220	140	H.V.	9	26
BL-282-D	700 "	3	132	140	H.V.	8	32
BL-220-D	5000 "	5	220	160	H.V.	4	24
BT-297-D	500 "	4	176	220	H.V.	2.3	16
GT-674-D	1260 "	3	132	220	H.V.	9	16
GT-710-D	1200 "			220	H.V.		
GP-501-D	1200 "	4	176	140	H.V.	12	26
GM-534-D	5000 "	6	264	140	H.V.	4.5	48

(1) These figures are for pressed material.

(2) See Table I.

TABLE XIII

PULVERIZATION DATA

Code	MILL DATA			(1)	
	Diam. (In .)	Rev./Min.	Ft./Min.	Screen	
BT-304-D	24	1850	11,600	1/8"	R.P.
BT-284-D	24	"	"	1/8"	"
BL-288-D	18	4600	21,700	3/32"	"
BP-173-D	24	1850	11,600	1/8"	"
BL-282-D	24	"	"	1/8"	"
BL-220-D	18	4600	21,700	3/32"	"
BT-297-D	24	1850	11,600	1/8"	"
GT-674-D	24	1850	11,600	1/8"	H.B.
GT-710-D	18	4600	21,700	1/8"	R.P.
GP-501-D	24	1580	11,600	1/8"	"
GM-534-D	18	4600	21,700	1/8"	"

(1) Size of perforations.

APPENDIX II

CODE: GT-674-D K# (D)
GOAL: SIZE:
DIAZO VAT:
COUPLING VAT:
STRIKE VAT: 240-390
(3166) STD. HRS. NON-BLEEDING 5-26-50 JRG

Approved By:
EK: 5-24-50
CWO: 5-25-50
HA: 5-24-50

VAT	NAME: "MONASTRAL" GREEN Instructions	Use Lbs	N-Code	Acct. Lbs
240-390	1. Pump into vat 240 through vat 390 and 1/8" screen. (1200# 100%)		624	1200
	From # Net Lot %		624	
	From # Net Lot %		624	
	From # Net Lot %		624	
	From # Net Lot %		624	
	From # Net Lot %		624	
	From # Net Lot %		624	
	From # Net Lot %		624	
	From # Net Lot %		624	
	From # Net Lot %		624	
	From # Net Lot %		624	
	2. Wash in drums.			
	3. Adjust to 42" (1860G.).			
	4. Start vat 240 agitator.			
	5. Remove 1/8" screen from pump line.			
	6. Start circulation pump and vat 390 agitator at 2000 RPM and circulate vat 240 10 mins. or longer thru draft tube maintaining vat 390 level 16" from top.			
Prep 2	7. While stirring and circulating step 6. weigh & slurry in clean drum with 20 gal. water at 100° - 140°F.	24	666	24
	8. Weigh & add to slurried N-666 in 1-2 mins. with agitation	60	650	60
	9. Stir 5 mins. or longer until N-650 is dispersed and emulsified.			
240-390 3	10. Heat circulating slurry in vat 240 to 190° - 195°F in 85-90 minutes.			
	11. Stir drum of prepared emulsion and pour into vat 240 through chute. Watch foam.			
	12. Stir at 190° - 195° for 90 mins. with 40 GPM circulation. Watch foam. Record: time started . Record: total mins.			
	13. Weigh and add in 4-6 minutes	60	65	60
	14. Continue circulation for 10 minutes.			
	15. Shut off circulation pump & vat 390 agitator.			
	16. Drain vat 390 into vat 240.			
	17. Wash in vat 390 using a min. amount of water.			
	18. Stop vat 240 agitator.			
	19. Check and record: ", normal 52".			
	20. Insert 1/8" screen in pump discharge line.			
	21. Press with agitation. TIME START TIME FIN OPTR			
	" " " " "			
	" " " " "			

Code: GT-674-D Goal: 1260#
Process: (D) Date: HA: 5-24-50

MAKING AREA NOTES TG: 6-9-50
Est. Loss Lbs.
Remarks

PRESSING AREA INSTRUCTIONS
Vat 240
Date
Time
Released by
Press No. 24 10
No. of cakes 120 120
Press with agitation
Wash to DO NOT WASH Ohms
Make first test after hrs.
Load on 5 cars
Special instructions NON-BLEEDING
Pumper must remain at vat during washing in to avoid excessive use of wash water
Deliver to

PRESSING AREA NOTES
Describe your yield
Recovery conditions

Est. Loss Lbs.
Cakes used
Hours washed Ohms
Dryer cars actual Or pulp containers
Notes on special instructions

