Copy No. 1

Numerical File

E. I. DU PONT DE NEMOURS & COMPANY
KREBS PIGMENTS DEPARTMENT
256 VANDERPOOL STREET
NEWARK, NEW JERSEY

NEWARK PLANT
PIGMENT COLOR RESEARCH REPORT

PROGRESS REPORT

DEVELOPMENT OF A STRONG G-550 LINE OF CHROME GREENS

Period Covered: JANUARY 1, 1948 to JUNE 1, 1949

FILE: 214

DATE: 11/15/49

NJ6275

Serial No. KN-49-35

Copy No. 1

Copy to:

1 - Numerical File
2 - Research Office (214)
3 - Library File (214)
4 - V. Chalupski - Plant Files
5 - D. B. Killian, Newark
6 - Extra
7 - Extra

NEWARK PLANT

PIGMENT COLOR RESEARCH REPORT

PROGRESS REPORT

TITLE: DEVELOPMENT OF A STRONG G-550-D LINE OF CHROME GREENS.

PERIOD COVERED: JANUARY 1, 1948 - JUNE 1, 1949.

CHARGE: 1101-11-4

SUBMITTED BY: Julius Jackson DATE SUBMITTED: 7/26/49

APPROVED BY: B. H. Perkins 8/16/49 DATE ISSUED: 11/15/49

INTRODUCTION:

This report summarizes the progress made in an attempt to improve the strength of our G-550-D line to equal the strong lines of Imperial, Reichhold and Calco. Considerable difficulty was encountered in this problem, because of the complications arising from such factors as definition of objective, which frequently was changed, and obtaining of satisfactory tinctorial requirements without exceeding the blue content limitations regularly established in current chrome greens.

CONCLUSIONS:

The use of sodium fluoride in place of sodium chloride in what is essentially a Y-493-D process has provided a method for manufacturing chrome greens fully as strong as the strongest competitive pigments, without an appreciable digression from the characteristics of the G-550-D line. Prospective G-550 and G-551-D standards have been submitted to the Sales Division for evaluation.

SUMMARY:

1. Proposed standards for G-550-D and G-551-D have been submitted to the Sales Division for evaluation. These products compare (by H-108 linseed oil rubout) with our existing standards and competitive pigments as follows:

CODE	LOT	% BLUE BY KCR-52
G-550-D* WJNS	90595	5.84
G-551-D* WJNS	90596	10.37
G-550-D (x)	SD-48494	5.28
G-551-D (x)	SD-48486	9.69
Imperial's A-4442	C# 50231	6.05
	C# 50256	6.30

(x) See letter NAM - WFS, Oct. 15, 1948, for discussion of blue content of standards.

	MT	STR.	TINT	MT L/F
90595 vs G-550-D	s.lt.,s.yel.	91=100 Std.	vs.yel.	=
vs Imperial				
A-4442 C# 51273	v.blue	97=100 C#	blue	better
A-4462 C# 51385	v.lt.,s.int., yellow	± =	vvs.blue sl.clean	vs.better
90596 vs G-551-D	s.dk.,s.yel., s.dull	88=100 Std.	s.blue s.dull	s.worse
vs Imperial				
A-4443 C# 51548	v.v.lt.,v.v.yel.			better
A-4463 C# 51219	vs.lt.,s.yel., s.int.,	±92=100 C#	v.blue	vs.better
A-4463 C# 51356	s.dk.,s.blue, int.	±92=100	v.blue	worse

Current standards compare with these competitive pigments as follows:

	MT	STR.	TINT	MT L/F
G-550 vs Imperial				
A-4442 C# 51273	s.dk.,blue, int.	±110=100 C#	blue	better
A-4462 C# 51385	lt.,blue, v.int.	±110=100 C#	blue	vs.better
G-551 vs Imperial				
A-4443 C# 51548	v.v.lt., v.v.yel.			better
A-4463 C# 50219	lt.,v.int.	103=100 C#	blue	better

2. A Shading Yellow coded BY-561-D - 90298, has been set up as a prospective standard strong Y-493-D type Shading Yellow. It compares as follows with recent Y-493-D standards by varnish drier rubout:

As a Yellow	MT	STR.	TINT	L/F
90298 vs Y-493-D				
SD-(86721)	lt.,gr.	97=100	green	better
SD-(48184)	s.lt.,gr.	95=100	red	vs.worse
As a Green				
90298 vs Y-493-D (48184)	v.lt.	O.K.	Yel.,s.int.	± =

3. Pro-mixes designed for Muench mix manufacture of the following codes have been set up:

CODE G-562-D		H-108 Tinctorial Properties vs Standard		
Proposed Mix	Calc.Blue Content KCR-52	MT	STR.	TINT
BY-561-D-90298-76.0% Y-442-D-60570- 2.5% B-269-D-89531-21.5%	20.5%	vs.blue	86=100 Std.	s.blue
CODE G-552-D				
BY-561-D-90298-66.0% Y-442-D-60570- 7.0% B-269-D-89531-27.0%	25.7%	s.lt.,v.sl. blue,int.	91=100	v.sl.yel.
CODE G-553-D				
BY-561-D-90298-53.2% B-269-D-89531-46.8%	44.5%	s.lt., s.blue,int.	89=100	=

4. A single attempt to manufacture G-552-D and G-553-D struck greens at the 5 mol batch size was unsuccessful, the products being dark and dull when compared with standards, G-552-D and G-553-D. This was determined as being partly the result of the difference in quality of the SF-24 blue utilized in the struck greens as compared with the B-269-D standard utilized in the proposed "Muench Mixes". A five percent reduction in blue content was found necessary and desirable when the SF-24 was compared with B-269-D, 89531.

5. A modification of the fluoride content of the Shading Yellow process (50 lbs. in place of 64) utilized in the above batches was attempted in the plant. The Shading Yellow obtained was converted into a green in the laboratory with satisfactory results. No dullness of masstone was apparent.

6. A plant mix coded AG-676-D, lot 99450, was submitted to the Sales Division as a match for Imperial's A-4464, C# 50441. By H-108 linseed oil varnish rubout, the product compared with the C# as follows:

	MT	STR.	TINT	L/F
Mix vs C#	vs lt., blue dull	3-4 str.	yellow	vvs worse

This mix was rejected by "Sales" because of tinctorial variations from competitive products.

7. A board mix consisting of

42.8% G-552-D, SD-48418 13.5% G-550-D, SD-48494 39.0% G-604-D, SD-48054 4.7% Y-424-D SW-9361

was accepted as a basis for Sales Service laboratory work in an attempt to match W.P. Fuller's No.43 green, C# 50893.

8. The use of 1% "Sotex C" cationic agent in conjunction with 1% of "Mulsor 3 CW" was investigated briefly as an anti-flooding agent. It was found to be effective when added to the yellow slurry before "bluing". Greens prepared in this fashion flooded less than untreated controls as evaluated in H-108 linseed oil vehicle. The effect was applicable to dry blended or struck greens.

9. An attempt was made to standardize a strong G-604 line Shading Yellow, coded (C)Y-572-D* for use in matching Imperial's A-4464. This was dropped when the necessity for its use was discontinued.

*This product was originally coded (A)Y-579-D. At the time of issuance of the standard formula, the Quality Control Group requested that the product be coded (C)Y-572-D.

