| | | | |
|---|---|---|---|
| F. H. BEADLES | - WILMINGTON | H. L. PRIDDY | - OLEDO |
| E. E. FURST | - WILMINGTON | R. H. BEIL | - ARLIN |
| J. S. ALLEN | - WILMINGTON | RUSSELL MORGAN | - ARSHALL LAB. |
| E. T. BREUER | - WILMINGTON | C. F. KALB | - HILADELPHIA |
| H. R. AYRES | - CHICAGO | R. P. WILSON | - OLEDO |
| M. L. BYRON | - SO. SAN FRAN. | C. B. SHERIDAN | - ARLIN |
| N. I. DRESS | - PHILADELPHIA | H. F. TRUCHSESS | - ARLIN |
| P. J. GRIFFIN | - EVERETT | R. T. HUCKS | - ARLIN |
| H. E. JOHNSON | - FLINT | A. J. STEVENS | - ARLIN |
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AUG 19 1957
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E. I. DU PONT DE NEMOURS & COMPANY, INC.

FABRICS & FINISHES DEPARTMENT

FINISHES DIVISION

PARLIN PLANT LABORATORY REPORT NO. 20

# DEVELOPMENT OF "47 PROCESS" REPLACEMENT FOR MB-222 AND MB-105 "DULUX" FURNITURE FLATTING MILL BASE

DUPONT
MARSHALL LABORATORY
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DATE ISSUED: 8/12/57

PROJECT NO.: None

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J. R. Marshall

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Plant Manager

C. B. Sheridan

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N 29363

PARLIN PLANT LABORATORY REPORT NO. 20

# DEVELOPMENT OF "47 PROCESS" REPLACEMENTS FOR MB-222 AND MB-105 "DULUX" FURNITURE FLATTING MILL BASES

## INTRODUCTION

Currently MB-105 and MB-222 "Dulux" Furniture Flatting Mill Bases are manufactured at Parlin for clear "Dulux" furniture products. To prevent color contamination, these mill bases are ground in small batches in porcelain lined mills using glass beads. Although 1956 production* of MB-105 was only 13,600 gallons and MB-222 was 5,120 gallons, this 18,720 gallons required production of 548 batches. Not only was there an excessive number of batches, grit and gloss problems were constantly referred to the laboratory. In view of these factors and the favorable economics involved, "47 Process" manufacture of replacements for subject bases was investigated.

## OBJECTIVES

The specific objectives of this work were as follows:

(1) To develop and evaluate "47 Process" formulas to replace current MB-105 and MB-222.

(2) To determine the desirability of installing a "47 Process" unit at Parlin for the manufacture of developed replacements.

(3) To formulate a single dispersion of G-222 Santocel C, in the interest of Simplification, which would replace both MB-222 and MB-105.

## SUMMARY AND CONCLUSIONS

In both MB-222 and MB-105, Santocel C (G-222), silicone dioxide is dispersed. Initial batch grinds indicated that, while dispersion of this fine white fluffy solid by "47-P" is not difficult, metal discoloration of the clear products will result in

*For complete monthly production see Exhibit III.

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conventional equipment manufacture. In an effort to reduce discoloration, improve dispersion rate and reduce conversion cost, the amount of G-222 in the "47-P" formulas was increased 50% over present ball mill formulations. The resultant "47-P" grind produced a relatively grit-free product, but was dark and dirty in color. "Teflon" discs were installed on the batch and continuous "47-P" units and MB-222 and MB-105 substitutes of good quality were produced.

SX-J-12829 "47-P" replacement for MB-105 and SX-J-12828 "47-P" replacement for MB-222, were scaled-up in the 1/2-gallon bottom feed continuous "47-P" unit with little difficulty. Letdown formulas of these bases in RF-J-12830 replacement for RF-5294 and RF-J-12831 replacement for RF-5774 "Dulux" clear products, were made equal to respective standards. A single dispersion of G-222 for replacement of both MB-105 and MB-222 was developed, but will require more extensive evaluation to determine complete feasibility.

Adoption of developed formulas will result in a gross savings* of $7,098 per year at Parlin and a reduction in flatting base inventory and storage of 50,700 lbs. per year. The savings is based on 1956 production and takes into consideration conversion savings and shipping cost. At present it is more desirable to manufacture proposed "47-P" base at Philadelphia. Indications are that the savings will be realized with no sacrifice in product quality and present plant grit and gloss problems will be essentially eliminated.

ACTION TAKEN OR PROPOSED

In view of the favorable economics and the present difficulties encountered by the plant with the use of MB-105 and MB-222,

*Savings make allowance for freight costs from Philadelphia to Parlin.