Sampled by
Released by

DRYING AREA INSTRUCTIONS

Type	L.V.	H.V.	Hurricane
Hours	24	16	24
Temp.	220°F	220°F	220°F

Lump container See chart.
Special instructions NON-BLEEDING

Samples
Deliver to

DRYING AREA NOTES
Lump - OK - Wet - Salts - Contaminated with
Remarks

No. dryer cars pulled
Lump weight
Est. loss Lbs.
Sampled by
Released by

GRINDING AREA INSTRUCTIONS
Grinder No. 7 L.S.P.
Special instructions NON-BLEEDING

Samples 2 envelopes

Deliver to Control Laboratory
Do not mix before sampling

Packaging See Chart

GRINDING AREA NOTES
Lump - OK - Wet - Salts - Contaminated with
Remarks
Est. loss lbs.
Remarks

Sampled by
Date mixed

Quality remarks
Lump weight check

GT-674-D (D)

STANDARD FORMULA NOTES

The (D) process replaces the previous (C) formula, and differs from it as follows:

1. Batch size has been increased from 400# to 1260#.
2. The material is processed thru the draft tube unit (Vat 390) rather than in the Abbé Lehart mixer.
3. Recirculation time has been increased to 120 minutes (see special notes).
4. The quantity of N-666 (TEA-C_{12} ester) has been increased from 1% to 2%.
5. To match standard GT-674-D using current N-624 made from Orchem crude, 2% N-657 is added.

The grinding and testing remain unchanged.

Processing GT-674-D in the draft tube unit was justified upon a labor and testing savings resulting from the increased batch size possible in this unit. No quality advantages are claimed however, there are indications that some strength improvement is accomplished.

CALCULATED COMPOSITION

CPC Toner	1200 lbs.	95%
Blanc Fixe	60 "	5
	1260 lbs.	100%

GOAL YIELD

1260 lbs. "as is"
1260 lbs. anhydrous
moisture - nil
Ref: See calculated composition.

SPECIAL NOTES

The following items remain for further study.

1. If the motor on Vat 240 is changed from the present 7-1/2 lbs. to a size capable of handling a full vat of color, the batch size can be increased to 1640 lbs. (3000 gal. final volume).
2. If the batch size is increased to 1640 lbs., the recirculation time can remain the same (120 min.).
3. There is evidence to indicate the 120 minute recirculation time is longer than necessary. It is quite likely that for the 1260 lb. batch size a 60 minute recirculation cycle would be adequate, provided the pumping rate does not drop below 40 GPM.

4. High temperature drying (200°F) has been found by Chemical Division and Quality Control tests to cause no color degradation. This higher temperature drying reduces the drying cycle by 50%.

Signed E. F. KLENKE - 5/24/50

H. ARNOUL - 5/24/50

EFK:cc

(A) GT-710-D

FORMULA NOTES

This process was developed primarily to produce a "Monastral" green toner with better dispersibility in vinyl plastics than GT-674-D (D). Material produced by this process is unsuited for ink or paint use (see GT-674-D (B) notes), being weaker and duller than GT-674-D standard.

Essentially the process is identical to the BT-284-D (C) formula, being a 10% CCl_4 treatment of a 10% pigment slurry in the plant draft tube unit. The treated slurry is pan dried and high speed pulverized.

SPECIAL NOTES

The following items remain for further study -

1. The batch size may possibly be increased to 2400 lbs. (2900 gal. final vol. at 10% slurry concentration).

2. If batch size increases are made, the following recirculation time to batch size ratios should be maintained until sufficient quality data have been accumulated to indicate a change.

1200 lbs. - 1500 gal. - 90 minutes reciro. at 40 GPM minimum.
1600 lbs. - 2000 gal. -110 " " " " " "
2400 lbs. - 2900 gal. -150 " " " " " "

CALCULATED COMPOSITION

CPC Toner-1200 lbs. 100%

GOAL YIELD

1200 lbs. "as is"
1200 lbs. anhydrous
Moisture: nil
Reference: See calc. comp.