10. Several attempts were made to manufacture more satisfactory shading blues than SF-24, "Potash blues", Nickel-containing blues", ferric chloride oxidized products, nitric acid oxidized, and air oxidized blues were studied without success.

11. A total mill cost penalty of $.40/100 lbs. results from the use of sodium fluoride in the BY-561-D process. Penalties of $.36/100 lbs. and $.34/100 lbs. are applicable to BG-550-D and BG-551-D respectively. (Assuming no blue cost penalty, see letter J.deL.M. - W.F.S., August 18, 1948).

PATENT REVIEW:

The possibility of patenting the use of sodium fluoride in Shading Yellow manufacture was considered. A review of the literature revealed no strictly analagous use of F^-, although Harshaw patents British 416,744, Sept. 20, 1934, and U.S. 2,044,244, June 16, 1936, suggest the use of hydrofluoric acid, fluoroboric acid, or fluorosilicic acid as solubilizing agents during the manufacture of lead chromate from lead oxide and chromic acid or sodium bichromate.

See letter AJS - WFS. July 22, 1948.

Some use of NaF had been made at Newark but no product was manufactured using this agent as a standard ingredient. The patent situation is still under consideration.

HISTORICAL:

Chrome Greens have appeared on the market in the past three years manufactured by Imperial, Reichhold, and Calco, which are substantially stronger than our existing G-550-D line. The Sales Division reported significant competition from these products and requested that an attempt be made to match the best of the competitive pigments. No specific request to match any given competitive product was stated when the program was initiated.

A review was made of the quality advantages of several of these competitive products and the "Vale" Green line of Imperial's A-4442-4446 were determined as being the best of competition. Strength advantages ranging from 12% versus G-550-D, SD-48494, to 6% versus G-553-D, SD-48483, were noted when the greens were adjusted to equal masstone depth. The competitive products were considerably yellower in masstone and tint than our existing G-550-D line, being intermediate between the G-550-D and G-604-D lines.

The strongest competitive products, regardless of manufacturer, contain higher percentages of iron blue than our existing G-550-D line. The lightfastness of these products was, in general, slightly inferior to that of our G-550-D line standards. Attempts to match the masstones of the "Vale" Greens by mixtures of G-550-D and G-604-D lines, or by use of other means of obtaining olive masstones, were unsuccessful,

the mixtures being dull in masstone versus the competitive products. It was apparent therefore, that a substantial tinctorial modification of our Y-493-D standard would have to be made if a match for these competitive products was to be developed.

Subsequently during this program, "Sales" requested the matching of specific competitive codes such as Imperial's A-4462 and A-4464, and W.P.Fuller's No. 43 Green (C# 50893).

When it became apparent that no single Shading Yellow would be satisfactory for matching the tinctorial properties of the various Imperial Greens, the matter was reviewed with the Sales Division and it was decided that the goal of this program should be the manufacture of greens similar to our current G-550-D line, but with strength advantages at least equal to the competitive products. The objective of matching specific competitive products was temporarily abandoned. "Wet struck" G-550, and G-551 type greens were to be developed, along with a Shading Yellow standard for use in manufacturing "Muench-mixed" G-562-D, G-552-D, G-647-D, G-553-D. This program was well under way and standard formulas written when "Muench-mixed" greens were abandoned on May 11, 1949. Work was then started on the setting up of struck G-552 and G-553-D standards to replace the formulated dry blended mixes.

EXPERIMENTAL DETAILS:

Attempts to Match Competitive Greens

1. W.P. Fuller's #43 Green.

Considerable effort had been spent by the Sales Service group in setting up a match for W.P. Fuller's #43 Green standard (C# 50190). A match (coded BG-663-D) composed of -

54% G-605-D
25% G-551-D
16% G-552-D
5% Y-442-D

was submitted to "Fuller" and was accepted. When the plant was requested to make this material from typical production, they were unable to do so because of current strength deficiencies in the G-604-D line. The Sales Division requested us to look into the matter of developing a practical match. Rubout work indicated that the use of a strong Y-493-D type Shading Yellow (BY-561-D), in conjunction with a strong G-604-D type yellow (GW-572-D), both of which were under development at the time, would overcome the previous difficulties. The problem was then dropped pending the receipt of a new sample of "Fuller" standard and testing vehicle.

Upon receipt of the new standard (C# 50893) work was resumed, and a change in "Fuller" standards detected. BG-663-D was no longer a suitable match, and in addition was strong versus the competitive material.

A mix consisting of 42.8% G-552-D, SD-48418
13.5% G-550-D, SD-48866
39. % G-604-D, SD-48054
4.7% Y-424-D, SW-9361

was then presented to the Sales Division for consideration. This mixture was considered sufficiently close to the competitive pigment to justify returning the problem to the Sales Service Laboratory. Similar material coded G-677-D was subsequently submitted to the Fuller Company and was accepted on a tinctorial basis, but was rejected because of cost considerations.

REFERENCES: 1282-37, 45, 51.
Inorganic Research Summary June, July, 1948.

2. Match for Imperial's A-4462

At "Sales" request, the problem of matching this code was started. A review of available samples of this competitive code was made, and exhibits versus our G-550-D standard and the proposed fluoride matches were shown to the Sales Division. The Imperial Greens were much darker, yellower and duller than our G-550-D standard and approximately 12% stronger. The fluoride counter-offerings (of the time) were of comparable strength and much more intense compared to the Imperial product.

"Sales" dropped its request for this match on reviewing the above mentioned exhibits.

3. Match for Imperial's A-4464

A match for this product was requested around 6/1/48. No specific C# was mentioned and our examination showed a very considerable variation among the products available in our files. This was brought to the attention of the Sales Division representative who approved the goal of developing a match for C# 50441 (received from Old Colony Paint Company) because of the possibility of developing business with that concern, and because it was somewhat closer in appearance to our existing G-550-D line. No specific vehicles were mentioned and the rubout evaluations and attempts to match were conducted in Varnish Drier (the vehicle in use at the time).

Evaluation showed the product to be intermediate in properties to our G-550 and G-604 line of Greens. At the Sales-Production-Research Conference of 8/12/48, the decision was made to attempt a match by dry blending. (Prior to this, wet struck greens had been considered satisfactory). It is interesting to note that none of the components AY-561, B-269, or (C)Y-572D were standardized at the time.

Board mixes utilized a strong G-604 line yellow and G-550 line green, and standardization of this code was requested (Coded(C)Y-572-D). At this same meeting, H-108 linseed oil was established as the new vehicle for evaluating greens. These activities culminated in a plant mix, coded G-676-D - 99450 (9/15/48), which was evaluated in H-108 oil, and subsequently rejected by Sales because of dullness of masstone. See letters - WFS - RHP - 9/9/48
JJ - AJH - 9/13/48
WFS - RHP - 9/22/48
RHP - WFS - 9/27/48

The Sales Division then requested that we attempt to match this code for the Armstrong Paint Company in their official vehicle of the time, Spencer Kellog's alkali refined linseed oil. Evaluation of the G-676-D mix - 99450, in this vehicle showed it to be considerably different from CD#50441, and some time was spent in attempting to match the product in this vehicle by changing the percentages and nature of components. This culminated in a board mix approved by Mr. Shrawder consisting of - 22% B-269-D(57320)
10% Y-424-D(8W-9361)
68% BY-561-D (60824)

It was subsequently discovered by a Sales representative that A-4464 was not used by Armstrong and the problem was dropped around 10/5/48.