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it is proposed that several 250-gallon batches of SX-J-12828 and SX-J-12829 be manufactured at Philadelphia in the "47-P" nylon-disc unit. (Order for 250 gallons of each base has been placed on Philadelphia). After scale-up formula alterations, these formulas should be adopted by the plant on a permanent basis. In view of the fact that Philadelphia has a "47-P" unit equipped with nylon discs, that yearly manufacture of proposed bases would utilize only 6.9% capacity of an 8-gallon "47-P" unit, that current cost of a conventional 8-gallon "47-P" unit installed is $15,000, and that shipping cost from Philadelphia to Parlin would be only $647 per year, it is recommended that the proposed bases be manufactured at Philadelphia until a "47-P" unit can be utilized at full capacity at Parlin. It is further suggested that the consolidated base formulation, shown in Exhibit XI, and later discussed, be evaluated by the Marshall Laboratory as a replacement for MB-105 and MB-222.

## DISCUSSION

### Background

G-222, Santocel C, is a bulky porous material utilized in "Dulux" furniture finishes as a flatting agent. To prevent particle agglomeration, this fine white solid must be dispersed before mixing into the furniture finish. MB-222 and MB-105 are flatting mill bases in which G-222 is dispersed for use in "Dulux" RF-5200 and RF-5700 lines respectively. These bases are nuisance items because of the small batch manufacture and the necessity of grinding these clear intermediates in porcelain lined mills using glass beads. It was first suggested that the clears be manufactured by "47 Process" in Philadelphia Plant Laboratory Memorandum Report No. 32 "Settling of Syloid 978, Synthetic Silica in 'Dulux' Furniture Flats". Exhibits I and II cover initial proposals for "47 Process" formulation and manufacture.

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Formulation

During the development of "47-P" replacements of MB-222 and MB-105, it was found that by removing VG-332 Nylon Solution and RC-718 or RC-721 Urea Formaldehyde Resins, the Santocel C concentration could be increased 50% for MB-105 and 60% for MB-222. These simplified formulations resulted in better vehicle wetting properties. The resin concentration was reduced one-third and the G-222 to binder ratio was doubled (for exact figures see Exhibit VI). The resultant bases showed slight increases in viscosity and good settling stability. G-222 has a tendency to form a soft gel or false body in concentrated solution, but the material is easily pumped by "47-P" equipment.

"47-P" Grinding and Scale-up

The two bases were ground in a standard "47-P" 1/2-gal. bottom feed continuous unit using "Teflon" disc. The grind rate, one pass, of SX-J-12828 (replacement for MB-222) was 5 GPH, and the rate for SX-J-12829 (replacement for MB-105) was 6.5 GPH. These rates suggest scale-up rates of 70 GPH and 90 GPH respectively in "47-P" 8-gallon units. The rapid one pass grinds are desirable to prevent color contamination of the final product. Initial grinds in conventional batch "47-P" equipment resulted in dark dirty gray colored bases. Replacement of the metal disc with "Teflon" disc on the "47-P" unit and increased concentration of G-222 in base formulas resulted in products equal to respective standards when let-down into RF-5294 and RF-5774 "Dulux" finished products.

Base Scale-up Data

| | SX-J-12828 | SX-J-12829 |
|---|---|---|
| Batch "47-P" Stay Time (Min.) | 5 | 5 |
| 1/2-gal. "47-P" Rate (GPH) | 5.0 | 6.5 |
| Sand to base ratio (volume) | 50/50 | 50/50 |
| Temperature (°F.) | 90-100 | 90-100 |
| Dispersed Base Visc.(10 cup @25°C) | 24" | 27" |
| P/L ratio (volume) | 0.074 | 0.070 |

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Evaluation of Developed Bases

Investigation of let-down procedure revealed that best results were obtained by stabilizing the "47-P" dispersion by slowly adding resin to it with the mixer running. Other methods of letting down SX-J-12828 and SX-J-12829 resulted in excessive grit caused by flocculation. The let-down formulas successfully developed are shown in Exhibit IV and V. Base evaluation is shown in Exhibits VI and VII.

