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Sales Development Report

PROGRESS REPORT ON CUSTOM COLOR UNIVERSAL COLORANTS

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APPENDIX

ABBREVIATIONS USED THROUGHOUT REPORT

G-12	Soya lecithin
H-156	Dehydrated castor oil
H-200	Aromatic hydrocarbon
H-481	Non-ionic surfactant (HLB = 10-13) Polyoxyethylene (5) sorbitan mono-oleate (Tween 81)
H-541	Non-ionic surfactant (HLB = 10-13) Polyoxyethylene ester of mixed fatty and rosin acids. (Renex 20)
H-609	Non-ionic surfactant (HLB = 13+) Alkyl aryl polyether alcohol. (Triton X-100)
H-632	Odorless mineral spirits
H-695	Anionic surfactant (HLB = 10-13) Di-Octyl Sodium Sulfosuccinate. (Triton GR-5)
H-73	A fine surface-treated calcium carbonate.
W-362	A fine precipitated red iron oxide pigment.
W-621	"Dalar"® Yellow YT-717-D-azo pigment dye-stuff
W-679	C.P. Chrome Yellow Light Y-433-D
W-895	95% red iron oxide pigment
W-325	Alizarine Type Maroon Lake RP-293-D
DCO	Dehydrated Castor Oil
HLB	Hydrophile/lipophile balance = water/oil miscibility. High Values = Good water misc.
P.D.W.	Paint Distribution Warehouse
"47 P"	"47 Process"
3 RL	3 Roll Mill
RC-601	10% dimer acids/65% soya acids/P.E. alkyd resin

*-Registered Du Pont Trademark

PROGRESS REPORT ON CUSTOM COLOR UNIVERSAL COLORANTS

INTRODUCTION:

The Custom Color System for Interior Trade Sales paints permit dealers to mix matching colors in "Flow-Kote"*, "Lucite"*, Gloss Enamel, Semi-Gloss Enamel, and Flat Alkyd qualities to about 1000 colors now in the system. This is accomplished by dispensing a definite volume of colorant (632-Line Custom Color Universal Colorant) from the Color Master Mixing Machine or tubes into the Custom Color white bases. This permits the dealers to supply a variety of qualities and colors with a minimum amount of inventory.

The present type 632-Line Custom Color Universal Colorants have been sold since 1958 and although they have been generally satisfactory, certain deficiencies either known initially or which developed as we sold the colorants, required correction.

The purpose of this report is to record the work done during the past year to overcome some of the deficiencies of the line.

OBJECTIVES:

Although the overall objective has been to improve the compatibility of the 632-Line so that its use could be extended to other products, specific objectives requiring attention were as follows:

1. To improve the alkali resistance of #11 Bright Red Violet.
2. To improve the settling properties of #21 Venetian Red Oxide.
3. Develop lead-free colorants to replace #12 Orange Vermillion, #13 Chrome Orange, #14 Chrome Yellow Light, and #15 Bright Chartruese.
4. To develop a bright purple colorant for interior use.

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SUMMARY AND CONCLUSIONS:

1. An improved settling resistant #21 Colorant has been developed. A 45 day field test in nine P.D.W.'s resulted in considerably improved Color Master Mixing Machine performance.
2. Lead-free #14 and #15 Colorants have been developed; neither colorant has been field tested. One color step is lost with the proposed colorants.
3. A lead-free #12 Colorant has been developed with good cross quality color uniformity and a minimum of brush sensitivity. Scrubbability and stability tests have not been run.
4. A proposed bright purple colorant showed good initial cross quality color uniformity and brush sensitivity but upon aging lost compatibility with "Flow Kote" and "Lucite" bases.
5. A proposed #11 Colorant resulted in good alkali resistance and fair brush sensitivity but upon aging lost compatibility with "Flow Kote" and "Lucite" bases.
6. Practically no work was done on the overall long term objective of improving the compatibility of the 632-Line colorants to expand its use.

ACTION TAKEN OR PROPOSED:

1. Release Letter #1946 has been written for national release of #21 Colorant. Plant batch stabilities will continue to be followed.
2. A Release Letter will be written for field testing of #14 and #15 Colorants.
3. Scrubbability tests, colorant and letdown stability, and Color Master Mixing Machine performance will be run with the lead-free #12 Colorant.
4. Laboratory work will continue to develop an alkali-resistant #11 Colorant with little or no brush sensitivity and good compatibility with latex bases upon aging.