SHADING BLUE STUDIES:

1. Potassium Blues

Because of the desirability of lowering the Kjeldahl nitrogen values of our greens (see subsequent discussion), an attempt was made to utilize blues different from our orthodox SF-24 type (dark masstone Milori Blue) for the purpose of producing shading blues which could be manufactured into greens containing lower nitrogen contents.

The first attempt involved study of the use of potassium blues in place of ammonia blues.

Various experiments were run utilizing potassium chloride, and potassium sulphate in place of ammonium sulphate, substituting on an equivalent basis in B-216-D type of process. Variables were studied for producing light or dark masstones. On an equivalent basis, the products obtained were very light in masstone and very weak in tint. When comparable masstone depth products were obtained, a 10% to 15% deficiency in strength of the potassium blues was noted. This low strength/masstone depth relationship proved to be unsatisfactory for this application, an actually increased quantity of blue being necessary to obtain comparable masstone greens, with no strength advantage.

See References - NB-1282-40, 41.

2. Use of Stronger Tint Blues

The knowledge that so-called "under-oxidation" of blues, that is, less than one equivalent of oxidant per mol of sodium ferrocyanide, will produce stronger blues, is fairly well established. It was felt that the use of a stronger tint blue (like stronger shading yellow) might be reflected in the production of strong tint greens. Working with this hypothesis in mind, attempts were made to obtain blues stronger in tint than the B-216-D type.

In addition to under-oxidation, variations in type of digestion, in type of oxidant (i.e., HNO_3, $NaClO_3$, $FeCl_3$), use of nickel in place of some iron, reverse striking, and method of addition of oxidant, were studied. None of the products obtained were found to be significantly better than SF-24 (K-1487).

It is apparent that for shading blue into greens, a specific relationship of masstone depth, strength, and blue is required. Increased strength blues, if redder in tint, are not desirable, making for duller tints which may be weaker (depending upon strength advantage of the blue in question). Increased strength blues at correspondingly darker masstones are not particularly useful since the masstone depth increase offsets any strength advantage. The ideal for this situation would be a stronger, greener tint blue of comparable masstone to that of our existing K-1487. This apparently is a difficult goal to obtain.

See N.B. 1282-42, 43, 44, 46, 49.

DEVELOPMENT OF STRONG 604-D LINE (CIY-572-D)

When work was started on the request for a match for Imperial's A-4464, it became apparent that a stronger G-604-D (K-1735) type of Shading Yellow would be useful. Previous work on a G-604-D sick list study, designed to increase strength of G-604-D line green, had indicated that a decrease in the amount of nitric acid in the strike (accompanied by a subsequent increase in the amount added after the strike) on the standard K-1735 process, gave rise to stronger G-604-D

line greens. This was accomplished thru the production of a slightly redder masstone, stronger redder tint Shading Yellow, which required more iron blue to reach a given masstone depth green. These greens were stronger than those made on standard process. A batch of this type color coded AY-572 - 58132, made with an initial cut of 15% nitric acid (sith simultaneous increase in second nitric acid) had been found useful in board mixes for matching Imperial's A-4464 Chrome Green. This was made the goal of a plant program designed to set up a standard for a stronger G-604-D line Shading Yellow. A code, GY-572-D, was issued. The following batches were made.

Lot Number	Initial N-33	Final N-33
Standard	160 lbs.	68 lbs.
60192	140	88
60132	140	88
60302	136	92
60445	120	108
60446	120	108

The last two batches were found to be comparable in strength at equal masstone depth to lot 58132. The poor reproducibility of these procedures may have been due to difficulties associated with the analysis of the basic lead acetate liquor used. This seems to have been the case in recent work on Y-524-D. See N.B. 1281 and also 1305. No standard for this code was issued, since the necessity for it ceased when Sales dropped the request for a match for Imperial's A-4464.

References: N.B. 1274-2-30.

VARIABLE STUDIES DESIGNED TO OBTAIN STRONGER CHROME GREENS

1. Use of Small Particle Size Rhombic Phase Lead Chromate

An early hypothesis concerning the obtaining of greater strength Chrome Greens was based on the assumption that the production of smaller particle size rhombic phase crystals than that existing in Y-443-D would make possible the manufacture of the desired stronger greens. This was tested by adding Y-202-D or Y-524 (84577) K-1735 (G-604-D line Shading Yellow) to Y-493-D since the former are smaller particle size rhombic phase yellows. Unfortunately, the masstone of greens made at definite percentages of blue from the smaller particle size rhombic material are considerably darker in masstone than greens of the same blue content made with Y-493-D as the Shading Yellow. This defeats the goal of obtaining greater strength greens (at any given depth) since the excessive darkness of masstone requires a decrease in blue content in order to obtain the desired darkness, with consequent weakness of tint. The strength of chrome greens are very markedly affected by the content of iron blue as well as by the previously discussed effects of hue.

2. Use of Shading Yellows containing Substantial Percentages of the Monoclinic Crystals.

An examination of Imperial's X-1945 light yellow (C# 48433) as a Shading Yellow led to several interesting conclusions. This material when examined by the electron microscope appears to be a mixture of the Rhombic and Monoclinic phases of lead chromate and lead sulfate in solid solution. Comparing it with Y-493-D as a Shading Yellow, it consumes a higher percentage of iron blue to reach a given masstone depth green, with the result that at equal depths the product was 15% stronger than our Y-493-D standard. Attempts to duplicate this effect by utilizing blends of Y-493-D with Y-404-D, Y-405-D, Y-469, or Y-500 were unsuccessful because of excessive dullness of masstones and tints.

The successful manufacture of a yellow of the Imperial X-1945 type might make possible a duplication of the Imperial "Vale" line.

3. Production of Stronger, Redder Shading Yellow

The knowledge that light yellows which are made with redder masstones and tints are usually stronger is well established. With this in mind, an attempt was made to apply variables that would produce such tinctorial effects in the Y-493-D process. In addition, the strong competitive greens were known to be yellower in masstone than our current G-550 line greens.

Such variables as:

1. Higher strike pH obtained by -

   A - increased sodium carbonate in white base.
   B - use of mixtures of sodium chromate and sodium bichromate.

2. Increased Chromate content.

3. Use of halogens to redden masstones.

   A - increased quantity of salt.
   B - use of sodium fluoride.

were resorted to for this purpose.

This work soon showed that the use of the sodium fluoride was the most effective strength improving agent despite the fact that some of the other variables gave yellows which were considerably redder. The quantity per mol used is quite specific. In the laboratory maximum strength products were obtained when 15 grams of sodium fluoride per mol of lead nitrate was used (the fluoride being added to the bichrome solution). Quantities in excess of this amount produced dark, yellow and dull masstone greens.

The use of sodium fluoride in the laboratory yielded Shading Yellows which were slightly redder in masstone and tint, and stronger than the control products made without the use of fluoride. They consumed increased quantities of iron blue to reach a given masstone depth, grn.& the tints are correspondingly stronger. This effect is directly proportional to the quantity of fluoride used (when evaluated as green of 20% blue or less). Strength advantages of 18-20% were obtained in the laboratory processes (when blue contents were disregarded), and comparable masstone depth products were rubbed out against the standard G-550-D line.