RF-5774 and RF-5294 products were chosen as critical products for test of flatting efficiency and metal contamination discoloration because of the large amount of base required in RF-5774 and frequent production difficulties encountered with RF-5294. It is significant that both standard and batch material had equal cloud and color numbers, indicating that contamination was insignificant. Also, the "47-P" dispersed G-222 had good flatting efficiency as indicated by the gloss before vehicle adjustments. The 27 gloss of RF-J-12831 suggests that less G-222 may be required when dispersed by "47-P", however, several production batches should be evaluated to establish this. Exhibit VII compares the flatting efficiencies of MB-105 and MB-222 versus the "47-P" bases developed, and further indicates that while the flatting efficiencies of MB-105 vs. SX-J-12829 show no significant difference, SX-J 12828 will produce a product 14 points flatter than its counterpart MB-222, at the same per cent of G-222 concentration. Final analysis will have to be made from scaled-up alignment batches

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Flatting Efficiency of MB-222 & MB-105
Vs. SX-J-12828 and SX-J-12829

(See Graph Exhibit VIII)

| % G-222 | 60° Gloss MB-105 | 60° Gloss SX-J-12829 | 60° Gloss MB-222 | 60° Gloss SX-J-12828 |
|---|---|---|---|---|
| 1 | 88 | 89 | 89 | 84 |
| 2 | 72 | 75 | 80 | 70 |
| 3 | 45 | 49 | 63 | 49 |
| 4 | 20 | 22 | 44 | 30 |
| 5 | 10 | 12 | 24 | 16 |
| 6 | 6 | 7 | 11 | 8 |
| 7 | 3 | 4 | 4 | 3 |

Savings

In the calculation of savings, Exhibits VIII and IX, conversion and shipping costs were considered. Based on 1956 production, a conversion savings of $5,590 per year for MB-105 and $2,155 per year for MB-222 would be realized by adoption of proposed intermediates. The gross annual savings would be reduced to $7,098 because of a yearly freight cost of $647. The present annual production of these mill bases is 145,974 lbs. compared to proposed "47-P" base production of 95,300 lbs. The savings in base storage would amount to 50,700 lbs. per year. The actual grind time required for MB-222 and MB-105 is 2190 hours per year as compared to proposed "47-P" formulas which require only 373 hours per year. The average batch size of MB-222 and MB-105 for 548 batches produced in 1956 was 34 gallons. The number of batches per year would be reduced from 548 to 37 if 500 gallon batches were produced by 8-gallon "47-P" unit.

Since production of the proposed bases would require 6.9% capacity* of an 8-gal. "47-P" unit, Philadelphia should manufacture the base. At present Philadelphia has the special "47-P" equipment in operation (see Exhibit I).

*Shown in Figure IX.

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Consolidation of MB-222 and MB-105

Since Santocel C is the media dispersed in both MB-105 and MB-222, it would be desirable from a simplification standpoint to replace these bases with a single dispersion that could be used in RF-5200 and RF-5700 lines. These "Dulux" lines have a similar composition. The RF-5200 line resin binder consist of RL-255, Castor Oil Resin and RC-718 Urea Formaldehyde Resin. The RF-5700 line resins are RC-6000 styrenated DCO Alkyd and Urea Formaldehyde Resins RC-718 and RC-721. Both lines employ G-222 dispersions as a flatting agent.

Although RC-718 was common to both lines, investigation showed the wetting properties of this resin would not permit base formulation at a high G-222 concentration. Therefore, a base which could replace MB-222 and MB-105 was developed using a combination of RC-6000 and RL-255 as wetting aids. Let-downs of a batch "47-P" grind into RF-5294 and RF-5774, produced products with gloss and grit properties equal to respective standards. Small amounts of RC-6000 and RL-255 would be introduced into RF-5200 and RF-5700 lines respectively. The largest resin substitution in the RF-5200 line would be in RF-5283, where 2.1% of RL-255 would have to be substituted for RC-6000. In the RF-5700 line the largest resin substitution would be 2.8% of RC-6000 for RL-255. The base formula is shown in Exhibit X, with a tabulation showing the necessary resin changes in RF-5200 and RF-5700 lines in order to utilize the consolidated base. It may require substantial evaluation to determine the effect of the slight resin changes discussed, therefore, it is suggested that this evaluation be considered by the Marshall Laboratory.