5. A lead-free #13 Colorant will be formulated from the lead-free #12 and #14 Colorants.

6. No further work will be done with the bright purple colorant until a management decision is made concerning its desirability at the present time.

PATENT SITUATION:

No further patent action is currently contemplated with the color bases described in this report. U. S. Patent 2,996,397, assigned to Du Pont, embraces the Custom Color Universal Colorants having a vehicle consisting essentially of dehydrated castor oil and soya lecithin in combination with a non-ionic polyethanoxylethanol derivative surfactant. Several of the newer colorant formulations are embraced by pending Patent Application FFD-1163, filed June 29, 1961, for which there has been no Office Action from the Patent Office to date. This invention embraces colorants based on synergistic combinations of certain non-ionic surfactants with an anionic soluble dialkyl sulfosuccinate salt and an oleaginous vehicle consisting essentially of dehydrated castor oil.

PUBLICATIONS PROPOSED:

No publications are proposed at this time.

ACKNOWLEDGEMENTS:

The author wishes to express his gratitude to F. T. Stevenson, Jr., and J. J. Kilkeary for their valuable information in this area.

DISCUSSION:

The Custom Color System permits dealers to mix about 1000 matching colors in "Flow Kote", "Lucite", Semi-Gloss Enamel, Gloss Enamel, and Flat Enamel qualities by dispensing 632-Line Universal Colorants from the Color Master Mixing Machine or tubes into white bases.

The original Custom Color Tube System was established in 1954-1955.¹⁻³ The colorants involved were essentially pigments dispersed in RC-601, H-632, and surfactants.⁷ Since these colorants were not stable in "Flow Kote" bases, new colorants were developed in 1956-1958 on a H-156, G-12, H-632 and/or H-202, surfactant basis^{4,8}. In 1960 the Custom Color white bases were revised to improve cross quality color uniformity.⁵ The Color Master Mixing Machine was introduced during 1959-1960 as a more accurate method of dispensing the Universal Colorants⁶.

Since that time, the following deficiencies have been discovered in the Universal Colorants:

1. #21 Colorant (Venetian Red Iron Oxide) settles badly and is too viscous for good Color Master Mixing Machine dispensing.
2. #11 Colorant (Bright Red Violet) has poor alkali resistance.
3. #12 (Orange Vermillion), #13 (Chrome Orange), #14 (Chrome Yellow Light), and #15 (Bright Chartreuse) colorants are prepared from lead-containing pigments. Removal of lead is desirable to avoid precautionary labeling under the Federal Hazardous Substances Labeling Act and to meet requirements of New York City and Baltimore.
4. The system does not contain a bright purple colorant.

EXPERIMENTAL DETAILS:

#21 Venetian Red Oxide

632-W-24456 Venetian Red Iron Oxide has been developed with settling and Color Master Mixing Machine dispensability improvement over 631-788 (#21 Colorant) although it is slightly more brush sensitive and shows considerable vehicle separation. However, the brush sensitivity is at an acceptable level and the vehicle separation is readily reincorporated in the Color Master Mixing Machine. The improved properties were achieved by replacing a calcined red iron oxide by a precipitated red iron oxide and by adding an

anionic surfactant (Triton GR-5) to the Triton X-100/Soya Lecithin system. Fourteen months stability samples show no loss of compatibility in "Flow Kote" and "Lucite" bases. A comparison of these two coslorants follows:

#21 Venetian Red Oxide:

<u>Raw</u> <u>Materials</u>	<u>Current</u> <u>Formula</u>	<u>New</u> <u>Formula</u>	<u>Reason for Change</u>
H-156	8.5	9.0	
H-609	7.5	7.8	
H-695	-	13.1	Synergistic effect needed.
G-12	9.0	7.2	
H-200	19.1	20.4	
W-73	12.9	-	Extender not needed to prevent flocculation.
W-895	43.0	-	
W-362	-	42.5	Produces less settling
	100.0	100.0	
Mill	3 RL	"47 Process"	
Gallon Wt.	13.46	11.93	
Raw Material			
Cost/Gal.	\$2.53	\$2.50	
Milling Cost/			
Gal.	.83	.39	
Settling	V. Poor	Good	
Separation	Considerable	Considerable	
Ease of Re-			
incorporation	V. Diff.	Good	
Scrubbability	Satisfactory	Satisfactory	
Gloss Reduc-			
tion in Gloss			
Enamel	"	"	
Gloss Increase			
in Flat Enamel	"	"	
Brush Sensiti-			
vity	None	V. Slight	

