CROSS REFERENCE
700 Line General
Refrigerator Finishes
Washing Machine Finishes
Stove Finishes
Alkyd Resin
Urea Formaldehyde Resin
Melamine " "
Competitive Resin

cc: Mr. John Marshall, Wilm. D-761
Mr. J. B. Bullitt, Leb.
Mr. J. W. Iliff, "
Mr. C. R. E. Markle "
Dr. P. Robinson "
Mr. R. L. Selby "
Mr. S. L. Godshalk "
Dr. P. B. Evans "

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MEMORANDUM REPORT NO. M-178

COMPETITIVE RESINS IN 700 LINE

Introduction:

In order to keep abreast with the developments of newer type resins suitable for white baking finishes, an evaluation has been made of seventeen competitive resins. These resins may be classified as non-oxidizing alkyds, oxidizing alkyds, ureas and melamines.

The recommendations of the resin supplier have been used in formulating these resins into our corresponding products.

This report supplements Memorandum Report #M-143, which discusses this same subject.

Conclusions:

The attached chart shows the general type formula used and in a condensed manner, the significant results obtained.

Of the seventeen competitive resins evaluated, only three alkyd resins showed outstanding performance in one or two properties and a suitable balance of properties suitable to improve our 700 Line products. The ureas and melamines showed no improvements over our standard nitrogen resins.

The following alkyd resins have been found to be equal or superior to our standard products as evaluated in 700 Line finishes:

1. Glyptal 4555 is a medium to short oil length alkyd of a castor oil type. This resin showed a definite increase in gloss and a slight deficiency in hardness as compared to standard RL-295. Under our conditions, grind, stain, and other film properties remained practically the same as standard RL-295. The decided increase in gloss may be utilized to the best of the shorter oil length resin

2. Dyal 15737, which is a short straight oil modified alkyd (oil unknown) imparted better adhesion, superior color retention characteristics in respect to overbake and a slight improvement in grease resistance as compared to our standard RC-305. This alkyd exhibited the same balance properties, both in a single coat and a two coat system.

3. Duraplex ND-78, which is a very short hydrogenated cocoanut oil type resin, was evaluated in both our washing machine finish (725-6740) and our heat resistant finish (722-2374). Superior alkali and heat resistance were the outstanding properties exhibited by this resin; however, a general decrease in flexibility, grease, and stain was noted. This resin is not suited for formulation in a one coat system, because of its poor adhesion property.

Proposed Program:

It is recommended that the following competitive resins with outstanding properties be further evaluated for use in our standard products.

1. Glyptal 2555 vs. RL-293 and RL-344 for gloss improvement.

2. Dyal 15737 vs. RC-305 for improvement in adhesion, grease, and color retention in overbake.

3. ND-78 vs. RL-413, RC-306, and RC-305 for alkali and heat resistant superiority.

Discussion:

The competitive alkyd resins were substituted on the equal oil length basis for our corresponding resins in 700 Line enamels, thus varying the UF/alkyd ratio.

The urea and melamine formaldehyde resins were substituted on the solids basis in the finishes recommended by the supplier.

The tests and exposures used in this program are as follows:

A. Long time tests.

1. Florida - 45°S - exposed for 12 mos.

2. Following in the dark - exposed for 2 yrs.

3. Following in the light - exposed for 2 yrs.

4. Short Film Tests.

1. General film properties

2. Humidity cabinet - 30 days

3. Grease - 30 days

4. Stain - 3 days

5. Soap - 4 days

6. Heat - 2 hrs. at 400°F.

The Resinous Products Company states that Uformite F-240, a urea formaldehyde resin, is internally plasticized. A ladder ratio of UF/alkyd in the varying amounts of 25/75, 50/50, and 75/25 was formulated in order to clarify the point made by the resin manufacturers. Increasing the alkyd content gave increasing gloss and, conversely, decreasing the alkyd ratio gave decreasing gloss. In all cases, this UF resin exhibited very poor stain and grease resistance along with definite softening. Uformite F-240 was definitely inferior to our RC-713.