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## APPENDIX

| | | |
|---|---|---|
| EXHIBIT I | - | Philadelphia Plant Letter -" 'Dulux' Furniture Flat Enamels" |
| EXHIBIT II | - | Parlin Plant Letter "'47 Process' Manufacture of MB-105 and MB-222" |
| EXHIBIT III | - | 1956 Production of MB-105 and MB-222 |
| EXHIBIT IV | - | Developed Replacements for MB-105 and RF-5294 |
| EXHIBIT V | - | Developed Replacements for MB-222 and RF-5774 |
| EXHIBIT VI | - | Comparison of Base and Let-down Properties |
| EXHIBIT VII | - | Flatting Efficiency of MB-105 and MB-222 Vs. Proposed "47-P" Replacements |
| EXHIBIT VIII | - | Conversion Cost and Savings based on 1956 Production |
| EXHIBIT IX | - | Shipping Cost and Per cent Utilization of 8-gallon "47-P" Unit |
| EXHIBIT X | - | Consolidated Base Formulation for MB-105 and MB-222 |
| EXHIBIT XI | - | SX-J-12828 "47-P" Laboratory Evaluation for Bottom Feed Manufacture for Philadelphia Alignment. |
| EXHIBIT XII | - | SX-J-12828 "47-P" Laboratory Evaluation for Bottom Feed Manufacture for Philadelphia Alignment. |

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EXHIBIT I

C
O
P
Y

CC: E. T. Breuer, Wilm.
E. A. Andre', Lab.
W. H. Toole, Lab.
W. P. Colio, Lab.
Phila. Plant Lab. File

Philadelphia Plant
September 4, 1956

C. B. SHERIDAN
PARLIN

Attention: J. W. Gkonos

"DULUX" FURNITURE FLAT ENAMELS
"47 PROCESS" MANUFACTURE
PHILADELPHIA

Re: Your Aug. 28th, 1956 phone conversation with W.P. Colio.

We are attaching a copy of Philadelphia Plant Laboratory's Memorandum #32 in which we recommended that consideration be given to manufacture of Santocel C Type "Dulux" Furniture Flat at the Philadelphia Plant by "47 Process" to reduce product manufacturing costs. A suggested "47 Process" formula for MB-105, "Dulux" flatting mill base, is included.

The Philadelphia Plant is currently manufacturing 32-5794, flatting base for RF-555, "Dulux" Satin Sheen Varnish, by "47 Process" using stainless steel - lined "47 Process" units and nylon grinding discs. Our original small scale, hand loaded equipment, has been supplanted by one 500-gallon premix tank, and two 13 1/2-gallon stainless steel- lined "47 Process" units mounted in tandem for the required two pass grind. The nylon discs are purchased from the Melarth Supply and Gasket Company, Tioga and Aramingo Avenues, Philadelphia, Pa., at a cost of approximately $40.00 each (12 inch diameter by 1-1/4 inch or 12 inch diameter by 3/8 inch).

Since we have just recently aligned on the new equipment, our production figures have varied, but it appears that we will produce a minimum of 250 pounds of 32-5794 base per hour of unit operation. No accurate production figure for pounds of base per man hour is available since one man operates a number of units and time is charged to general "47 Process" grinding. Our loading time for a typical 3000-pound batch of base has been approximately 1-1/2 hrs.

If interest in this process warrants, we would be happy to arrange for manufacture of a trial batch on our existing equipment for your evaluation.

N. I. DRESS, PLANT MANAGER
By:
J. W. Bastian

JWB:eak
cc:eod

DUP030001332

N 29363.01

EXHIBIT II

C
O
P
Y

CC: E. T. Breuer, Wilm.
H. F. Truchsess

Technical Area
Parlin, N. J.
September 18, 1956

C. B. SHERIDAN

SIMPLIFICATION
"47 PROCESS" MANUFACTURE OF MB-105 AND MB-222
PARLIN

In December of 1955, J. W. Bastian of the Philadelphia "B" Group wrote a report recommending that Philadelphia manufacture MB-105 "Dulux" Flatting Mill Base for Parlin by "47 Process". This report, Philadelphia Plant Laboratory Memorandum Report No. 32, indicated that satisfactory product had been made at Phila. by "47 Process" and that savings of ten cents a gallon were possible. The suggested Philadelphia formula calls for a two pass grind in stainless steel lined units using nylon grinding discs, the special equipment being required to prevent color contamination.

Now that we have a laboratory scale "47 Process" unit and will eventually obtain some for plant use, it is recommended that work be carried out to develop satisfactory "47 Process" formulas for MB-105 and MB-222, both of which are currently made by glass bead grinding. In 1955 we made 496 batches of MB-105 at an average batch size of 268 lbs. and in the first eight months of 1956 we have made 201 batches. As for the MB-222 we made 187 batches in 1955 and 82 in the first eight months of 1956, each of an average batch size of 266 lbs. The attached tabulation shows our production by month for 1955 and 1956 up to September 1, and shows that in 1955 we made as many as 152 batches of the two mill bases in one month. This required 608 hours of grinding time alone without even considering loading and unloading time. This same amount could be made in 163 hours of grinding time in a "47 Process" unit and could be automatically pumped to a storage tank, thus eliminating unloading costs. Parlin cost group calculations indicate that the savings should be ten to twenty cents a gallon on MB-105. The savings on MB-222 would, of course, be similar.