Signed E. F. Klenke - 6/9/50

Approved H. Arnoul - 6/12/50

EFK:CC

APPENDIX III

CODE: BT-284-D K# (C)
GOAL: 1800# SIZE:
DIAZO VAT:
COUPLING VAT:
STRIKE VAT: 240-390

APPROVED BY:
EK: 8-18-50
[illegible]: 8-18-50
RA: 8-18-50

Cost Group - 80 (3161) STD. HRS.________ NON-BLENDING JHS: 8-23-50

VAT	NAME: "MONASTRAL" BLUE B — INSTRUCTIONS	USE LBS.	CODE	ACCT.LBS
240-390	1. Pump into vat 240 through vat 390 and 1/8"			
1	screen (1800# 100%)		888	1800
	From ________ # Wet Lot ________ $		888	
	From ________ # Wet Lot ________ $		888	
	From ________ # Wet Lot ________ $		888	
	From ________ # Wet Lot ________ $		888	
	From ________ # Wet Lot ________ $		888	
	From ________ # Wet Lot ________ $		888	
	From ________ # Wet Lot ________ $		888	
	From ________ # Wet Lot ________ $		888	
	From ________ # Wet Lot ________ $		888	
	From ________ # Wet Lot ________ $		888	
	2. Wash in lines.			
	3. Adjust to 34" (15000 .).			
	4. Start vat 240 agitator.			
	5. Remove 1/8" screen from pump line.			
	6. Start circulation pump and vat 390 agitator at 2000 RPM and circulate vat 240 10 minutes or longer thru draft tube maintaining vat 390 level 16" from top			
Top	7. While stirring and circulating step 6, weigh			
2	and hold at vat 390 for step 8	180	889	180
390-240	8. When step 6 stirring and circulation completed, add X-350, weighed in step 7, into vat 390 draft tube in 14-16 minutes			
3	9. Weigh and add to vat 240 in 4-6 minutes	60	88	60
	10. Stir and circulate 60 minutes at 40 RPM.			
	Record: Time started________			
	Record: Total minutes________			
	Note: If necessary, small increments of water may be added in order that the slurry will just flow thru the circulation pump and into vat 390.			
	11. When step 10 completed, shut off circulation pump and vat 390 agitator.			
	12. Drain vat 390 into vat 240.			
	13. Wash in vat 390 using a minimum amount of water.			
	14. Stop vat 240 agitator.			
	15. Check and record: ____________", normal 36".			
	16. Insert 1/8" screen in pump discharge line.			
	17. Run out without agitation.			
	Time start________ Time fin________ Oper________			
	________ ________ ________			
	________ ________ ________			
	Cont'd. on Page 2.			

BT-284-D
(C)

1260#
HA: 5-17-50
JES: 5-23-50

PRESSING AREA INSTRUCTIONS

Lot 240
Date
Time
Released By
Press No.
No. of Cakes
Press with OUT Agitation
Wash to Ohms
Make First Test After Hrs
Load On 15 cars- see other side.
Special Instructions NON-BLEEDING.
Must not contaminate with iron blue.
Samples
Deliver To

PRESSING AREA NOTES

DRYING AREA INSTRUCTIONS

Type
Hours 24 16
Temp 220 220

Lump Container See Chart.
Special Instructions NON-BLEEDING.
Must not contaminate with iron blue.
Scrape pans.
Samples
Deliver To

DRYING AREA NOTES

Lump - OK - Wet - Salts - Contaminated with
Remarks

No. Dryer Cars Filled
Lump Weight
Est. Loss Lbs.
Sampled By
Released By

GRINDING AREA INSTRUCTIONS

Grinder No. 7 L.S.P.
Special Instructions NON-BLEEDING.
Must not contaminate with iron blue.
Samples 2 envelopes.

Deliver To Control Laboratory.
Do Not Mix Before Sampling

Packaging See Chart.

GRINDING AREA NOTES

Lump - OK - Wet - Salts - Contaminated with
Remarks
Est. Loss Lbs.
Remarks

Sampled By
Date Mixed

Quality Remarks
Lump Weight Check

DUP050069220

1. Agitate vat 240 for 3 minutes just prior to pan loading.
2. Stop agitator.
3. Immediately pan load to an even depth of 3/4", thru 1/8" screen.
4. Place each car in dryer; strat steam and fan within 1 hour after the car has been filled.
5. Wash down vat sides using a one inch hose nozzle for maximum of 2 minutes (approx. 12 gals.).
6. Collect washings in 50 gallon drum provided for Abbs Lenart or Vat 240 codes.
7. Nofity making supervisor as soon as mixer is emptied.
8. Pan load washings from 50 gallon drum using dipper.

Note: If the same code is to be made again immediately following this batch, omit steps 5, 6, and 7 and 8. Check with making area Group Supervisor during step 1.

BT-284-D (C)

STANDARD FORMULA NOTES

The (C) process replaces the previous (B) formula.

The (C) formula is written for the draft tube process and differs from the (B) formula as follows:

1. The batch size has been increased from 400# to 1260#(see special notes).
2. The material is processed thru the draft tube (Vat 390) rather than in the Abbé Lenart mixer.
3. To compensate for the increase in strength over the Abbé product 5% Blanc Fixe is added to the toner during the recirculation cycle.
4. Drying times have been reduced 50% by increasing the temperature of drying from 140°F to 220°F.
5. There is no change in the number of dryer cars required per pound of color.

Grinding and testing remain the same.