The quantity of sodium fluoride necessary for optimum strength, considering also the hue of the masstone, was found to vary with batch size. In the semi-works, 10 lbs. of sodium fluoride per mol of lead nitrate was found to be comparable in effect to the 15 lbs. used in the laboratory. The quantity of sodium fluoride used per mol in the plant (12-6/7 lbs./mol lead nitrate) was a compromise designed to meet the requirements of effect of batch size, hue of masstone and tint, the necessity for strength advantage sufficient to overcome the strength discrepancies of our current G-550-D line versus competition, and iron blue content limitations upon which price ranges are set. Sales Division policy dictated that no blue increases above the maximum limit of 6% for G-550-D, 11% for G-551-D, etc., would be tolerated.

Electron micrographs do not reveal any visual effect upon particle size or shade resulting from this use of F^- on Y-493-D. It is interesting to note, however, that F^- can be detected in the Shading Yellow after its manufacture.

DEVELOPMENT OF FLUORIDE GREENS:

After demonstrating in the laboratory and semi-works that the fluoride variable would provide a means of obtaining the necessary strength advantages, preparation of actual plant struck G-550 and G-551 products, as well as fluoride type "Muench mixed" G-562-D and G-647-D, was undertaken at the request of the Sales Division. (The latter were prepared in the Semi-Works mixer). These products were prepared and submitted to "Sales" for evaluation.

See - G-550-DNS - 88713
G-551-DNS - 88714
G-562-DNS - 9753
G-647-DNS - 9763

After reviewing the results of rubouts and alkyd grinds of these products, standardization of the fluoride type G-550-D line was requested around 2/20/49.

See letter GHM - WFS, 2/14/49)

Since G-562-D, G-552-D and G-553-D were to be made by dry blending in the Muench mixer, a standard Shading Yellow (coded BY-561-D) was set up. An equal part mix (90298) of each of five lots of BY-561-D - 64982, 65244, 65399, 65094, 65400, was approved by the Production Division as a prospective standard and was submitted to the Sales Division for their evaluation. This mix compares with Y-493-D standards as follows in varnish drier vehicle.

	MT	STR.	TINT	L/F
90298 vs Y-493-D (48184)	s.lt.,grn.	5% str.	red	v.sl.worse*
vs Y-493-D (86721)	lt., grn.	2-3% str.	grn.	better*

*Note: 90298 and 86721 contains 75% of tin crystals used in SD-48184.

Promixes (previously tabulated in conclusion section) were developed utilizing this Shading Yellow, B-269-D, and suitable "oliving" agents for use by the Plant Development group in making Muench mixes for G-562-D, G-552-D, G-647-D and G-553-D. The promixes were approved by Sales. (See memorandum for files BHP 4/21/49 - Strong Chrome Greens). These mixes were prepared by that group; however, since the decision was reached about May 11, 1949 to abandon Muench mixing, they were not submitted as prospective standards.

Simultaneously with the development of the Shading Yellow, struck batches of G-550-D and G-551-D were produced using the standard fluoride Shading Yellow formula and adding the necessary amounts of blue liquor to give a masstone approximation for the G-550-D and G-551-D standards. The plan decided upon was to make light masstone G-550-D and dark masstone G-551-D from which the respective standards could be set up at the desired blue contents.

Lots G-550-DNS -		G-551-DNS -	
	65111*		65429**
	65245		65467
	65411***		65479
	65556		65767
	65848		65821

*Used 140 lbs. blue liquor.
**Used 320 lbs. blue liquor.
***Considered out of line because of operating difficulty.

These batches were approved for reproducibility by the Production Division and mixes of each code were prepared.

G-550-D* WJNS - 90527	KCR-52 blue content 5.0%
G-551-D* WJNS - 90525	KCR-52 " " 11.45%

Suitable blends of each of these mixes were determined for matching the G-550-D and G-551-D standards.

G-550-D* WJNS (90595) consisted of 87.6% G-550-D* WJNS 90527
12.4% G-551-D* WJNS 90525

G-551-D* WJNS (90596) consisted of 17.2% G-550-D* WJNS 90527
82.8% G-551-D* WJNS 90525

Readings of these final mixes versus current standards and competition have been previously listed under the section entitled Conclusions.

Attempts to match G-552-D (66394) and G-553-D (66395) were limited to a single batch. A batch of struck yellow was made by scaling down the seven mol proportions (used in BY-561-D and struck G-550, G-551-D) to five mols. This was split in the vat and to each half of the slurry sufficient iron blue added to make a G-552-D and G-553-D depth green. (27% blue for G-552-D and 47% for G-553-D respectively). The blue contents were determined from the Muench mixing requirements for these codes. The batches were unsatisfactory being very dark, and dull in masstone, and extremely strong in tint.

An attempt to attribute this behavior to inaccuracies in blue liquor usage was found to be unfounded. However, a portion of the blue liquor utilized in these greens when dried out and compared with B-269-D - 89531 (standard) as a shading component was found to compare as follows:

	MT	STR.	TINT
60% Y-493-D (48184) blue liquor vs 40% Blue B-269-D	v.dk., v.dull	3 str.	s.blue

40% Blue.

It was found that a five percent reduction in blue was necessary to compensate for differences in behavior between blue liquor and dry B-269-D.

A second batch of Shading Yellow was made decreasing the sodium fluoride used. (Because of the previously discussed effect of batch size on fluoride requirements, and the belief that too great a quantity may have been used). See BY-561-D*NS - 66520. Struck greens of the G-552-D and G-553-D depths were made from this slurry in the laboratory.

These products when evaluated against G-552-D and G-553-D were considerably lighter and more intense than those made in the plant at the higher fluoride level. The final comparison showed the G-552-D products to be intense and blue in masstone vs G-552-D at equal depth. The product made to match G-553-D was somewhat bluer and duller in masstone than standard G-553-D.

The problem was then transferred to Dr. Morrison with recommendations to modify the low fluoride formula in an attempt to obtain greater oliveness of masstone.

FUTURE WORK:

Work on this problem is being continued by Dr. Morrison.