In view of the simplified manufacturing procedure and large savings possible, it is recommended that the suggested development work be carried out in conjunction with the other "47 Process" work aimed at replacing the "SUW-49 Process" formulas for certain 253-line tinting solutions.

J. W. GKONOS

JWG:MCN
cc:eod

N 29363.02

DUP030001333

## EXHIBIT III

## 1956 PRODUCTION OF MB-105 AND MB-222

| MONTH | MB-105 | | MB-222 | |
|---|---|---|---|---|
| | NO. BATCHES | POUNDS | NO. BATCHES | POUNDS |
| January | 21 | 5,341 | 20 | 5,274 |
| February | 6 | 1,589 | - | - |
| March | - | - | - | - |
| April | 15 | 4,028 | 5 | 1,326 |
| May | 56 | 14,871 | 24 | 6,469 |
| June | 40 | 10,633 | 7 | 1,872 |
| July | 22 | 5,921 | 16 | 4,286 |
| August | 42 | 11,256 | 10 | 2,679 |
| September | 42 | 11,244 | 8 | 2,122 |
| October | 54 | 14,414 | 42 | 11,228 |
| November | 57 | 15,277 | 13 | 3,447 |
| December | 53 | 11,462 | 5 | 1,275 |
| Total | 398 | 106,026 | 150 | 39,978 |

MB-105

Avg. batch size MB-105 lbs. = $\frac{106,026\#}{398 \text{ batches}}$ = $266 \frac{\#}{\text{Batch}}$

Avg. batch size MB-105 gal. = $\frac{266 \frac{\#}{\text{Batch}}}{7.80\#/\text{gal.}}$ = 34 gal/batch

MB-222

Avg. batch size MB-222 lbs. = $\frac{39,978\#}{150 \text{ batches}}$ = 266#/batch

Avg. batch size MB-222 gal. = $\frac{266\#/\text{batch}}{7.81}$ = 34 gal/batch

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N 29363.03

# EXHIBIT IV

## DEVELOPED REPLACEMENTS FOR MB-105 AND RF-5294

### SX-J-12829 (Replacement for MB-105)

| First Portion | % | "47 Process" | 8-gal. "47-P" unit |
|---|---|---|---|
| H-583 | 29.0 | | Rate: 50 GPH |
| H-12 | 25.0 | Add in order shown | Temp: 90-120°F. |
| RC-6000 | 32.0 | and mix 10 mins. | Sand to Base: 50:50 |
| | | | "Teflon" disc required |
| Second Portion | | | Total Solids: 26.8 |
| G-222 | 14.0 | Add slowly to running | Wt/Gal: 7.96 |
| | 100.0% | mixer, mix 1 hour, then grind. | |

### RF-J-12830 (Replacement for RF-5294)

| First Portion | % | | |
|---|---|---|---|
| SX-J-12829 | 6.4 | Add slowly to running | Wt/Gal. 7.97 |
| H-583 | 1.1 | mixer in order listed. | Visc: 45-55" 7 cup |
| RC-6000 | 44.5 | Mix 15 mins. | Total Solids: 40.0 |
| Second Portion | | | |
| RC-718 | 30.6 | Add slowly to running | |
| H-136 | 0.9 | mixer in order listed. | |
| H-12 | 6.8 | Mix 20 mins. Adjust to | |
| VG-332 | 1.7 | gloss | |
| Third Portion | | | |
| H-583 | 8.0 | Add to adjust viscosity. | |
| | 100.0% | | |

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# EXHIBIT V

## DEVELOPED REPLACEMENTS FOR MB-222 AND RF-5774

### SX-J-12828 (Replacement for MB-222)

"47 Process"

| First Portion | % | | |
|---|---|---|---|
| H-202 | 37.0 | Add and mix | 8-gal "47-P" Unit |
| H-12 | 30.0 | 10 mins. | Rate: 50 QPH |
| RL-255 | 18.0 | | Temp: 90-120°F. |
| | | | Sand to Base: 50:50 |
| **Second Portion** | | | "Teflon" Disc required |
| G-222 | 15.0 | Add, mix 1 hr. then grind | Total Solids: 26.8 |
| | | | Wt/Gal: 7.7 |
| | 100.0% | | |