The other resins evaluated did not show as uniform a balance of properties as did the control resins: however, reformulation may produce a better balance of properties. Exposure Series 9671 has been prepared to obtain durability information on the competitive resins.

References:

Further details may be found in Notebooks #3293, 3405 and 3272, Exposure Series 9671.

PHILADELPHIA LABORATORY

E. L. COSTENBADER

ELC:bj

Finish	Resin	Primer Type	Primer Resin	Gloss	Scratch	Impact	Bend	Solvent	Pencil Hardness	Overbake Color	Overbake Gloss	Blister	Scratch	Gloss Retention	Color Retention	Pencil Hardness	[illegible]
		PRIMER		[illegible] FILM PROPERTIES						Overbake		HUMIDITY CABINET (IND.)				GREASE (11 DAYS)	
704-6731	RL-295/RC-718	764-042	RC-114	7-	6+	9+	10	10	HB-	8+	10	8.5	8.0	7.0	10	6B-	5
"	" "	"	Alkyd 7910	7+	8	9+	10	8	B-	--	--	7.5	7.5	7.0	10	6B+	6-
"	Alkyd 15166	"	RC-114	7	8+	9+	10	10	B+	9+	10	8.5	8.0	9.0	10	6B-	5-
"	"	"	Alkyd 7910	7+	8+	9+	10	10	B	--	--	8.0	7.5	9.0	10	6B-	5
"	Duraplex A-27	764-042	RC-115	5+	7+	9+	10	8	B-	6-	8	7.0R	7.0	7.5	10	6B-	5
"	Falkyd G-25	"	"	8-	8	7	9+	9	HB	8+	9	6.0R	8.0	9.0	8	3B-	7
"	Rezyl 99-5	"	"	8-	8-	8+	9+	10	HB-	9	10	8.5	8.0	9.0	10	6B-	5
"	Uformite F-200E	"	"	8-	7+	9+	10	9	B-	8+	10	8.0	9.0	8.0	10	6B-	5
"	Uralite 7A	"	"	8+	7	9+	10	10	2B+	8+	7	8.0	6.0	8.0	10	6B-	5
"	Beetle 227-8	"	"	8-	7	9+	10	8	2B+	8-	9-	8.5	8.5	9.0	10	6B-	5
"	Duraplex A-27/ Uformite F-200E	"	"	9-	7+	9+	9+	8	2B-	7+	8+	8.5	7.5	8.0	10	6B-	5
"	Falkyd G-25/ Uralite 7A	"	"	8-	8	9+	10	9	B-	8-	10	8.0	8.0	9.0	10	6B-	5
726-7661	RL-344/RC-718	----	----	6-	6+	8+	10	10	2B+	6	2	4.0	7.0	7.0	10	6B-	5
"	Rezyl 42-5	----	----	9-	6+	9	10	10	2B+-	6-	9	7.0	4.0	9.0	10	6B-	6
"	Rezyl 92-5	----	----	10-	6	6	8	9	4B-	8-	10	5.5	1.0	3.0	10	6B-	4
724-6735	RC-306/RC-718	64-923	RC-114	8-	9+	7+	9+	10	H	8+	8+	8.5	9.0	8.0	10	3B	8
"	" "	"	Alkyd 7910	8-	9	6-	10	10	H	--	--	7.0R	8.0	9.0	10	2B	8+
"	" "	"	Aroplaz 1333	8-	8+	8+	10	10	F-	--	--	8.0	9.0	9.0	10	4B	7
"	" "	"	" 1120	8-	7	9	3+	10	HB-	--	--	7.5	8.5	9.0	10	5B	7+
"	Aroplaz 956	64-923	RC-114	8	8+	7	8	8	F-	7-	8	8.0	8.5	9.0	4	3B	6+
"	"	"	Alkyd 7910	8	9-	7	9	9	H	--	--	2.0R	8.0	9.0	6	3B	6+
"	"	"	Aroplaz 1333	8+	9	9	9-	9-	F	--	--	8.0	9.0	9.0	6	3D	7-
"	"	"	" 1120	8	7	7	9	9	F+	--	--	8.0	8.0	9.0	6	4B	6
"	Glyptal 2595	64-923	RC-114	4+	8	8+	9+	9+	HB	6-	5+	9.0	8.5	7.0	6	5B	5
707-6741	RC-306/RC-718	----	----	8	7+	8+	9+	10	HB+	8-	10	9.0	7.0	9.0	9	2B	3+
"	Aroplaz 956	----	----	9+	8-	7-	9	8	F+-	7	9-	4.0R	8.0	9.0	4	3B	7
"	Glyptal 2595	----	----	4	6	8+	9+	9	3B+	7+	6	8.5	7.5	7.0	9	6B	7-
[illegible]-2205	RC-325/RC-718	----	----	8+	7	9	9+	10	HB-	8	10	8.0	8.0	9.0	6	4B	8-
"	"	764-042	RC-114	8-	7-	9	9+	10	B+	--	--	7.5	7.0	8.0	8+	4B	7
"	"	"	Alkyd 7910	8+	7	9+	10	10	B+	--	--	5.0R	6.0	9.0	8-	4B	8-
"	Alkyd 15576	----	"	9+	7-	8+	9+	10	HB	9-	10	7.0	8.0	9.0	8+	4B	8-
"	"	764-042	RC-114	8+	7+	9	9+	10	B+	--	--	8.0	7.0	8.0	10	4B	6-
"	"	"	Alkyd 7910	8+	7+	9+	9+	10	HB	--	--	4.0	6.0	9.0	10	4B	8-
"	Aroplaz 1365	----	----	7+	7-	6	7	7	2H	4+	8+	8.0	8.0	9.0	4	2H	9
"	"	764-042	RC-114	5+	8+	6	8	8	F	4-	--	2.0R	7.0	8.0	4	[illegible]	9-
"	Beckosol 1313	----	----	8-	8+	8	9+	9	HB	8	8	2.0R	4.0	[illegible]	4	[illegible]	8+
"	"	764-042	RC-114	3-	8	9	9+	10	HB	--	--	4.0R	7.0	9.0	4	B	8+