REFERENCES:

1 - KN-48-1
2 - DSN-49-31
3 - N.B. 1282-13, 14, 15, 17, 18, 20-26, 28-55.
4 - N.B. 1319-1-3

TYPICAL LABORATORY FLUORIDE FORMULA

$Pb(NO_3)_2$		165.5 gr.
	in	3.4 liters water
	at	4.6 pH
		80°F
	Add - Stir 15 minutes exactly	
Na_2CO_3		20 gr./200 cc
	Add in 20 minutes	
$Na_2Cr_2O_7.2H_2O$		62 gr.
NaF		7.5 gr.
Na_2SO_4		5.0 gr.
	in	.3 liter
		4.6 pH
		80°F
	Add within 2 minutes - Stir.	
$SnCl_2.2H_2O$		1.5 gr./20 ml
Na_2CO_3		±3.6 gr./36 ml
	to pH	5.1
Na_2S		.5 gr./40 ml
$Al_2(SO_4)_3$ 18 H_2O		12 gr./20 ml
	Stir 10 minutes	
	Flood to 8 L's - Draw 3 waters	
$Al_2(SO_4)_3$ 18 H_2O		10 gr./100 ml
$SnCl_2$-$2H_2O$		1.5 gr./20
Na_2CO_3		3.4 gr./30 ml
	to pH	5.1

N CODE INDEX

N Number	Chemical Formula	Common Name
N-3	Na_2CO_3	Sodium Carbonate
N-8	$Na_2Cr_2O_7.2H_2O$	Sodium Bichromate
N-10	Na_2CrO_4	Sodium Chromate
N-15	$Al_2(SO_4)_3$ 18 H_2O	Aluminum Sulfate
N-26	$SnCl_2.2H_2O$	Stannous Chloride
N-30	$HC_2H_3O_2$	Acetic Acid
N-33	HNO_3	Nitric Acid
N-41	$Pb(NO_3)_2$	Lead Nitrate Solution
N-52	-	Tannic Acid
N-64	$(Pb(OH_2)_2Pb(Ac)_2$	Basic Lead Acetate
N-108	Na_2SO_4	Sodium Sulfate
N-262	H C_2 H_3O_2	Acetic Acid Solution
N-368	Na_2S	Sodium Sulfide
N-416	-	Blue Liquor
N-484	-	Para Soap
N-518	NaF	Sodium Fluoride

Cost Group - 4

U.S. Pat. 2,139,753

CODE: _____ K# ~~(B) G-551-D~~ (B) G-550-D

GOAL: 2291# YELLOW SIZE: 1 MOL.

DIAZO VAT: _____

COUPLING VAT: _____

STRIKE VAT: 260,261,262,267

(2984) STD. HOURS 6.7 . NON-BLEEDING

[redacted]
APPROVED BY:
JJ: 8-10-49
JOM: 8-10-49
HA: 8-16-49
CWO: 8-17-49
JT: 9-16-49

VAT	NAME: "HY-CAP" CHROME GREEN INSTRUCTIONS	USE LBS.	N. CODE	ACCT. LE
PREP 1.	1. WEIGH AND HOLD AT VAT 365 FOR STEP 15	280	3	280
	2. WEIGH AND HOLD AT VAT 365 FOR STEP 30	40	3	40
	3. WEIGH AND HOLD AT SCALE TANK 361 FOR STEP 20	90	518	90
	4. WEIGH AND HOLD AT SCALE TANK 361 FOR STEP 21	91	108	91
	5. WEIGH IN WOODEN KEG AND HOLD FOR STEP 39	28	26	28
	6. WEIGH AND HOLD AT AT 366 FOR STEP 35	7	368	7
	7. WEIGH DISSOLVE IN 10 GALLONS WATER IN KEG, AND HOLD AT STRIKE VAT FOR STEP 46	28	15	28
S.V. 2.	8. RUN 30-40" (+3000G.) WATER INTO STRIKE VAT.			
	9. RUN IN FROM SCALE TANK 360			
	FE M T %		41	2317
	FE M T %		41	
	10. WHEN USING VATS 261,262, OR 267, SET AGITATOR AT 20 RPM.			
	11. ADJUST TO 65" (5655G.) AT 73-77°F.			
	12. ADJUST TO PH 4.6-4.8 WITH N-7 OR N-33. RECORD: PH _____			
365 3.	13. RUN 35-45" (+ 176G.) WATER INTO VAT 365.			
	14. TURN ON AGITATOR AND STEAM.			
	15. DUMP IN N-3 WEIGHED IN STEP 1.			
	16. ADJUST TO 55" (242G.) AT 80-120°F.			
	17. STIR TO DISSOLVE.			
361 4.	18. RUN 18" (299G.) WATER INTO SCALE TANK 361.			
	19. TURN ON AGITATOR.			
	20. DUMP IN N-518 WEIGHED IN STEP 3.			
	21. DUMP IN N-108 WEIGHED IN STEP 4.			
	22. STIR 10 MINUTES OR LONGER TO COMPLETELY DISSOLVE.			
	23. RUN IN M T %		8	868
	24. ADJUST TO 29" (479G.) AT 74-76°F.			
	25. ADJUST TO PH 4.6-4.8 WITH N-7 OR N-33. RECORD: PH _____			
	MAINTAIN AGITATION IN TANK 361 UNTIL END OF STEP 38.			
S.V. 5.	26. RUN VAT 365 INTO STRIKE VAT IN 4-5 MINUTES.			
	27. STIR EXACTLY 14-16 MINUTES.			
365 6.	28. RUN 10-15" (+ 55G.) WATER INTO VAT 365.			
	29. TURN ON AGITATOR AND STEAM.			
	30. DUMP IN N-3 WEIGHED IN STEP 2.			
	31. ADJUST TO 25" (110G.) AT 80-120°F.			
	32. STIR TO DISSOLVE.			
366 7.	33. RUN 10-15" (+ 20G.) WATER INTO VAT 366.			
	34. TURN ON STEAM.			
	35. DUMP IN N-368 WEIGHED IN STEP 6.			
	36. ADJUST TO 25" (40G.) AT 80-120°F.			
	37. STIR TO DISSOLVE.			

CONTINUED ON PAGE 2.

VAT	PAGE: 2 CODE: (B) G-550-D (B) G-551-D LBS: 2291# INSTRUCTIONS	USE LBS.	N-CODE	ACCT. LBS.
S.V. 8.	38. WHEN STEP 27 STIRRING COMPLETED, STRIKE SCALE TANK 361 AT 74-76°F INTO STRIKE VAT AT 74-76°F ON THE SURFACE IN 19-21 MINUTES.			
	RECORD: TOTAL MINUTES _____.			
Misc. 9.	39. WEIGH AND ADD TO N-26 WEIGHED IN STEP 5.	2	28	1
	40. DISSOLVE N-26 TREATED IN STEP 39 WITH 40 GALLONS WATER AND HOLD AT STRIKE VAT FOR STEP 42.			
S.V. 10.	41. WHEN STEP 38 STRIKE COMPLETED, WASH IN SCALE TANK 361 IMMEDIATELY.			
	42. POUR IN N-26 PREPARED IN STEP 40 AT ONCE.			
	43. RUN VAT 365 INTO STRIKE VAT AT ONCE IN 2-3 MINUTES.			
	44. SAMPLE FOR pH AND HOLD SAMPLE FOR STEP 47.			
	45. RUN VAT 366 INTO STRIKE VAT AT ONCE IN 2-3 MINUTES.			
	46. POUR IN N-15 PREPARED IN STEP 7 AT ONCE.			
	47. STIR 10 MINUTES. WHILE STIRRING, TEST AND RECORD STEP 44: pH _____, NORMAL 4.6-5.0			
	48. WHEN STEP 47 COMPLETED, TEST AND RECORD: pH _____, NORMAL 4.9-5.1.			
	49. IF NECESSARY, ADJUST TO pH 4.9-5.1 WITH N-3 OR N-33.			
	RECORD: pH _____.			
	50. TEST AND RECORD: SLURRY COLOR _____.			
	51. FLOOD TO 85" (7395G.).			
	52. DRAW 3 WATERS AT 5 HOUR INTERVALS.			
	53. WHEN USING VATS, 261, 262, OR 267, SET AGITATOR AT 12 RPM.			
	DO STEPS 54-66 ABOUT 1/2 HOUR BEFORE DRAWING LAST WATER.			
363-364 11.	54. START AGITATOR ON VAT 363 OR 364 AND STIR UNTIL COMPLETION OF STEP 76.			
365 12.	55. RUN 25-30" (± 121G.) WATER INTO VAT 365.			
	56. TURN ON AGITATOR AND STEAM.			
	57. WEIGH AND DUMP IN	140	15	140
	58. ADJUST TO 40" (176G.) AT 80-120°F.			
	59. STIR TO DISSOLVE.			
366 13.	60. RUN 10-15" (20G.) WATER INTO VAT 366.			
	61. TURN ON STEAM.			
	62. WEIGH AND DUMP IN	30	3	30
	63. ADJUST TO 20" (32G.) AT 80-120°F.			
	64. STIR TO DISSOLVE.			
Misc. 14.	65. WEIGH N-26 AND N-28 INTO KEG, DISSOLVE WITH 10 GALLONS WATER, AND HOLD AT STRIKE VAT FOR STEP 69	14	26	14
		2	28	1
	66. WEIGH INTO KEG, SLURRY WITH 10 GALLONS WATER, AND HOLD AT STRIKE VAT FOR STEP 74	21	484	21
S.V. 15.	67. AFTER 3RD WATER DRAWN, TEST AND RECORD: SLURRY COLOR _____			
	68. RUN VAT 365 INTO STRIKE VAT IN 3-4 MINUTES.			
	69. POUR IN N-26 PREPARED IN STEP 65 AT ONCE.			
	70. RUN VAT 366 INTO STRIKE VAT AT ONCE IN 2-3 MINUTES.			
	71. STIR 5 MINUTES.			
	(CONTINUED ON PAGE 3)			