### RF-J-12831 (Replacement for RF-5774)

| First Portion | | | |
|---|---|---|---|
| SX-J-12828 | 23.3 | Add slowly to | Wt/Gal: 7.97 |
| H-202 | 3.0 | running mixer. in | Visc: 55-65" 7 cup |
| RL-255 | 20.0 | order listed. | Total Solids: 43.8 |
| | | Mix 15 mins. | |
| **Second Portion** | | | |
| RC-718 | 26.8 | Add slowly to | |
| RC-721 | 6.1 | running mixer in | |
| VG-334 | 9.8 | order listed. | |
| H-120 | 1.9 | Mix 20 mins. | |
| H-136 | 1.0 | *Adjust to gloss | |
| VG-332 | 1.5 | | |
| H-12 | 2.1 | | |
| **Third Portion** | | | |
| H-202 | 4.5 | Adjust to visc. | |
| | 100.0% | | |

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## EXHIBIT VI

### COMPARISON OF BASE AND LET-DOWN PROPERTIES

| PROPERTY | MB-222 | SX-J-12828 | MB-105 | SX-J-12829 |
|---|---|---|---|---|
| Viscosity 10 cup @ 25°C.(Sec) | 12 | 24 | 12 | 27 |
| Solids (Theo) % | 29.9 | 25.8 | 27.9 | 26.8 |
| % G-222 | 9.4 | 15.0 | 9.3 | 14.0 |
| % Solid Binder | 20.5 | 10.8 | 18.6 | 12.8 |
| G-222/binder ratio | 0.46 | 1.39 | 0.5 | 1.0 |
| Wt/Gal. #/gal. | 7.70 | 7.80 | 7.81 | 7.96 |
| Grinding Rate GPM | 8.5(MB) | 50(8 gal"47P") | 8.5 | 50(8-gal"47P") |
| P/L Ratio (volume) | | 0.074 | | 0.070 |

| PROPERTY | SPECIFI. | RF-5774 J-651047 | RF-J-12831 Batch | SPECIFI. | RF-5294 J-641000 | RF-J-12830 Batch |
|---|---|---|---|---|---|---|
| Viscosity 7 cup @ 25°C.(Sec) | 55-65 | 51 | 50 | 45-55 | 60 | 56 |
| Grit-Filtration | F.&N. | F.&N. | F.&N. | F.&N. | F.&N. | F.&N. |
| Color No. | 20 max. | 20 | 20 | 15 max. | 9 | 9 |
| Cloud No. | *- | 3 | 3 | *- | 2 | 2 |
| General appearance | Equal Std. | Equal Std. | Equal Std. | Equal Std. | Equal Std. | Equal Std. |
| Gloss | 40 ± 1 | 40 | 27** | 54 ± 2 | 54 | 56* |

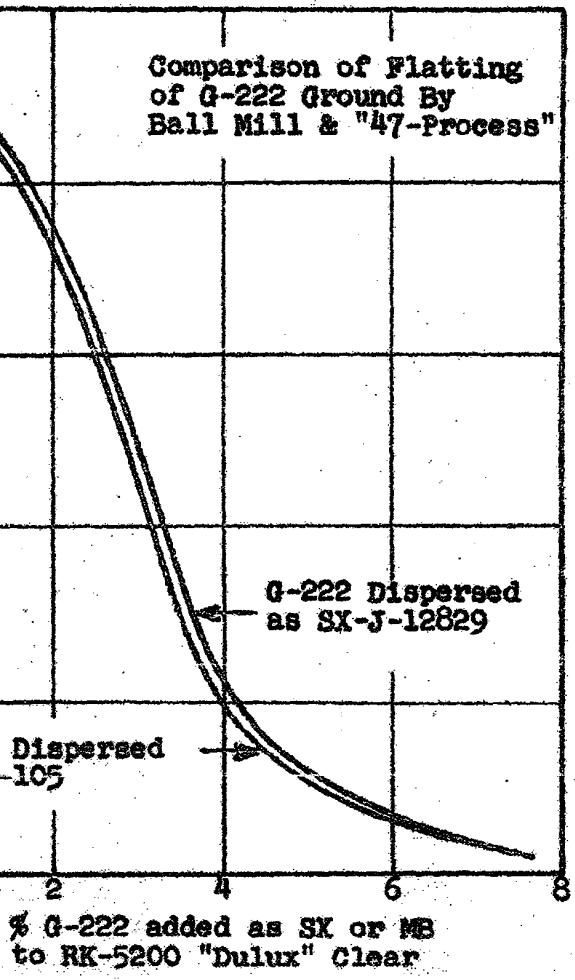
*There is no specification for cloud, but is tested for contamination.

