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MEMORANDUM REPORT M-644

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EVALUATION OF SAFFLOWER OIL IN #20 OUTSIDE WHITE

INTRODUCTION:

Safflower Oil is a commercially available oil, the largest producer being the Pacific Vegetable Oil Corporation on the West Coast. Production of Safflower Oil totaled about 250 tank cars in 1952, and the 1953 production is expected to be about 300 tank cars. Practically all this Safflower Oil has been the non-break grade, and only a few tank cars of alkali refined Safflower Oil have been made. The prices of vegetable oils fluctuate from day to day, but generally the price of non-break Safflower Oil is only a fraction of a cent higher than alkali refined Soya Oil. Alkali refined Safflower Oil is 1-1/2 cents higher in price than the non-break grade.

Chemically, Safflower Oil is much higher in linoleic acid and lower in linolenic acid than Soya Oil. Safflower Oil has an average iodine value of 145 versus 130 for Soya Oil and 185 for linseed oil. Generally speaking, Safflower Oil has drying properties similar to linseed oil, with color retention about equal to Soya Oil.

N35480

This report summarizes the initial results of an evaluation of Safflower Oil as a partial replacement for linseed oil in house paint.

SUMMARY AND CONCLUSIONS:

1. No results are yet available from exposure tests, but based on tests of initial properties, up to 70% of the linseed oil in 301-892 Outside White can be replaced by non-break Safflower Oil with a resulting improvement in initial color, wrinkle resistance, and in drying time under high humidity conditions, and without sacrifice of any important initial property.
2. Non-break Safflower Oil is superior in dry to alkali refined Safflower Oil, and is superior in dry to linseed oil at 40°F - 90% RH and 90°F - 90% RH, and equal at 77°F - 65% RH.
3. The major effect of high humidity (90% RH) is to prolong markedly the tack free drying time of house paints. Thus, at 90°F, 90% RH, the tack free drying time is generally much greater than at 77°F, 65% RH, while the firm, or through drying times are only slightly different under these two sets of drying conditions. Non-break Safflower Oil stands out from linseed oil, soya bean oil, and alkali refined Safflower Oil, in that house paints containing it have definitely faster tack free drying times at 90°F, 90% RH.

ACTION:

1. Exposure tests in Florida, Delaware and Texas will be followed to conclusion.
2. K. C. Lampert will make a house test with house paints based on 50% non-break Safflower/50% linseed, and 100% non-break Safflower Oil.

EXPERIMENTAL:

How Tested:

301-892 #40 Outside White modifications were prepared with 50% and 100% of the varnish type linseed oil replaced with -

- (a) non-break Safflower Oil,
- (b) alkali refined Safflower Oil,
- (c) alkali refined soya-bean oil.

The varnish grade linseed oil constitutes about 70% of the total oil in 301-892. The remaining 30% is a bodied linseed oil which was not replaced with Safflower Oil.

Except for the oil replacements, these test paints were identical. The experimental paints were tested versus 301-892 #40 Outside White for all important initial properties, including brushability, drying time, viscosity and yield values, gloss, sag, color and hardness. In addition, drying times were compared at 70°F - 65% RH, 40°F - 90% RH and 90°F - 90% RH. Drying time data is summarized in tables at end of report. Results of all other tests were satisfactory.

Above tests were made by the writer - wrinkle test by Mr. W. J. McConshey.

Exposure Series 13089 and 13090 have been prepared covering the exposure of alkali refined Safflower Oil in 301-892 Outside White modifications. Results of Exposure Series 13090 show alkali refined Safflower Oil analogues to be equal to linseed oil in blister resistance. No results yet available from other exposure tests.

Comparative drying time data for the alkali refined Safflower Oil, soya-bean oil, and non-break Safflower Oil modifications of 301-892 #40 Outside White, replacing 100% of the varnish type linseed oil or 70% of the total oil are given in the table below.

Drying Times at 77°F-65% RH of
#40 Outside White Based on

	(1) Varnish Type Linseed Oil (Control)	(2) Alkali Refined Safflower Oil	(3) Soya-bean Oil	(4) Non- break Safflower Oil
Set to touch	5.3 hours	5.8 hours	7.0 hours	6.9 hours
Firm dry	22.5 "	18.0 "	17.0 "	24.0 "
Tack free	20.0 "	20.0 "	23.0 "	24.0 "
<u>40°F - 90% RH</u>				
Set to touch	15.0 hours	15.0 hours	14.5 hours	19.0 hours
Firm dry	65.0 "	57.0 "	56.0 "	55.0 "
Tack free	74.0 "	78.0 "	80.0 "	60.0 "
<u>90°F - 90% RH</u>				
Set to touch	----- Less than 6.5 hours -----			
Firm dry	24.0 hours	18.0 hours	24.0 hours	14.0 hours
Tack free	65.0 "	49.0 "	37.0 "	20.0 "

REFERENCES:

Notebook #5493, pages 134-139, 160-161, 166-167,
182-185.

Notebook #5670, pages 6-7.

Exposure Series #13089, #13090, #13225, and #13226.

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