Processing BT-284-D in the draft tube unit rather than in the Abbé Lenart mixer was justified in the basis of the 5% increase in strength inherent in the draft tube process, and on the basis of the increased batch size possible in the unit, which affords considerable savings.

SPECIAL NOTES

The following items remain for further study -

1. If the Vat 240 motor is replaced with a larger one, the batch size may be increased to 2436# (2900 gal. final vol. at 10% slurry concentration).
2. If the batch size is increased the following recirculation time to batch size ratios should be maintained until sufficient quality data has been accumulated to indicate a change:

   1260 lbs. - 1500 gal. - 60 min. recirc. at 40 GPM minimum
   1680 lbs. - 2000 gal. - 90 " " " " " "
   2436 lbs. - 2900 gal. -120 " " " " " "

3. It is quite possible that the slurry concentration can be increased somewhat without causing serious quality degradation; however, the effect on agitator load must be watched carefully.
4. It is also possible that the amount of treating agent (CCl_4) can be reduced to5% without causing loss of texture or adversely affecting ink mill behavior. No experimental data are available at this time to confirm this.

CALCULATED COMPOSITION

CPC Toner	1200#	95%
Blanc Fixe	60	5
	1260#	100%

GOAL YIELD

1260# "as is"
1260# anhydrous
Moisture: nil
Reference: See Calc. comp.

Signed E. F. KLENKE
Approved H. ARNOUL - 5/18/50
J.H.COOPER - 5/19/50

EFK:CC

APPENDIX IV

ALT.

CODE: BL-288-D (1)
GOAL: 3170# SIZE:
DIAZO VAT:
COUPLING VAT
STRIKE VAT: 240 & 390

APPROVED BY:
IG: 6-7-50
HA: 6-7-50
CWO: 6-9-50
JG: 6-13-50

Cost Group - 21 (3182) Std. Hours_____. NON-BLEEDING.

VAT	NAME: INSTRUCTIONS	USE LBS.	CODE	ACCT LBS
Prep 1.	1. Weigh, dissolve in 30 gallons water in drum at 90°-120°F and hold for step 5	8	567	8
	2. Weigh and hold at vat 390 for step 3 & 6 (840# 100%)		623	840
	From # Lot %		623	
	From # Lot %		623	
	From # Lot %		623	
	From # Lot %		623	
	From # Lot %		623	
	From # Lot %		623	
	From # Lot %		623	
	From # Lot %		623	
	From # Lot %		623	
	From # Lot %		623	
390-240 2	3. Pour three drums N-623 into vat 390			
	4. Turn on agitator at 2000 R.P.M.			
	5. Add ± 6 gallons N-567 solution prepared in step 1.			
	6. Pump vat 390 thru 1/8" pump screen, and 60 mesh screen in vat 240 chute into vat 240. When the slurry level in vat 390 drops to ± 4" below the top of the draft tube, add another drum N-623 & ± 2 gallon N-567 solution. Repeat until all the N-623 and N-567 have been added.			
	7. Wash in drums with water.			
	8. Start vat 240 agitator.			
	9. Stir and circulate vat 240 10 minutes or longer thru draft tube maintaining vat 390 level 16" from top.			
Misc. 3	10. Weigh and hold at vat 390 for step 11	2200	19	2200
390-240 4	11. When step 9 stirring and circulation completed, sift into vat 390 in 25-35 minutes N-19 weighed in step 10.			
	12. Stir and circulate 30 minutes or longer thru draft tube maintaining vat 390 level 16" from top.			
Drums 5.	13. While stirring and circulating step 12, weigh 163# water into 50 gallon drum.			
	14. Weigh and pour in M %		7	1
	15. Heat to 128-132°F			
	16. Weigh and pour in	4	399	4
	17. Stir 5 minutes to solution			
	18. Test and Record: CY must be +. If necessary, adjust using N-7			
	19. Weigh and pour in	71	552	71
	20. Stir 5-10 minutes to smooth emulsion.			
	21. Repeat steps 13-20 inclusive in a second 50 gallon drum		7	1
		.4	399	4
		71	552	71

Cont'd. on Page 2.