VAT	PAGE: 3 CODE: (B) G-550-D (B) G-551-D LBS: 2291# INSTRUCTIONS	USE LBS.	N-CODE	ACCT. LBS.
	72. TEST AND RECORD: pH _____, NORMAL 5.0-5.2.			
	73. IF NECESSARY, ADJUST TO pH 5.0-5.2 WITH N-3 OR N-33. RECORD: pH _____.			
	74. POUR IN N-484 SLURRY PREPARED IN STEP 66.			
	75. STIR 3 MINUTES.			
	76. IF SLURRY COLOR OF STEP 67 WAS 4+ OR BELOW, RUN IN FROM SCALE TANK 363 OR 364 M T ℄		416	
	NOTE: IF SLURRY COLOR OF STEP 67 WAS REDDER THAN 4+ USE 162 LBS. N-416 AND PRESS BATCH AS G-550-D (2453 LB. EST.).			
	77. FLOOD TO 85".			
	78. STIR 5 MINUTES.			
	79. PRESS WITH AGITATION.			

TIME START ____ TIME FIN ____ OPTR ____

" " " " "

" " " " "

CODE	N-416	GOAL YIELD
(B) G-550-D	162	2453
(B) G-551-D	289	2580

5 HOUR WATERS					
DRAW TO	FLOOD TO	HOUR	DATE	OPTR	REMARKS
X	85"				PRESS WITH AGITATION.
X	85"				FLOOD.
	X				TREAT.
	85"				
	85"				
X	85"				

DUP050067386

G-550-D (B)

STANDARD FORMULA NOTES

This formula replaces G-550-D (A) and was developed during a program designed to find ways of increasing the strength of our G-550-D line of Chrome Greens. Existing "A" processes yield products which are weaker than the competitive greens such as the Velo and Velvet line of Imperial as well as such products as Reichhold's 3005 and Calco's 10-6100. The previous non-fluoride type G-550-D has been recoded G-690-D.

References: DSN-49-31
MN-49-35

1. A stepwise process has been written.

2. A decrease in sodium fluoride will result in the production of weaker Shading Yellow which consumes less iron blue to reach a given masstone depth and will give weaker tints.

   The tinctorial effects will depend upon the extent of the reduction in quantity of fluoride. Large reductions will produce bluer masstone and bluer tint greens. The converse of this is also applicable up to a given maximum amount of sodium fluoride. Above this quantity excessively dark, yellow and dull masstone greens result if the maximum amount permissible for a given process has been exceeded. This has not been determined in the plant but in the laboratory +8.5 lbs./165.5 $Fe(NO_3)_2$ was an excessive amount.

3. Attempts to reduce the increased blue requirements of this type Shading Yellow, by such factors as an increase in sodium sulfide, are successful. However, the masstones are somewhat duller, and the strength advantage will fall off proportionately to the decreased blue requirements.

4. Such factors as increased chromate content, higher initial sodium carbonate (white base) produce similar effects to the use of sodium fluoride, but are not fully equivalent.

5. The process has been written with a stipulated amount of sodium carbonate (N-3) for steps 2 and 45. Plant history should be accumulated as to the desirability of continuing this practice instead of adjusting the pH to a given range (4.95 - 5.05) before addition of the N-366. This pH adjustment step was thought necessary because of variable N-3 requirements observed during the standardization program. This adjustment procedure was considered undesirable by the Quality Control Group. Laboratory results indicate that a variable pH at the point of addition of N-366 is undesirable since a lower pH produces a darker masstone green than that resulting from higher pH at that point.

6. No color values for yellow slurries were obtained during the development program. At the suggestion of the Quality Control Group, the standard formula includes a recording of this information (Step 67) for future plant use as a possible control point.

   In addition, Quality Control has assigned a maximum value of 4+ to this point. All shading yellow with color readings above this value will be converted into G-550-D (see Step 76). As plant experience is obtained on G-550-D and G-551-D, this value will be adjusted accordingly.

7. This process, with an adjustment of blue liquor to 289 lbs., was utilized in manufacturing a proposed G-551-D standard (G-551-D NS, lot 90596). The mix of five plant batches was rejected by the Sales Division, but a blend of three of the five batches gave an acceptable product. It is strongly recommended that in the event of future plant production of this code, further attempts be made to manufacture the struck G-551-D from this process.

8. General notes pertinent to the Y-493-D (A) and G-550-D (A) processes are applicable to the present process.

GOAL YIELD	G-550-D (B) #	(B)G-551-D #
Yellow	2291	2291
Blue	162	289
Total Wt.	2453	2580
% Yellow	93.40	88.80
% Blue Complex	6.60	11.20

CALCULATED COMPOSITION	%	%
$PbCrO_4$	76.76	72.99
Other Pb Compounds	12.07	11.47
" Inorg. "	3.43	3.26
Organic "	.41	.39
Moisture	.73	.69
*Iron Blue Complex	6.60	11.20
Blue Content by KCD-52	5.84	10.37

*CALCULATED COMPOSITION OF IRON BLUE COMPLEX

	% Comp.	G-550-D(B)	(B)G-551-D
Anhydrous Ferrocyanides	91.8%	6.06	10.28
Organic Agents	3.2	.21	.36
Moisture	5.0	.33	.56
	100.0%	6.60	11.20

Notebook Reference: 1096-56.

Signed J. JACKSON - 8/20/49

Approved H. ARNOUL - 8/20/49

JJ:CC

U/S. Pat. 2,139,753

Cost Group - 3

CODE: _____ K# (B) Y-561-D

GOAL: 2281# SIZE: 7 Mol.

