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PIGMENT COLOR RESEARCH REPORT
Final Report

Miniature Panel Series 65, 67, 69, 70, 72
"IMPEDEX" Primers

Period Covered: February 1943 - November 1943

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NEWARK PLANT

PIGMENT COLOR RESEARCH REPORT

Final Report

Title: Miniature Panel Series 65, 67, 69, 70, 72 "IMPEDEX" Primers.

Period Covered: February 1943 - November 1943.

SUBMITTED BY: G. Grimm G Grimm DATE SUBMITTED: 8-22-44

APPROVED BY: F. E. Bolton F E Bolton 10/13/44 DATE ISSUED:

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INTRODUCTION:

The miniature panel series reported here are concerned with the effect of wet grinding on flake pigments. The primary interest is the effect of degree of dispersion on the performance of "IMPEDEX" in metal primers.

The effect of ferric iron contamination in "IMPEDEX", and the performance of material manufactured from ammonium sulfate and sodium phosphate are reported.

An attempt was made to coat steel with a film of ammonium ferrous phosphate similar to the phosphatized steel coatings commonly used. The results of moisture condensation exposure of the treated steel specimens are reported.

CONCLUSION:

1 - The performance of well dispersed (severe paint grind) "IMPEDEX" was superior to mix-in or light grinding. The indication was that the wetting accomplished by severe grinding was more effective than large flake size in determining moisture impedance. The same trend was noted for Aratone and aluminum but the effect was not as marked.

2 - Lump "IMPEDEX" returned approximately the same performance as did micropulverized material.

3 - "IMPEDEX" manufactured from ammonium sulfate and sodium phosphate was equal to that manufactured from ammonium phosphate. Thus the source of ammonia and phosphate would be dictated by economic considerations.

4 - The treatment of steel with "IMPEDEX" holds no interest at this time since no improvement has been effected over the phosphoric acid dip. However, it should be noted that an ammonium phosphate dip or a copperas dip followed by ammonium phosphate treatment showed some promise.

SUMMARY:

MPS #65 - Ferric Iron Contaminated "IMPEDEX" and the Manufacture of "IMPEDEX" from Ammonium Sulfate and Sodium Phosphate

None of the "IMPEDEX" primers was better than the zinc yellow/Fe_2O_3/Josp. control.

The deleterious effect of high amounts of ferric iron was demonstrated. When the ferric iron content was over 10% the presence of "IMPEDEX" was detrimental to the performance of the primer.

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"IMPEDEX" manufactured from ammonium sulfate and sodium phosphate, substituted for ammonium phosphate in A-1-D was found to be equal to the material made from ammonium phosphate.

MPS #67 - "IMPEDEX" Dispersion in a Paint Medium (40% P.V.)

Moisture condensation exposure of zinc yellow/Fe_2O_3/Jasperine/ "IMPEDEX" paints demonstrated slightly better performance in the case of well ground "IMPEDEX" (in the paint) compared with lightly ground material.

Immersion panels of single pigment "IMPEDEX" paints indicated that light grinding was preferable to severe grinding.

MPS #69 - Dispersion of Flake Pigments in a Paint (40%)

"IMPEDEX", Aratone and aluminum were compared in single pigment primers and in combination with zinc yellow/Fe_2O_3, in which the flake pigments were subjected to several degrees of grinding as well as having been added as mix-in pigments.

All single pigment primers failed rapidly on moisture condensation exposure. The effect of dispersion on the performance of "IMPEDEX" was noted, in that the well ground pigment showed definitely better performance compared with the mix-in paint. Aratone and aluminum were inferior to "IMPEDEX". The latter two showed no effect of the degree of dispersion.

In combination with zinc yellow/Fe_2O_3, the performance of "IMPEDEX" primers was superior to Aratone primers and equal to the aluminum paints. Here again "IMPEDEX" was improved by the better dispersion as was aluminum; degree of grinding had no effect on Aratone.

The flake pigment combinations with zinc yellow/Fe_2O_3 showed no improvement over the zinc yellow/Fe_2O_3 control.

MPS #70 - "IMPEDEX" Treated Steel

An attempt was made by two methods to coat steel with ammonium ferrous phosphate crystals, to function similar to the phosphate films in common use:

1 - Crystallize ammonium ferrous phosphate crystals on a steel surface by successive immersions in reactant solutions.

2 - Apply a film of a.f.p. crystals to a steel surface by immersion in an "IMPEDEX" dispersion (water or other volatile medium).

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In no case was steel treated in this manner superior to a phosphoric acid dip (no ammonia present).

Two procedures were equal to the phosphoric acid control e.g., ammonium phosphate dip, or copperas dip followed by an ammonium phosphate dip. Only in these two instances of method 1 were crystals (believed to be a.f.p.) observed on the steel when viewed under the microscope.

MPS #72 - Dispersion of Flake Pigments in a Paint (30% PV)

The same single pigment comparisons were made in this series as in M.P.S.-69 except that the paints were pigmented at 30% by volume.

In this case as in the 40% P.V. primers the better moisture condensation performance was noted for the well ground "IMPEDEX". Paint grinding also improved the aluminum and Aratone primers.

Lump and micropulverized "IMPEDEX" were compared in this series. No difference was noted; this was similar to the comparison in M.P.S. 67.