[illegible] Days)	[illegible] ([illegible])	Heat (2 x 400°F)	Advantages	Disadvantages
	---	---	Grease	Gloss ret. in OB, HC
	---	---	Grease	HC
	---	---	Grease, Gloss	Color, color ret. in HC
	---	---	Hardness, HC, Gloss	Grease
	---	---	Gloss, Stain	HC, Grease
	---	---	Gloss Hardness	HC, Grease
	---	---	Gloss	Color, Grease
	---	---	Gloss	Grease
	---	---	Gloss	Poor color ret. in OB, HC, Grease
	---	---	Gloss	HC, Grease
			Gloss, Scratch, Flex, Stain	Color, color and gloss ret. in ob, HC
			Scratch	Color, HC, Grease
			-----	Gloss, color and gloss ret. in OB, HC, Grease
				HC, Grease
	8+	---	- - - - - - - - - - - - C O N T R O L - - - - - - - - - - - - -	
	8+	---	Stain	Flex, HC, Grease, Soap
	4	---	Flex, Stain	Soft color HC Grease Soap
	6+	---	Stain	Color and gloss ret in OB, HC, Grease, Soap
	9+	---	Flex, Stain, Grease, Soap-	Gloss, color and gloss ret in OB, HC
	6+	---	Grease, Stain	Color and gloss ret in OB, HC
	8	---	Grease Stain	Flex, color and gloss ret in OB, HC
	9+	---	Grease, Stain, Soap	Gloss, Flex, Color and Gloss ret in OB, HC
	---	8	- - - - - - - - - - - - C O N T R O L - - - - - - - - - - - - -	
		8+	Flex, Hard	Gloss HC
	---	8-	Flex, Hard HC	Gloss, Heat
	---	8-	Flex, Hard HC	Grease Heat Gloss
	---	5	Gloss, Hard, Grease	Flex, color Heat
	---	6	Flex, Hard, HC, Grease Stain	
		7-	Flex, HC	Grease
		6+	Flex, HC, Grease	Gloss, Heat
		5-	Flex	Gloss, Grease, Heat
		8+	Flex, HC, Heat	
		2		HC, Bad Heat