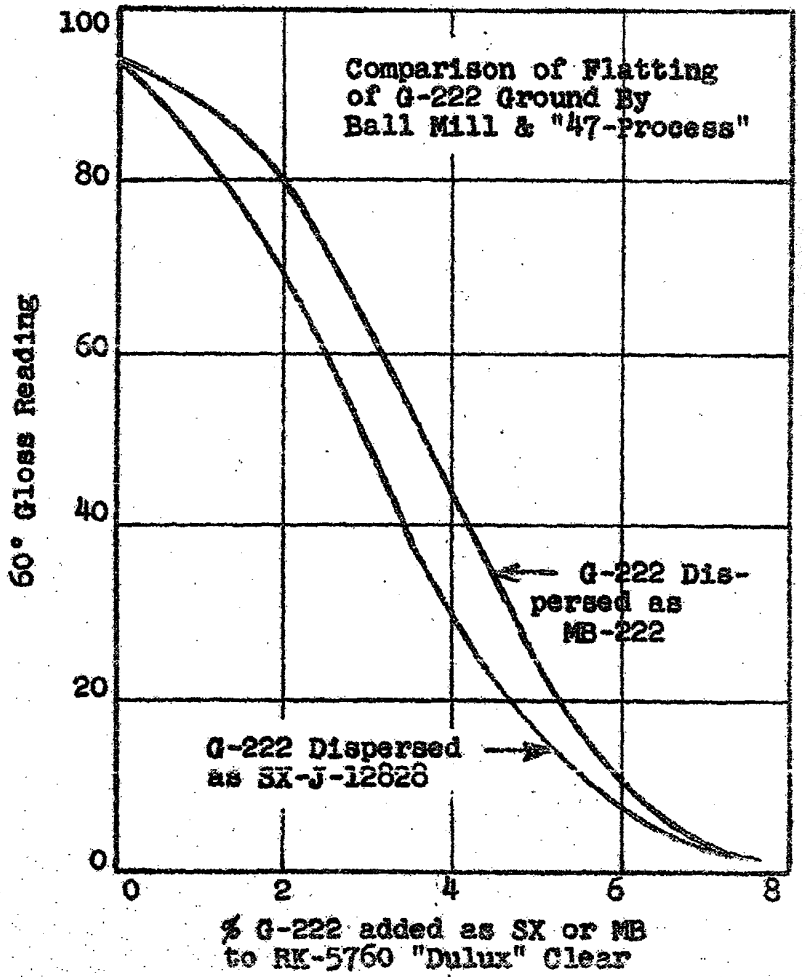
**Gloss taken before any adjustment made. It is common practice to add more mill base or resin to adjust to proper gloss.

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## EXHIBIT VII

FLATTING EFFICIENCY OF MB-222 AND MB-105
VS. PROPOSED "47-P" REPLACEMENTS



## EXHIBIT VIII

## CONVERSION COST AND SAVINGS BASED ON 1956 PRODUCTION

**Basis 1 Year**

Conversion cost for Ball Mill = 0.072$/#

Conversion cost for "47 Process" = 0.029$/#

(1) #G-222 dispersed in MB-105 =
*106,026# X 0.093 = 9850#

(2) #G-222 dispersed in MB-222 =
*39,948# X 0.094 = 3760#

(3) #"47-P" Base to replace MB-105 =
$\frac{9,850\#}{0.14}$ = 70,300#

(4) #"47-P" Base to replace MB-222 =
$\frac{3,760\#}{0.15}$ = 25,000#

(5) Base storage savings =
146,004# - 95,300# = 50,704#

(6) Conversion cost MB-105 and MB-222 =
0.072$/#(106,026# + 39,948#) = $10,510

(7) Conversion cost SX-J-12828 & SX-J-12829 =
0.029$/# (25,000# + 70,300#) = $ 2,765

(8) Conversion savings = (6) - (7) =
$10,510 - $2,765 = $ 7,745

*See Exhibit III.

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## EXHIBIT IX

## SHIPPING COST AND PER CENT OF 8-GAL. "47-P" UNIT UTILIZATION

**Basis: 1 yr.**

Freight cost from Philadelphia to Parlin = 0.006$/#

(1) #Base shipped = 95,300#

(2) #Drums for Base =

$$\frac{95{,}300\# \times 57\#/\text{Drum}}{55\ \text{gal/drums} \times 7.8\#/\text{gal.}} = 12{,}600\#$$

(3) Total shipping weight = 107,900#

(4) Total shipping cost =

107,900# X 0.006$/# = $647

(5) *Net savings = Conversion savings -shipping cost =

$7,745 - $647 = $7,098

**% Capacity of 8-Gal. Unit Utilized by Proposed Bases**

Average production rate = 50 GPH
Average weight/gallon = 7.8#/gal.
*Total available grinding hours = 3,560 hrs/year
Capacity of 8-gal unit =