EXPERIMENTAL DETAILS

The plan of the miniature panel series 65, 67, 69, 72 has been tabulated at the end of this report. All paints were ground in a ball mill except as indicated. The flake pigment dispersion studies were prepared by mixing a suitably ground flake pigment mill base with the zinc yellow control primer. 1" x 3" clear steel panels were sanded and solvent wiped then primed, using the "Dry Brush Technique" (±0.2 mil dry film). The exposure was made in the roof condensation box: sun and weather during the daylight hours with positive moisture condensation at night.

The M.P.S. 70 was prepared as follows. Previously cleared 1" x 3" steel panels were treated.

1 - Phosphoric Acid dip followed by ammonium hydroxide dip.
2 - Hydrochloric acid dip followed by ammonium phosphate dip.
3 - Ammonium phosphate dip.
4 - Phosphoric acid dip.
5 - Phosphoric acid dip followed by ammonium phosphate dip.
6 - Copperas dip followed by ammonium phosphate dip.
7 - "IMPEDEX" dispersed in water (1039-3A)
8 - " " " mineral spirit
9 - " " " " " /alkyd resin
10 - " " " acetone
11 - " " " " /alkyd resin.

After treatment the panels were dried and one half was primed with a zinc yellow/Fe_2O_3/Jasperine paint using the "Dry Brush Technique".

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The exposure was in the roof condensation box: sun and weather during the daylight hours with positive moisture condensation at night.

For further details refer to notebook 958 experiments 68 and 71; notebook 1039 experiments 10, 11, 15.

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M.P.S.	NB	PIGMENTATION	WEIGHT RATIO	P.V.	VEHICLE	REMARKS
66	958-68A	Y-467-D/Fe_2O_3/Jasperine	75/10/15	40%	KF-15	Control
	B	" " " /958-46A	55/10/15/20	"	"	Fe content of "IMPEDEX" 4.8%
	C	" " " / " -46B	"	"	"	" " 9.3%
	D	" " " / " -46C	"	"	"	" " 15%
	E	" " " / " -46D	"	"	"	" " 22%
	F	" " " / " -46E	"	"	"	" " 27%
	G	" " " / " -42B	"	"	"	"IMPEDEX" Man. from $(NH_4)_2SO_4$
	H	" " " / " -42E	"	"	"	" " " "
	I	" " " / SW-5T89	"	"	"	
	J	" " " /Aratone	"	"	"	Water Ground Mica
	K	" " " /SW-5T89	"	"	15 gal ester gum	
	L	" " "	75/10/15	"	"	
	M	Red Lead	100	30%	R.L.O.	
67	958-71A	Y-467-D/Fe_2O_3/Jasperine	75/10/15	40%	KF-15	Control
	B	" " " /958-69F	59/8/12/21	"	"	"IMPEDEX" ground 4X on a 3 roll mill
	C	" " " "	"	"	"	" " 1T "
	D	" " " "	"	"	"	" " 5T "
	E	" " " "	"	"	"	" " 8T "
	F	958-69F(Lab. sample of "IMPEDEX")		"	"	Ground 4X(4 loose passes) on a 3 roll mill
	G	"	100	"	"	Ground 1T(1 tight pass) on a 3 roll mill
	H	"	"	"	"	Ground 5T on a 3 roll mill
	I	"	"	"	"	Ground 8T " " "
	J	Not pigmented	-	-	"	

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M.P.S.	NB	PIGMENTATION	WEIGHT RATIO	P.V.	VEHICLE	REMARKS
69	1039-10A	K-1761, Lot 98288 Lump	100	40%	KV-15	"IMPERMEX" mix-in
	B	"	"	"	"	5Tight passes on a 3 roll mill
	C	"	"	"	"	10 " " " " " "
	D	" Micropulverized	100	"	"	Mix-in
	E	" "	"	"	"	5T passes on a 3 roll mill
	F	" "	"	"	"	10T " " " " "
	G	Aratone	"	"	"	Mix-in
	H	"	"	"	"	5T
	I	"	"	"	"	10T
	J	Aluminum Powder	"	"	"	Mix-in
	K	" "	"	"	"	5T
	L	Y-467-D/Fe_2O_3/K1761 Mic	60/20/20	"	"	K1761 mix-in
	M	" " "	"	"	"	K1761 ground 10T
	N	" " /K1761 Lump	"	"	"	K1761 mix-in
	O	" " / "	"	"	"	K1761 ground 10T
	P	" " /Aratone	"	"	"	Aratone mix-in
	Q	" " / "	"	"	"	Aratone ground 10T
	R	" "	75/25	"	"	Control
72	1039-15A	K1761,Lot 98288 Lump	100	30%	"	Mix-in
	B	" " "	"	"	"	6X(6 loose passes) on a 3 roll mill
	C	" " "	"	"	"	10T " "
	D	" " Micropulverized	"	"	"	Mix-in
	E	" " "	"	"	"	6X
	F	" " "	"	"	"	10T
	G	Aratone	"	"	"	Mix-in
	H	"	"	"	"	6X
	I	"	"	"	"	10T
	J	Aluminum powder	"	"	"	Mix-in
	K	" "	"	"	"	10T

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