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PARLIN LABORATORY REPORT

SUBJECT: IMPROVEMENT OF CHROMIUM TETRAHYDROXIDE GREEN
"DUCCO" ENAMEL.

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**SUBJECT: IMPROVEMENT OF CHROMIUM TETRAHYDROXIDE GREEN
"DUCC" ENAMEL.**

I. INTRODUCTION

Due to the increased demand for more transparent and more iridescent automotive "Duco" finishes, such as 213-33039-M Royal Maroon, the laboratory has attempted to develop other colors with similar transparency. The purpose of the following investigation was to disperse chromium tetrahydroxide green pigment (W-701) in such a manner as to obtain a more desirable and more transparent color than that produced by the ball mill process of dispersion in current use by the plant.

This report covers experimental work done by the laboratory on improved dispersion methods for chromium tetrahydroxide green but does not include durability information on the new enamels developed as a result of these investigations.

II. SUMMARY

(1) Chromium tetrahydroxide green water wet pulp dispersed in nitrocellulose by the pulp process produced an enamel far superior in transparency and color depth to the ball mill enamel, and possessing less than half the hiding power of the latter.

(2) Dry W-701 Chromium Tetrahydroxide pigment which is normally dispersed by the plant in a ball mill, when made into a water slurry pulp and subsequently dispersed by the pulp process, resulted in a deep transparent green enamel closely approximating that obtained from commercially prepared pulp.

(3) Dry chromium tetrahydroxide pigment added directly to water wet nitrocellulose and carried through the pulp process resulted in a green enamel very close in transparency to the pulp dispersed enamel but slightly milkier in color.

(4) Chromium tetrahydroxide enamel in which the pigment was dispersed in clear base in a W. & P. mixer, while somewhat darker in color and lower in hiding than the ball mill enamel, was considerably inferior to the pulp dispersions, both in transparency and in depth of color.

(5) In view of the above results, it seems probable that the water which is present during pulp process dispersion plays a major part in the production of the improved dispersion and the consequent transparency which is characteristic of pulp process chromium tetrahydroxide green enamels.

(6) Although much durability data have been accumulated by the laboratory on ball mill chromium tetrahydroxide green enamels, it is felt that additional exposure information must now be obtained on the high transparency enamel prepared by the pulp process. The lower hiding power enamel may conceivably fail to equal the ball mill dispersion in resistance to color change and film deterioration. In order to check this possibility, a complete exposure program is now underway in Florida, the results of which will be discussed in a subsequent report. If these durability tests prove satisfactory, it will be possible to substitute the pulp process chromium tetrahydroxide enamel in production of desirable green solid and metallic "Duco" colors. This substitution will result in a considerable saving over the cost of present transparent metallic formulations calling for a more expensive green pigment.

III. EXPERIMENTAL

(1) W-701 Water Wet Pulp Dispersion

A sample of water wet chromium tetrahydroxide green pulp (T.S. 30.4%) obtained from Imperial Color Works was successfully made up into a WX stock using the following modification of WX-0952 Milori Blue stock formula.

WX-1004P1

PX-7800	48.50%
Green Pulp (dry)	18.50
H-120	9.75
H-111	10.30
Green Pulp	8.00
H-111	4.95
	<u>100.00%</u>

After the above had been sheeted out on the rolls and dried forty-eight hours, it was made into the following formula:

<u>1004P1</u>		<u>Solids</u>	<u>Ratio</u>
H-62	20.70%	PX	16.5%
H-51	7.50	RL-3032	6.4
WX-1004P1	34.00	G-678	0.3
H-62	12.36	Pigment	9.0
H-12	7.65	H-111	5.19
H-1	3.06	H-116	3.32
H-51	4.59		40.71%
RL-3032	9.14		
H-1	0.70		
G-678	0.30		
	100.00%		

In comparison with ball mill 253-0751, the experimental formula is practically identical, possessing 0.5% more PX and 0.5% more plasticizer, or 1.0% more total solids.