50 gal/hr. X 7.8#/gal. X 3,560 hrs. = 1,390,000#

Total proposed base production = 95,300# from Exhibit IV

% of 8-gal. unit utilized by proposed bases =

$$\frac{95{,}300\#}{1{,}390{,}000\#} \times 100 = 6.9\%$$

*Provided Intermediate is manufactured in Philadelphia

**Allows down time for maintenance, cleaning, loading and premixing.

DUP030001340

EXHIBIT X

## CONSOLIDATED BASE FORMULATION FOR MB-105 AND MB-222

### Consolidated Base Formula*

"47 Process"

Total Solids: 25.3%
Suggested Grind Data
8-gal. "47-P" Unit

| First Portion | % |
|---|---|
| H-583 | 920 |
| H-202 | 19.0 |
| H-12 | 25.0 |
| RC-6000 | 12.0 |
| RL-255 | 10.0 |

Add in order shown.
Mix 10 mins.

Teflon disc required
Rate: 50 GPH
Temp: 90-120°F.
Sand to Base: 50/50

| Second Portion | |
|---|---|
| G-222 | 15.0 |
| | 100.0% |

*Base has not been scaled-up in 1/2-gal. continuous unit.

| RF-CODE | % CONSOL.BASE | % RL-255 INTRODUCED |
|---|---|---|
| 5278 | 1.7 | 0.2 |
| 5279 | 18.0 | 1.8 |
| 5281 | 1.7 | 0.2 |
| 5283 | 21.3 | 2.1 |
| 5284 | 20.0 | 2.0 |
| 5285 | 5.0 | 0.5 |
| 5288 | 8.0 | 0.8 |
| 5289 | 12.7 | 1.3 |
| 5290 | 4.3 | 0.4 |
| 5292 | 6.1 | 0.6 |
| 5291 | 18.7 | 1.9 |
| 5293 | 19.3 | 1.9 |
| 5294 | 6.1 | 0.6 |
| 5295 | 21.3 | 2.1 |
| 5297 | 11.3 | 1.1 |
| 5298 | 17.3 | 1.7 |
| 5700 | 20.6 | **2.5 |
| 5732 | 6.3 | **0.8 |
| 5774 | 23.3 | **2.8 |
| 5780 | 20.7 | **2.5 |
| 5781 | 6.6 | **0.8 |
| 5797 | 20.7 | **2.5 |

**% of RL-255 replaced by RC-6000

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EXHIBIT XI

SX-J-12828 "47 PROCESS" LABORATORY EVALUATION
FOR BOTTOM FEED MANUFACTURE FOR PHILADELPHIA ALIGNMENT

CODE: SX-J-12828 (Replacement for MB-222)

TITLE: "Dulux" Base

P/L RATIO: 0.074 by volume

SAND LOAD: 2300 grams

RATE (Gal/Hr): 5.0 GPH

SAND LEVEL(Inches): 2.5 inches from top

LIQUID LEVEL(Inches): 3.0 inches from top

SAND/BASE TEMP.(°F.): 100-110°F.

BASE TEMP. AT TROUGH (°F.): 90-100°F.

RESIN SOLIDS (%): 10.8%

DISPERSED BASE VISC: 24" 10 Cup @ 25°C.

REMARKS: (With regard to skinning tendency, false body effect on flow in trough, etc.)

Satisfactory operation in all respects.

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EXHIBIT XII

SX-J-12829 "47 PROCESS" LABORATORY EVALUATION
FOR BOTTOM FEED MANUFACTURE FOR PHILADELPHIA ALIGNMENT

| | |
|---|---|
| CODE: | SX-J-12829 (Replacement for MB-105) |
| TITLE: | "Dulux" Flatting Base |
| P/L RATIO: | 0.070 by volume |
| SAND LOAD: | 2300 grams |
| RATE (Gal/Hr) | 6.5 GPH |
| SAND LEVEL (In.) | 2.5 inches from top |
| LIQUID LEVEL(In.) | 3.0 inches from top |
| SAND/BASE TEMP.(°F.): | 100 - 110°F. |
| BASE TEMP.AT TROUGH (°F.): | 90 - 100°F. |
| RESIN SOLIDS (%): | 12.8% |
| DISPERSED BASE VISC: | 27" 10 Cup @ 25°C. |

REMARKS: (With regard to skinning tendency, false body effect on flow in trough, etc.)

Satisfactory operation in all respects.

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