Raw Materials	Current Formula	New Formula	Reason for Changes
Cross Quality			
Color Uniformity.	Good	Good	
Aging on Color			
Master Mixing Machine	Poor	Satisfactory	
Color Master Mixing Machine Dispensing Ease	Poor	Good	

#14 Chrome Yellow Light

632-W-18395 was developed as a lead-free #14 Colorant with "Dalamar" Yellow replacing chrome yellow and by replacing Tween 81 and Soya Lecithin with Triton GR-5 and Renex 20 surfactants.¹⁰ Although brush sensitivity is slightly greater than with the regular #14 Colorant (632-776) it is at an acceptable level and does not become worse with aging. One color step is lost in this substitution due to the high oil requirements of the "Dalamar" Yellow.

A comparison of the present colorant and the proposed colorant follows:

Raw Materials	Current Formula	Proposed Formula	Reason for Change
H-156	4.7	25.0	Better wetting of W-621
H-481	7.9	-	" " " "
H-609	1.1	5.0	" " " "
G-12	3.0	-	" " " "
H-695	-	5.0	" " " "
H-541	-	5.0	Lower consistency for "47 P"
H-200	6.8	-	
H-632	3.2	45.0	Reduce flocculation and also H-200 not required for new surfactant system.
W-679	73.3	-	
W-621	-	15.0	Lead-free
	100.0	100.0	

Raw Materials	Current Formula	Proposed Formula	Reason for Change
Mill	3 RL	"47 Process"	
Gal. Wt.	19.57	7.45	
Cost (Raw Mat.) per gal.	\$6.41	\$5.97	
Milling Cost per gal.	\$1.21	.24	
Color	Red Toned Yellow	Clean-Green Yellow	
Color Strength	Control	One-Half of control	
Cross Quality	Good	Good	
Color Uniformity			
Brush Sensitivity	None	Slight	
Stability on Color			
Master Mixing Machine	Satisfactory	Satisfactory	
Colorant & Let- down Stability	Satisfactory	Satisfactory	
Settling	Fair	Good	
Gloss Reduction in Gloss Enamel	Satisfactory	Satisfactory	
Gloss Increase in Flat Enamel	Satisfactory	Satisfactory	
Scrubbability	Satisfactory	Satisfactory	

#15 Bright Chartreuse

The proposed #15 Bright Chartreuse is a blend of approximately 97% "Dalar" Colorant and 3% #16 Colorant and has the same characteristics as the proposed lead-free #14 Colorant.

#12 Orange Vermillion

A lead-free #12 Colorant has been developed using Harmon's Signal Orange dispersed in Renex 20, Triton X-100, Triton GR-5, DCO, and solvents. Brush sensitivity and color development uniformity are satisfactory. Compatability with "Flow Kote" and "Lucite" bases is satisfactory after three months. Scrubbability and water sensitivity tests have not been run.

Deep Purple Colorant

A deep purple colorant was developed by dispersing W-325 (a Pigments Department Maroon Lake) in the above vehicle system. Although the initial color development and brush sensitivity were good, after three months aging, the compatibility with "Flow Kote" and "Lucite" bases deteriorated. Since this pigment is too hard to grind by "47 Process" it must be pebble milled or roller milled.

#11 Bright Red Violet

632-W-18382, improved alkali resistant #11 Bright Red Violet Colorant, showed good color development initially with brush sensitivity slightly poorer than 632-773 (the current #11 Colorant). However, upon aging its compatibility with "Flow Kote" and "Lucite" bases is very poor. This colorant is a dispersion of American Cyanamid Naphthol Red 20-7515 in Triton X-100, Triton GR-5, D.C.O., and solvent. Although the Triton X-100 and Triton GR-5 produce a synergistic effect to give excellent cross quality color uniformity at a low surfactant level, they are apparently not stable in the presence of this pigment. The surfactant system will be reviewed using both high and low HLB surfactants to replace medium range HLB surfactants and to determine in general whether a non-ionic or anionic/non-ionic system is more effective for color development and stability.

Misc.

In general, the organic pigments, being hydrophobic, are much more difficult to disperse in a water system than in organics which are hydrophilic. In addition, each organic pigment usually requires its own unique vehicle system.

WTC:dk

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