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Type Finish	Resin	Primer Type	Primer Resin	Gloss	Scratch	Impact	Cond	Color	Pencil Hardness	Overbake Color	Overbake Gloss	Humidity Cabinet (MC.) Blister	Scratch	Gloss Retention	Grease (14 Days) Color Retention	Pencil Hardness	Solvent
704-23105	Falkyd B-2-S	----		8-	7+	6+	9+	10	H-	8-	8-	5.0	7.0	9.0	8	2B	7-
"	"	764-042	RC-114	8-	7+	6+	9+	10	HB	--	--	6.0	7.0	8.0	10	2B-	7
"	Glyptol 2509	----		8+	6+	9+	10	8	HB	7	10	8.0	7.0	8.0	8+	4B	5
"	" "	764-042	RC-114	8+	7+	8+	9+	10	HB	--	--	6.5	7.0	8.0	9+	6B-	5
"	Uformite F-200E	----		9-	7	9	9+	9	HB	8	10	7.5	7.5	9.0	9	6B	5
"	"	764-042	RC-114	8+	8-	9	9+	10	HB	--	--	7.0	7.0	8.0	9	6B	4
"	Beckamine P-354	----		10-	7-	9	9	7	HB	6	10	8.0	7.5	9.0	10	6B	5
"	"	764-042	RC-114	9+	7	9	9	10	B+	--	--	7.5	7.0	8.0	9-	6B	5
"	Uralite 7A	----	----	10-	6+	9	9	9	3B+	7+	10	7.0	6.0	9.0	9-	6B	5
"	"	764-042	RC-114	9+	7-	9	9	9	B	--	--	7.0	7.0	8.9	10	6B	6
"	Beckosol 1313/ Beckamine P-354	----	----	9-	8	9+	10	7	HB	4	7+	6.0	8.0	9.0	5	4B	8+
"	"	764-042	RC-114	8+	9+	9	9	8	B	--	--	2.0R	6.0	8.0	5	6B	7+
"	Falkyd B-2-S/ Uralite 7A	----	----	7	7	9	9	9	HB	8	7	7.0	8.0	9.0	8+	6B-	7
"	"	764-042	RC-114	8	8-	9	9	9	--	--	--	5.0R	7.0	8.0	9-	6B	6
725-6740	RC-305/RC-306/ RC-718/G-78	475-801		6+	9	7	8	10	H-	8+	6+	8.0	8.0	9.0	10	2B	9
"	Duraplex ND-77-B	"		6+	9+	6	4	10	H	8+	7+	7.0	8.0	8.0	10	4B	8
"	Duraplex A-29	"		6+	8	6	9+	8+	B	6+	8	6.5	7.0	7.0	10	3B	9-
"	Resyl 387-5	"		6+	9	7	8+	9	HB	6+	7-	7.0	7.0	8.0	9	5B	7
"	Uformite MU-56	"		5+	9+	7	5+	9	F+	5+	7+	6.5	8.0	8.0	10	2B	9
"	Beetle 230-8	"		5+	8	7	7-	9	F+	6+	8+	7.0	8.0	8.5	10	2B	9+
"	Melmac 245-8	"		6-	8+	9	5	9	F-	6+	8+	7.5	8.0	8.0	10	2B	8+
"	Duraplex ND-77-B/ Uformite MU-56	"		5-	9+	6	5	9	F-	6+	7	6.5	8.0	7.0	10	B	9
722-23743	XL-413/G-78	64-823	RC-114	8	10-	6	5	10	H	--	--	8.0	7.0	9.0	10	B	8
"	"	"	Alkyd 7910	6+	9+	7+	6-	10	3H-	--	--	3.0R	7.0	9.0	10	B	8
"	"	"	Aroplaz 1313	7	9	7	7+	9	3H-	--	--	8.0	8.0	9.0	10	B	7+
"	"	"	" 1120	7	8	8	6-	9	2H	--	--	8.0	8.0	9.0	10	B	5+
"	Amberlac 80-2	64-823	RC-114	8+	10-	6	7+	8	3H-	--	--	8.0	7.0	9.0	10	2H	7+
"	Resyl 330-5	"		8	9-	6	7+	9	3H-	--	--	8.0	8.0	9.0	10	3H-	10
"	Glyptol 2570	"		7	9	7	9	9	HB+	--	--	8.5	8.0	9.5	10	4B	6
"	Melmac 2456	"		7+	9-	7+	9	9	H+	--	--	8.0	8.0	9.0	10	F	8+
"	" 300-8	"		7+	9-	7	9	9	HB	--	--	8.0	8.0	9.0	10	6B	5
"	Duraplex ND-77-B/G-78	"		8	9+	7	9	9	A	--	--	8.0	8.5	9.0	10	B	7
"	" /RC-718	"		8	9	7	6	9	HB+	--	--	7.5	8.0	8.0	10	B	8