VAT	PAGE: 8 CODE: [illegible] ALP.LBS: 3170 INSTRUCTIONS	USE LBS.	N-CODE	ACCT.LBS
390-240 6	NOTE: With the present centrifugal pump and the slurry thickening during the addition of the resinous oil, it is usually necessary to finish the batch from this point on using a steam pump.			
	22. Add to draft tube in 30-40 minutes resinous oil prepared in steps 13-21 inclusive.			
	NOTE: If necessary, small increments of water may be added in order that the slurry will just flow thru the circulation pump and into vat 390.			
	23. Stir and circulate vat 240 30 minutes thru draft tube maintaining vat 390 level 18" from top.			
	24. When step 23 stirring and circulating completed, heat vat 240 to 185-190°F in 30-40 minutes.			
	25. Stir and circulate vat 240 30 minutes thru draft tube maintaining vat 390 level 18" from top.			
	26. When step 25 stirring and circulation completed, shut off circulation pump and vat 390 agitator.			
	27. Drain vat 390 into vat 240.			
	28. Wash in vat 390.			
	29. Press with agitation.			
	Send process card to press room.			
	TIME START______ TIME FIN______ OPER______			
	" " ______ " " ______ " ______			
	" " ______ " " ______ " ______			

BL-288-D ALT 3170#
(1) HA: 6-7-50

JRG 6-20-50

240

92
140

DO NOT WASH

4 cars

NON-BLEEDING.

Temp	24	24
	180	180

Scrape pans.

See Chart.

NON-BLEEDING

8 H.S.P.

NON-BLEEDING

2 envelopes

Control Laboratory

See Chart.

Bump Weight Check

BL-288-D (I)

STANDARD FORMULA NOTES

The "I" process does not replace any previous standard formula. It has been established as an alternate formula for manufacture in vats 240 and 390 when the #2 Abbé Lenart is not available.

This process requires filtration of the slurry in order to avoid the use of a large number of dryer cars which would reduce the Dry Room capacity. After more experience has been gained, it is planned to study the effect on strength of pan loading versus pressing.

An advantage of this process is that the CPC is all passed thru a 60 mesh screen. This should eliminate or reduce streaking in pale shades of linoleum.

All material ratios are based on the "H" process; the weights have been doubled. The resinous oil is also emulsified in the same manner as in this process.

The following calculation composition is copied from the BL-288-D (H) formula and applies. The goal yield has been doubled on the basis of batch size.

CALCULATED COMPOSITION	Lbs.	%
CPC LB	840	26.5
Treating Agent*	134	4.23
Whiting**	2196	69.27
	3170#	100.00%

GOAL YIELD

3170# "as is"
3170# anhydrous
Moisture: Nil
Reference: 1313-37 and BL-288-D (G)

*Assume 85% retention of treating agent.

**Assume 0.15% moisture in whiting.

Additional information and variables can be obtained by referring to the BL-288-D (H) formula notes.

