Cross Reference:

94 Line "Dulux"
Resins, ion exchange

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MEMORANDUM REPORT NO. M-218

BLISTERING: AMBERLITE ION EXCHANGE RESINS IN "DULUX"

Introduction:

This memo will record several experiments conducted with two ion exchange resins in 94 Line "Dulux" during the period of 6/28/48 to 10/11/48.

Conclusions:

The results of this preliminary study indicate that the addition of small amounts of ion exchange resins will improve the blister resistance of "Dulux". Additional work will be necessary to improve the dispersions and establish limits.

Recommendation For Future Program:

The Amberlite resins used in these experiments were tough and resilient. We could not grind them fine enough for high gloss results. Therefore, an effort should be made to (1) procure more brittle, easier ground resins and/or (2) develop more efficient grinding techniques. Limits should then be established using the well dispersed material in various formulations. Other test conditions such as salt spray, humidity, and soap bath should be used. Effect in both primer and topcoat should be studied.

Searching Action:

Experiments with ion exchange resins in anti-fouling primers for aircraft were conducted by E. R. Gilbert in the summer of 1942. This work was done in cooperation with the Naval Laboratories, Anacostia Station, and was classified confidential. A search is being made to locate any reports pertaining to this work.

Experimental Details:

In starting these experiments we reasoned that osmotic pressure, a probable cause of blistering, could be reduced by lowering the salt concentration of the water which permeates the film. The two Amberlite ion exchange resins selected for the test were XE-59, anion exchanger, and XE-60, cation exchanger. They were supplied as 200 mesh powder.

First attempts at grinding these resins in a steel ball mill with solvent failed. The supplier, Resinous Products Co., advised that the resins contain 30-40% moisture and that dehydration will improve grinding. We confirmed this with an eight day grind after dehydrating approx. 5 hrs. at 225°F. The fineness was greatly improved. However, the addition in the typical 94 Line gray enamel did cause lower gloss. Formulations containing 2, 4, 9, and 15% Amberlite on the enamel solids were prepared and placed in the water bath. In five days the controls were showing definite fine blisters. The 9 and 15% Amberlite enamels were showing loss of gloss only. After three weeks immersion the failures were only slightly exaggerated and the test was discontinued. These results seemed conclusive; however, it would have been easier to grade the panels if they were all of the same initial gloss level.

Another attempt to grind the Amberlite using a combination dry steel ball mill and 47 process grind gave only slightly better dispersion. Results of this test in the blister bath confirmed the results of the first test.

It is possible that the gloss failures of the Amberlite formulations were caused by the swelling of the dehydrated resin particles. Hydration after grinding would probably remedy this condition.

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Note Book # 3470, P 55-167
Exposure Series # 9980

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