OB-Overbake
HC-Humidity Cabinet

Soap (6 Days)	Heat (2 x 400°F)	Advantages	Disadvantages
		- - - - - - - - - - C O N T R O L - - - - - - - - - -	
		Sl. gloss improvement	Color, Humidity, Grease
		Gloss, color ret. in ob, HC, Stain	
		Gloss, color ret in ob and HC	
		Gloss, air dries, tack free	Color, gloss ret in ob, Humidity
		Gloss, Grease	Color, Humidity
		Gloss, Humidity, Air Dries, Tack Free	
		Gloss, Humidity	Poor color and gloss ret. in ob.
		Gloss	Soft., color and gloss ret. in ob.
		Gloss, Humidity	Color, Soft., Scratch
		Gloss, Air Dries, Tack Free	Color Soft., color and gloss ret. in ob., HC
		Gloss, Humidity	
		- - - - - - - - - - C O N T R O L - - - - - - - - - -	
		Gloss, Flex., Gloss ret.	HC better than control
		Gloss, air dries, Tack free	Flex., soft., HC, Grease
		- - - - - - - - - - C O N T R O L - - - - - - - - - -	
		Flex., Grease	H C
		Flex.	Grease
			HC Grease
		Grease	Color, Flex., HC, color ret. in HC.
			HC, Color ret. in HC.
			Flex., Discoloration HC
			Discoloration in HC, Grease
		Flex., HC, Stain Gloss, Color and gloss ret. in OB, Discoloration in HC, Grease	
		- - - - - - - - - - C O N T R O L - - - - - - - - - -	
		Gloss, Stain	Color, HC, Discoloration in HC, Grease
		Stain	Gloss, Scratch, Soft., Grease
		- - - - - - - - - - C O N T R O L - - - - - - - - - -	
		- - - - - - - - - - C O N T R O L - - - - - - - - - -	
		----	HC
		Gloss, Color ret. in OB	HC
		Flex. OR HC	HC
		Hardness, Grease Gloss, Flex Color, Color and less ret. in OB, Color ret. in HC	
		Grease	Gloss, Flex, Color, HC, Discolor in HC
		Grease	Color and gloss ret in OB, HC
		Grease	HC