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Marshall Laboratory
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MEMORANDUM REPORT M-398

CONTINUOUS PROCESS UF vs. RC-718 IN 700 LINE ENAMELS

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Introduction:

Four batches of experimental continuous process UF resins which were prepared in the Parlin Semi-Works continuous set-up were submitted by Miss A. Willard for evaluation in 700 Line enamels vs. RC-718.

Conclusion:

General conclusions were that with one exception no significant differences were found between the performance of the continuous process UF resins and the RC-718 control. The exception was in batches that were green in color due to copper contamination. These batches were definitely poorer in initial color and overbake color in 745-6741 type formulations than the RC-718 control. In other 700 line enamels tested color differences between the green colored batches and RC-718 were detectable but not as great as in the 745-6741 type formulations.

Experimental Detail:

The experimental continuous process UF resins evaluated were PRCR-78980, 78981, 78982 and 78984. RC-718 (663,418) was the control. (See attached chart for resin constants). These resins were evaluated in unshaded laboratory batches of 745-6741, 745-6735, P-707-R-77270 and P-707-R-77270 without CaCO₃ (W73). P-707-R-77270 is a Castor Oil Alkyd (RL-475)/RC-718= 75/25 formulation pigmented with W73/W28=1.5/75 which was developed to improve the moisture resistance of A707-24396 Crosley one-coat enamel.

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The 745-6735 type formulations were applied over 64-925 primer on Bonderite 100. The other enamels were evaluated as one-coat systems direct to Bonderite 100.

Tests run were pencil hardness, Knoop hardness, impact and flexibility, 22° gloss, stain resistance, grease resistance, humidity cabinet, initial color at standard 30' x 280°F bake, and standard bake vs. 30' x 325°F overbake. Color differences were measured by Beckman Spectro-photometric values (TM350E). Exposure Study Series #12448 will be exposed to obtain information on Florida durability and yellowing in the light and dark.

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In all of the formulations tested, no significant differences were found between the experimental resins and RC-718 in any of the tests except initial color and overbake color.

The two batches of continuous process UF resins which were green in color were PRCR-78982 and 78984. Beckman color differences were calculated by the formula $(r^2 + s^2)^{1/2}$.

In 745-0741 type formulas initial color with PRCR 78982 was 3.9 points poorer than the control value of 28.2 and PRCR 78984 was 11.4 points poorer. Overbake color with PRCR 78982 was 11.6 points poorer than the control value of 38.5 and PRCR 78984 was 9.5 points poorer.

In 745-6735 type formulas initial color with PRCR-78982 was 3.1 points lower than the control value of 22.4 PRCR 78984 was 9.3 points poorer. Overbake color with PRCR 78982 was 3.7 points poorer than the control value of 22.7 and PRCR-78984 was 3.3 points poorer.

In the P-707-R-77270 type formulas both with and without CaCO_3 , the green colored experimental resins had no significant effect upon the initial color.

In P-707-R-77270 type formulas overbake color with PRCR 78982 was 3.8 points poorer than the control value of 22.8 and PRCR 78984 was 8.1 points poorer.

In P-707-R-77270 type formulas without CaCO_3 , overbake color with PRCR -78982 was 2.2 points poorer than the control value of 24.5 and PRCR 78984 was 5.1 points poorer.

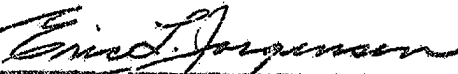
Color values obtained with the other two experimental UF resins (PRCR-78980 and 78981) were essentially equal to those obtained with RC-718.

Based on these results it is concluded that copper contamination of UF resins be avoided for use in white industrial enamels.

Details are recorded in NE-5290, pages 145-154.

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Continuous Process UP vs. RC-718
in 700 line Enamels

SAMPLE	Control RC-718 (663418)	78980	78981	78982	78984
% Solids	59.38	60.05	58.80	60.50	59.38
Viscosity	Z-1+1/3	Z+1/4	Z-2-1/3	Z-1-1/3	Z-1+1/3
% Water Content	3.95	2.60	2.50	2.10	2.60
Color (Parlin)	1.0	1.0	1.0	1.0*	1.0*
Cloud (inches)	0	0	3/4-1**	0	0
Gal. Wgt.	8.58	8.53	8.51	8.53	8.52
Min. Spirit Tol.	1.5	2.04	1.7	2.09	2.08
Acid No.	6.86	6.93	7.11	6.83	8.60

* Green (Copper)

** Increasing on standing.

The control sample is from regular batch production. The other samples were made in the continuous set-up in the Parlin Semi-Works. PRCR-78980 and 78981 are from duplicate runs made with 6.6% xs HCHO and 1.70/1 alcohol/DMU, with 90% water take off in the presence of a hydrocarbon water carrier. PRCR 78982 and 78984 are from duplicate runs made with 11.5% xs HCHO and 1.70/1 alcohol/DMU, with 90% water take off in the absence of hydrocarbon.