DIAZO VAT: _____

COUPLING VAT: _____

STRIKE VAT: 260, 261, 262, 267

(3032) STD. HOURS _____. NON-BLEEDING

APPROVED BY:
JJ: 8-10-49
HA: 8-16-49
CHO: 8-19-49
JES: 10-19-49

VAT	NAME: SHADING YELLOW — INSTRUCTIONS	USE LBS.	N. CODE	ACCT. LBS.
PREP 1.	1. WEIGH AND HOLD AT VAT 365 FOR STEP 15	280	3	280
	2. WEIGH AND HOLD AT VAT 365 FOR STEP 30	40	3	40
	3. WEIGH AND HOLD AT SCALE TANK 361 FOR STEP 20	90	518	90
	4. WEIGH AND HOLD AT SCALE TANK 361 FOR STEP 21	91	108	91
	5. WEIGH IN WOODEN KEG AND HOLD FOR STEP 39	28	26	28
	6. WEIGH AND HOLD AT VAT 366 FOR STEP 35	7	368	7
	7. WEIGH, DISSOLVE IN 10 GALLONS WATER IN KEG, AND HOLD AT STRIKE VAT FOR STEP 46	28	15	28
S.V. 2.	8. RUN 30-40" (+ 3000G.) WATER INTO STRIKE VAT.			
	9. RUN IN FROM SCALE TANK 360			
	FE M T %		41	2317
	FE M T %		41	
	10. WHEN USING VATS 261, 262, OR 267, SET AGITATOR AT 20 RPM.			
	11. ADJUST TO 65" (565SG.) AT 73-77°F.			
	12. ADJUST TO PH 4.6-4.8 WITH N-7 OR N-33. RECORD: PH _____.			
365 3.	13. RUN 35-45" (+ 176G.) WATER INTO VAT 365.			
	14. TURN ON AGITATOR AND STEAM.			
	15. DUMP IN N-3 WEIGHED IN STEP 1.			
	16. ADJUST TO 55" (242G.) AT 80-120°F.			
	17. STIR TO DISSOLVE.			
361 4.	18. RUN 18" (299G.) WATER INTO SCALE TANK 361.			
	19. TURN ON AGITATOR AND STEAM.			
	20. DUMP IN N-518 WEIGHED IN STEP 3.			
	21. DUMP IN N-108 WEIGHED IN STEP 4.			
	22. STIR 10 MINUTES OR LONGER TO COMPLETELY DISSOLVE.			
	23. RUN IN M T %		8	868
	24. ADJUST TO 29" (479G.) AT 74-76°F.			
	25. ADJUST TO PH 4.6-4.8 WITH N-7 OR N-33. RECORD: PH _____. MAINTAIN AGITATION IN TANK 361 UNTIL END OF STEP 38.			
S.V. 5.	26. RUN VAT 365 INTO STRIKE VAT IN 4-5 MINUTES.			
	27. STIR EXACTLY 14-16 MINUTES.			
365 6.	28. RUN 10-15" (+ 55G.) WATER INTO VAT 365.			
	29. TURN ON AGITATOR AND STEAM.			
	30. DUMP IN N-3 WEIGHED IN STEP 2.			
	31. ADJUST TO 25" (110G.) AT 80-120°F.			
	32. STIR TO DISSOLVE.			
366 7.	33. RUN 10-15" (+ 20G.) WATER INTO VAT 366.			
	34. TURN ON STEAM.			
	35. DUMP IN N-368 WEIGHED IN STEP 6.			
	36. ADJUST TO 25" (40G.) AT 80-120°F.			
	37. STIR TO DISSOLVE.			

CONTINUED ON PAGE 2.

VAT	PAGE: 3 CODE: (B)Y-561-D LBS: 2281 INSTRUCTIONS	USE LBS.	N-CODE	ACCT. LBS.
	70. TEST AND RECORD: pH _____, NORMAL 5.0-5.2			
	71. IF NECESSARY, ADJUST TO pH 5.0-5.2 WITH N-3 OR N-33. RECORD: pH _____			
	72. FLOOD TO 85"			
	73. STIR 5 MINUTES.			
	74. PRESS WITHOUT AGITATION.			
	TIME START _____ TIME FIN _____ OPTR _____			
	" " " " "			
	" " " " "			

DRAW TO	FLOOD TO	HOUR	DATE	OPTR.	REMARKS
	5 HOUR WATERS				
X	85"				
	85"				
	85"				
	X				TREAT.
X	85"				FLOOD.
X	X				PRESS WITH AGITATION.

DUP050067390

VAT	PAGE: 2 CODE:(B) Y-561-D LBS: 2281# INSTRUCTIONS	USE LBS.	N-CODE	ACCT. LBS.
S.V. 8.	38. WHEN STEP 27 STIRRING COMPLETED, STRIKE SCALE TANK 361 AT 74-76°F INTO STRIKE VAT AT 74-76°F ON THE SURFACE IN 19-21 MINUTES. RECORD: TOTAL MINUTES_____.			
Misc. 9.	39. WEIGH AND ADD TO N-26 WEIGHED IN STEP 5	2	28	1
	40. DISSOLVE N-26 TREATED IN STEP 39 WITH 10 GALLONS WATER AND HOLD AT STRIKE VAT FOR STEP 42.			
S.V. 10.	41. WHEN STEP 38 STRIKE COMPLETED, WASH IN SCALE TANK 361 IMMEDIATELY.			
	42. POUR IN N-26 PREPARED IN STEP 40 AT ONCE.			
	43. RUN VAT 365 INTO STRIKE VAT AT ONCE IN 2-3 MINUTES.			
	44. SAMPLE FOR pH AND HOLD SAMPLE FOR STEP 47.			
	45. RUN VAT 366 INTO STRIKE VAT AT ONCE IN 2-3 MINUTES.			
	46. POUR IN N-15 PREPARED IN STEP 7 AT ONCE.			
	47. STIR 10 MINUTES. WHILE STIRRING, TEST AND RECORD STEP 44: pH_____, NORMAL 4.6-5.0			
	48. WHEN STEP 47 COMPLETED, TEST AND RECORD: pH_____. NORMAL 4.9-5.1			
	49. IF NECESSARY, ADJUST TO pH 4.9-5.1 WITH N-3 OR N-33. RECORD: pH_____.			
	50. TEST AND RECORD: SLURRY COLOR_____.			
	51. FLOOD TO 85" (7395G.).			
	52. DRAW 3 WATERS AT 5 HOUR INTERVALS.			
	53. WHEN USING VATS, 261, 262, OR 267, SET AGITATOR AT 12 RPM.			
	DO STEPS 54-64 ABOUT 1/2 HOUR BEFORE DRAWING LAST WATER.			
365 11.	54. RUN 25-30" (± 121G.) WATER INTO VAT 365.			
	55. TURN ON AGITATOR AND STEAM.			
	56. WEIGH AND DUMP IN	140	15	140
	57. ADJUST TO 40" (176G.) AT 80-120°F.			
	58. STIR TO DISSOLVE.			
366 12.	59. RUN 10-15" (20G.) WATER INTO VAT 366.			
	60. TURN ON STEAM.			
	61. WEIGH AND DUMP IN	30	3	30
	62. ADJUST TO 20" (32G.) AT 80-120°F.			
	63. STIR TO DISSOLVE.			
Misc. 13.	64. WEIGH N-26 AND N-28 INTO KEG, DISSOLVE WITH 10 GALLONS WATER, AND HOLD AT STRIKE VAT FOR STEP 67.	14	26	14
		2	28	1
S.V. 14	65. AFTER 3RD WATER DRAWN, TEST AND RECORD: SLURRY COLOR_____.			
	66. RUN VAT 365 INTO STRIKE VAT IN 3-4 MINUTES.			
	67. POUR IN N-26 PREPARED IN STEP 64 AT ONCE.			
	68. RUN VAT 366 INTO STRIKE VAT AT ONCE IN 2-3 MINUTES.			
	69. STIR 5 MINUTES.			
	CONTINUED ON PAGE 3.			