(2) Dispersion of Laboratory Made Chromium Tetrahydroxide Green Pulp

A sample of Krebs dry W-701 chromium tetrahydroxide pigment, ordinarily dispersed by the plant in ball mills, was made up into a water wet slurry of 28.7% solids content by mixing water and pigment at concentrations suitable for formation of a pulp-like mixture. The resulting slurry was dispersed exactly as was the above pulp, and produced a green enamel of characteristic transparency and high gloss.

(3) Dispersion of Dry Chromium Tetrahydroxide by the Pulp Process

Dry chromium tetrahydroxide green pigment was successfully dispersed in water wet nitrocellulose utilizing the same formula which worked satisfactorily for the pulp. This time, however, the total amounts of dry pigment and plasticizer were added at one time, as is indicated in the following formula:

<u>WX-1004P4</u>	
PX-7800 (dry)	48.50%
Pigment (dry)	26.50
H-120	9.75
H-111	15.25
	100.00%

Mix 2 hour
Grind 3/4 hr

The water present in the PX was removed as steam, instead of being poured off, as it was in the case of the pulp samples. After two days' drying, the WX- stock was made up into formula No. 1004P1. The final enamel possessed the characteristic transparency of pulp enamel but was slightly lighter in color.

(4) WX Paste Dispersion in Clear Base (1004F7)

After several attempts to obtain a WX paste which could be adequately kneaded for a period of several hours, the following formula was found to be the most satisfactory for the particular lot of pigment utilized.

W-701	9.00%
B-303	5.86 Grind 3 hrs. at
	stiff consistency
B-303	8.60 Take out
B-303	42.34
H-111	4.80
H-116	3.20
RL-3032	9.14
H-12	4.30
H-80	1.00
H-35	3.60
H-62	7.16
G-678	0.30
H-1	0.70
	100.00%

At other ratios of W-701/B-303 the paste either failed to attain a stiff grinding consistency or broke up into hard lumps after brief grinding. The constituents and their proportions in the above formula are identical with ball mill 253-0751. A laboratory W. & P. mixer of half gallon capacity was used in all cases where a grind of this type was employed.

(5) A consideration of the preceding evidence suggests the probability that the presence of water during dispersion is in some manner responsible for the depth of color and the transparency of pulp process chromium tetrahydroxide green enamel. Only those processes where water was present during the actual dispersing operation produced the iridescence and gloss which was desired. It is probable that, in the dry state, many particles of the green pigment are bound together as agglomerates by crystals of water-soluble salts which have been adsorbed to the surfaces of the former during the process of manufacture. During pulp process dispersion in the W. & P. mixer, water which may be present either in the water wet pulp or nitrocellulose will dissolve these salts and break up the agglomerates. Even though dry pigment may replace water wet pulp, the nitrocellulose alone apparently possesses sufficient water to dissolve that small fraction of water soluble salts which are normally present. As a result of this action, there is improved dispersion of the pigment particles in the nitrocellulose plasticizer medium.

HDP:DMZ
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<u>Experimental Number</u>	<u>Description</u>	<u>Hiding Power</u>	<u>Color as Compared to 253-0751 Ball Mill Control</u>	<u>Gloss as Compared to 253-0751 Ball Mill Control</u>
-	253-0751 Control	160	-	-
1004P1	Imperial Pulp Lot 12337	65-75	Darker	Higher
1007P1	" " " 30618 (dark)	58	"	"
1007P2	" " " 30618 (light)	62	"	"
1004P2	W-701 Lab. made slurry	62	"	"
1004P4	Dry W-701 in Pulp Process (9% pigment conc.)	67	"	"
1004P9	Dry W-701 in Pulp Process (15% pigment conc.)	98	"	"
1004P7	W-701 dispersed in B-303 as WX paste	98	"	Lower

HDP:DMZ
5/22/40