Signed L. GEMMILL

Approved H. ARNOUL - 6/7/50

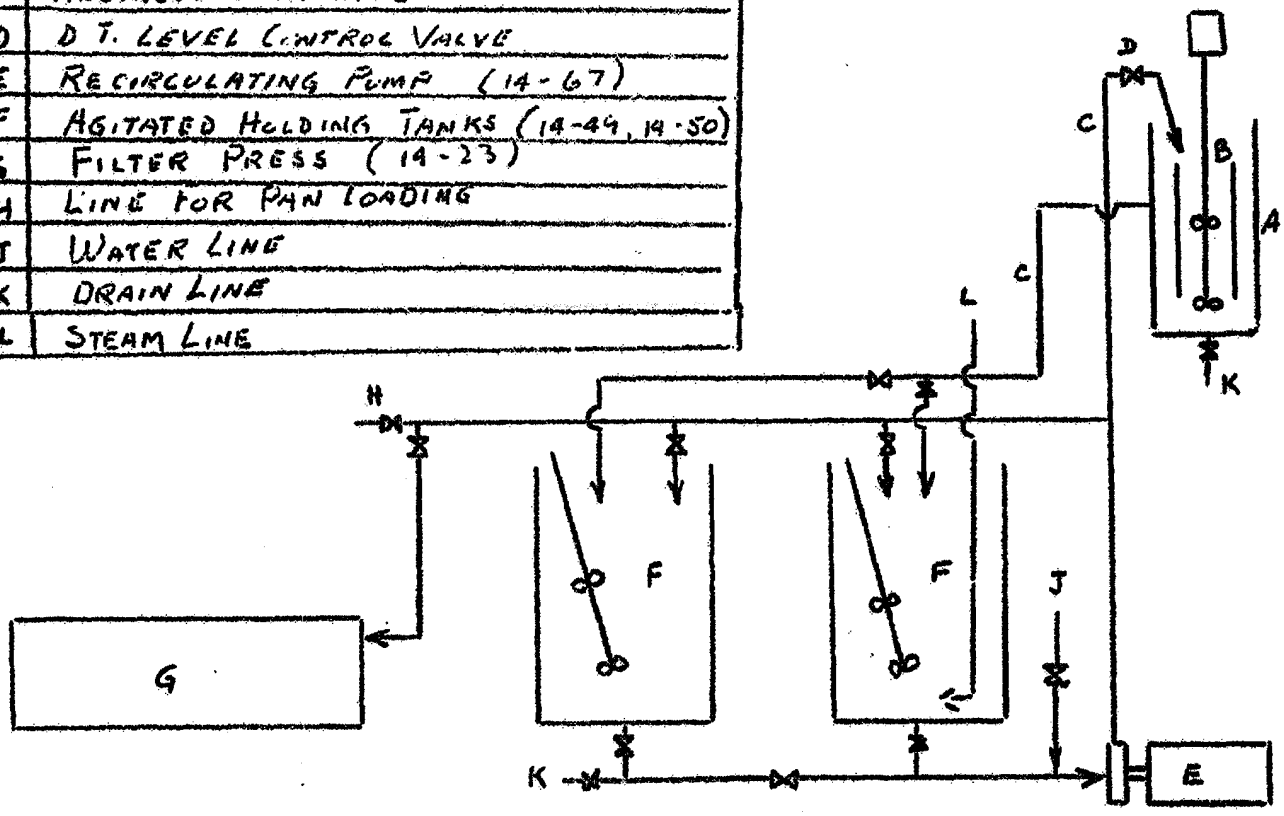
J. H. COOPER - 6/9/50

LG:CC

SEMI WORKS DRAFT TUBE UNIT

FIGURE I

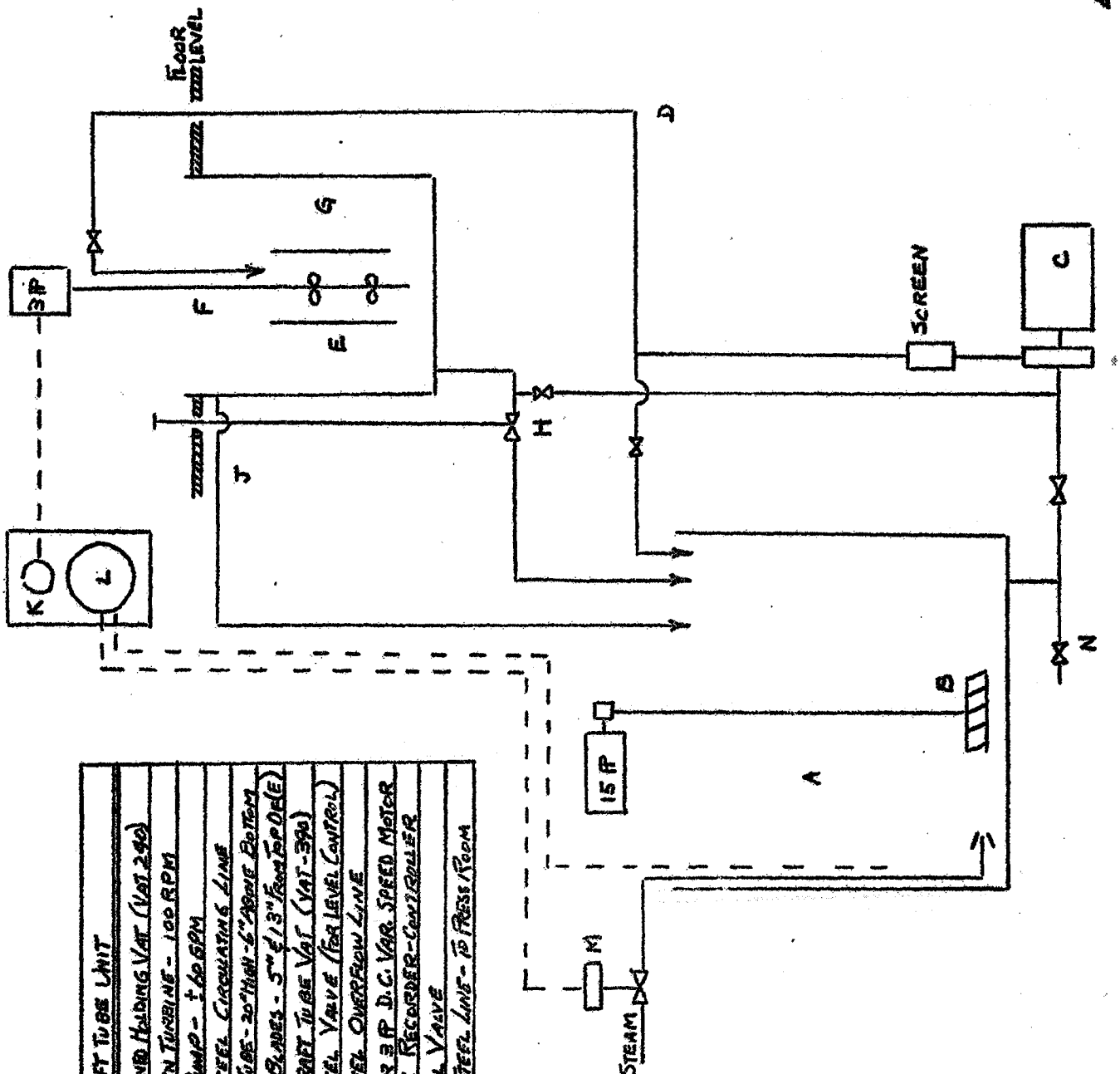
A	DRAFT TUBE VAT (14-48)
B	DRAFT TUBE
C	RECIRCULATING LINES
D	D T. LEVEL CONTROL VALVE
E	RECIRCULATING PUMP (14-67)
F	AGITATED HOLDING TANKS (14-49, 14-50)
G	FILTER PRESS (14-23)
H	LINE FOR PAN LOADING
J	WATER LINE
K	DRAIN LINE
L	STEAM LINE