(B)Y-561-D

FORMULA NOTES

This formula was developed for use in Muench mixing of the proposed strong fluoride type C-550-D line of chrome greens. The existing "A" process (non-fluoride type) yields products which when formulated into greens are weaker than competitive products such as the Valo and Velvet line of Imperial. This material will be submitted to F & F for possible future replacement of Y-493-D(A) or Y-561-D(A).

References: DSK-49-31
KN-49-35

1. A stepwise process has been written.

2. A decrease in sodium fluoride will result in the production of weaker Shading Yellow which consumes less iron blue to reach a given masstone depth and will give weaker tints.

   The tinctorial effects will depend upon the extent of the reduction in quantity of fluoride. Large reductions will produce bluer masstone and bluer tint greens. The converse of this is also applicable up to a given maximum amount of sodium fluoride. Above this quantity excessively dark, yellow and dull masstone greens result if the maximum amount permissible for a given process has been exceeded. This has not been determined in the plant but in the laboratory +8.5 lbs./165.5 $Pb(IO_3)_2$ was an excessive amount.

3. Attempts to reduce the increase blue requirements of this type Shading Yellow, by such factors as an increase in sodium sulfide, are successful. However, the masstones are somewhat duller, and the strength advantage will fall off proportionately to the decreased blue requirements.

4. Such factors as increased chromate content, higher initial sodium carbonate (white base) produce similar effects to the use of sodium fluoride, but are not fully equivalent.

5. The process has been written with a stipulated amount of sodium carbonate (N-3) for steps 2 and 45. Plant history should be accumulated as to the desirability of continuing this practice instead of adjusting the pH to a given range (4.95 - 5.05) before addition of the N-368. This pH adjustment step was thought necessary because of variable N-3 requirements observed during the standardization program. This adjustment procedure was considered undesirable by the Quality Control Group. Laboratory results indicate that a variable pH at the point of addition of N-368 is undesirable since a lower pH produces a darker masstone green than that resulting from higher pH at that point.

6. No color values for yellow slurries were obtained during the development studies. At the suggestion of the Quality Control Group, the standard formula includes a recording of this information (Step 67) for future plant use as a possible control point.

7. In conformance with the current practice in (A) Y-561-D the use of para soap has been discontinued, in order to decrease fire hazard.

8. General notes applicable to X-493-D (A) and G-550-D (A) processes are pertinent.

CALCULATED COMPOSITION	#	%
$PbCrO_4$	1883	82.55
Other Pb Compounds	296	12.98
Inorganic "	84	3.68
Moisture	18	.79
	2281	100.00%

GOAL YIELD

2281#

Notebook Reference: 1096-56.

Signed by J. JACKSON - 8/20/49

Approved by H. ARNOUL - 8/20/49

JJ:CC

Cost Group - 3

Code: (C)Y-572-D K/
Goal: 1258# Size:
Diazo Vat:
Coupling Vat:
Strike Vat: 260, 261, 262, 267

Approved By:

(2700) NON-BLEEDING

VAT	NAME: INSTRUCTIONS	USE LBS.	N-CODE	ACCT. LBS
PREP 1	1. Weigh, dissolve together in 10 gallons water at 120-200°F in drum, and hold at strike vat for step 18	(12	52	12
		(8	32	8
350 2	2. Pump into scale tank 350 M T Ratio	%	64	892
	M T Ratio	%	64	
		%	262	
		%	262	
MISC. 3	3. While pumping step 2, weigh into wooden barrel and hold at strike vat for step 24			
	M T Ratio	%	64	12
		%	262	
S.V. 4	4. Run 4-6" (+435G.) water into strike vat.			
	5. Run scale tank 350 into strike vat.			
	6. Adjust total acetic acid content to 168# at 100%.			
	M	%	30	
	7. Set agitator at 20 RPM.			
	8. Weigh in pails and pour in M	%	33	120
MISC. 5	9. Weigh in pail and hold at strike vat for step 17			
	M	%	33	108
S.V. 6	10. Adjust strike vat to 63" (5620G.) at 78-82°F.			
	11. Test and record: pH , normal 6.2 - 6.5.			
361 7	12. Run into scale tank 361 M T	%	8	290
	13. Run in M T	%	10	258
	14. Adjust to 15" (256G.) at 78-82°F.			
	15. Test and record: pH , adjust to pH 6.0 - 6.5 with N-33 or N-7.			
S.V. 8	16. Strike scale tank 361 at 78-82°F into strike vat at 78-82°F on the surface in 14-16 minutes.			
	17. Pour in immediately N-33 weighed in step 9.			
	18. Pour in immediately N-52 N-32 prepared in step 1.			
	19. Stir 5 minutes.			
	20. Test and record: pH , normal 5.1 - 5.3.			
	21. Test and record: Back-water , must be - chrome.			
	22. Flood to 85" (7580G.).			
	23. Draw 2 waters at 5 hour intervals.			
	24. After last water pour in N-64 weighed in step 3.			
	25. Flood to 85" (7580G.).			
	26. Press without agitation.			

(C) Y-572-D

FORMULA NOTES

This formula does not replace any previous formula, and is very similar to the (B)Y-572-D formula.

This process is the outgrowth of a Sick List study on the G-604-D line, the object of which was to obtain stronger greens. Material of this type was found useful in attempts to match Imperial's A-4464 green. The product was never standardized, because the request for the match was withdrawn by Sales.

References: DSN 49-31
KN-49-35

1. The process has been established on a stepwise basis.

2. A decrease in initial nitric acid (N-33) followed by a simultaneous increase in second portion of N-33 results in the production of a stronger, redder masstone, and tint, shading yellow. This yellow consumes a higher percentage of iron blue to reach a given masstone depth green, than does standard, and is therefore, correspondingly stronger in tint. Strength increases of the order of five percent were obtained in this fashion.

3. All notes applicable to the shading yellow portions of the (A) Y-572-D process or G-604-D process are pertinent to this process.

The following calculated composition and estimated yield apply:

CALCULATED COMPOSITION			GOAL YIELD
$PbCrO_4$	1189#	94.5%	1258# anhydrous
$PbSO_4$	14	1.1	
PbO	16	1.3	N.B. 951-19.
Organic Lead Salts	39.0	3.1	
	1258 #	100.0%	

Signed J. JACKSON - 8/10/49

Approved H. ARNOUL - 8/16/49

JJ:CC