E. F. KLENKE, JR
1/22/53

NEWARK PLANT - DRAFT TUBE UNIT
FIGURE II

E. F. Kuehnle Jr. 10/11/50



NEWARK PLANT DRAFT TUBE UNIT	
A	3000 GAL. TILE LINED HOLDING VAT (VAT 2-40)
B	± 30" DIAM. OPEN TURBINE - 100 RPM
C	CIRCULATING PUMP - ± 60 GPM
D	2" STAINLESS STEEL CIRCULATING LINE
E	10" DIAM. DRAFT TUBE - 20" HIGH - 6" ABOVE BOTTOM
F	AGITATOR - 5" BLADES - 5" & 3" FROM TOP DRIVE
G	± 300 GAL. SS DRAFT TUBE VAT (VAT-3P)
H	3" STAINLESS STEEL VALVE (FOR LEVEL CONTROL)
J	4" STAINLESS STEEL OVERFLOW LINE
K	RHEOSTAT - FOR 3 HP D.C. VAR. SPEED MOTOR
L	TEMPERATURE RECORDER-CONTROLLER
M	STEAM CONTROL VALVE
N	2" STAINLESS STEEL LINE - 15 PRESS. ROOM

(Ref. 1)

CC: E. F. Klenke
A. A. Brizzolara

NEWARK, NEW JERSEY
DECEMBER 8, 1950

DR. J. H. COOPER

GT-674-D QUALITY

I understand that the quality of CPC green from Newport (N-624) has been poor lately, and that variables have been employed in the GT-674-D process here at Newark in an attempt to improve the material. In that connection, I would like to make a suggestion based upon some recollections of my past work on GT-674-D.

At that time I noticed that when the N-624 was sub-standard (weak and/or dull), the GT-674-D made from it would sometimes show a tinctorial improvement. This occurred primarily in those cases where the pH of the normally alkaline Newport pulp (pH 8-10) had been adjusted in the vat with hydrochloric acid to the range 5-6, prior to the heating and ester-emulsion addition steps.

The pH adjustment step was written into the original GT-674-D formulas (B and C) in order to facilitate pressing. Alkaline CPC pastes are very thixotropic and consequently resist pressing and yield thin, soupy presscakes. An acidic slurry, however, will press without difficulty. When the (D) formula for the draft tube unit was written, the acidification step was believed unnecessary and omitted.

I suggest that trials in the plant draft tube unit be made, to determine whether quality improvements can be realized with sub-standard N-624 when the soft powder treatment is carried out on an acidic slurry. The effect can be determined by rubouts of the finished GT-674-D lump versus a sample of the untreated N-624.

Because GT-674-D at present is reported to be erratic in pressing behavior, batches made on the revised process should be followed through the pressing stage. If the expected improvement in pressing behavior is realized, it may be possible to use fewer frames and decrease pressing time.

M. B. VER NOOY
CHEMICAL DIVISION

MBV:CC

(Ref. 2)

CC: Messrs. R. A. Kaiser, Wilm.
J. E. Booge, "
J. H. Bailey, Nwk.
V. Chalupski, "
C. D. Atkinson, "
H. Arnoul, "
C. W. Oskins, Nwk.
J. deL. Moomaw, "
A. J. Hughes, "
D. B. Killian, "
A. Siegel, "
L. B. Magruder, "

Newark, New Jersey
May 10, 1950

DR. J. H. COOPER,
NEWARK

"MONASTRAL" BLUE AND GREEN

DRAFT TUBE STUDY

This letter is intended to review the original objectives of the draft tube study and to summarize the results to date of the plant development program. Such a summary is desirable, since the plant program was conducted at a rapid pace more consistent with production than development requirements. As a result, some confusion may have arisen and some incorrect conclusions possibly drawn.

ORIGIN:

Installation of the plant draft tube unit was originally justified on the basis of the following:

1. BT-284-D

Semi-works data predicted a 5% increase in strength and greater intensity over standard Abbé Lenart processed material. No improvement in texture was claimed or predicted. Savings were predicted on the basis of dilution with blanc fixe to compensate for the increased strength.

An increase in batch size from 400 lbs. (Abbé batch size) to 1200 lbs. was forecast, the size being dictated by capacity of the dryers and not by that of the draft tube unit per se.

2. GT-674-D

An increase in batch size from 400 lbs. to 1200 lbs. was forecast for the plant unit, thereby affording labor, processing, testing, etc. savings, calculated at $7.26/100 lbs. No quality improvements were claimed. Here too the 1200 lbs. batch size was selected largely because of limited dryer and press capacity.

3. BL-288-D

This code was included in the project for further development work since a few runs on a semi-works scale indicated better

dry lump uniformity than by standard Abbé Lenart production, thereby reducing re-mix and testing costs. In addition, there was some indication that greater strength might be obtained. No definite claims were made for this code, since development data were limited.

RESULTS:

Development work started in the plant draft tube unit as soon as it was available (April 4, 1950). The results of the 16 CPC development batches made to date indicate that the performance of the unit has actually exceeded expectation. Furthermore, the experience to date indicates that, with some additional modifications, appreciably larger batches can be processed thru the unit with possible attending economic advantages.

The following is a summary of plant experience to date:

1. BT-284-D

The first draft tube batch was intense in tint and 6% stronger than a control batch made in the Abbé Lenart mixer (using identical raw materials). The batch size was 1200 lbs., as compared with the standard 400 lbs. in the Abbé. Subsequently, 8 successive batches were made in the D.T. unit with 3% blanc fixe added before panning out. The resulting products were invariably equal to or slightly stronger than standard, and all were on the intense side in tint*.

No operating difficulties were encountered and the number of dryer cars required per pound of color was actually somewhat lower than for standard Abbé processed material.

2. GT-674-D*HM

This code was actually the first batch to be processed in the plant draft tube unit, a decision dictated by the need for improved material to fill an open order from Masland. The process differs from the conventional GT-674-D in that only the CCl_4 treatment is used and the product is high speed pulverized. Prior draft tube development work was restricted to one semi-works run, where it was established that the material produced was superior to standard GT-674-D for vinyl dispersion. Despite the lack of complete operating data, the plant batch was fully equal in all properties to the semi-works standard.

3. GT-674-D

To date 4 draft tube batches have been made (1200 lbs. each) with no operating difficulties encountered. Evaluation of the first batch indicated it to be 5% strong versus standard (lot 451) and

*One 1650 lb. batch was made (4 x Abbé size batch) with no deterioration of quality. All draft tube batches were equal to standard in ink mill behavior and texture.

possibly a trace better in printing ink properties. Subsequent batches were made with 5% extender added. However, ink mill tests indicated a 2-3% strength advantage still remained, with the same slight superiority in ink mill properties. This quality improvement exceeds expectations.

Since this code has always been pressed, there was no change in the dryer capacity per unit of color.

4. BL-288-D

To date only two batches have been made in the plant draft tube unit. One 1585 lbs. (equal to an Abbé batch) and one 3100 lbs. Although complete evaluations are not available as yet, those that are can be reported as follows. The first batch was 8-10% stronger than standard by Armstrong rubout test, and 20% stronger by Sloan-Blabon test. In dry appearance the draft tube product was completely uniform and required no remixing (remixing is required on most Abbé batches).

Despite considerable difficulty in pumping and screening (60 mesh) the heavy slurry (±25% solids), the large 3100 lbs. batch was scheduled to provide operating and quality data. The latter are not yet available. However, in view of the serious pumping problem, it was recommended that further production of BL-288-D in the draft tube unit be delayed until more suitable pumping and screening facilities can be provided.

The two draft tube batches used precisely the number of dryer cars predicted from the limited semi-works study; i.e. a significant increase on a unit color weight basis compared with a standard Abbé batch. This was expected, since one of the features of the draft tube process, by which the improvement in dry uniformity and ultimate strength are obtained, is to use heat development which causes an increase in volume and "fluffiness". In an effort to reduce the demand on dryer car facilities, a portion of the 3100 lbs. batch was pressed before drying. By the Armstrong rubout test the pressed material was fully equal to standard BL-288-D in strength, but weaker than the counterpart which had been pan dried without pressing.

In summary, it can be said that sufficient evidence has been accumulated from production of BT-284-D, GT-674-D and GT-674-D*HM in the plant draft tube unit to demonstrate that this unit has at least fulfilled expectations, and is completely satisfactory for use in the regular production of these codes.

E. F. KLENKE,
CHEMICAL DIVISION

EFK:RMK