

NEWARK PLANT

COLOR SALES SERVICE SPECIAL REPORT

EVALUATION OF MING ORANGE (Kentucky C. & C. Co.)

July 9, 1935

File:- 10.1

N36978

NEWARK PLANT

COLOR SALES SERVICE SPECIAL REPORT

EVALUATION OF KING ORANGE (Kentucky C. & C. Co.)

Data Prepared by: A. J. Sauerborn
N. A. Martyak

Approved by:

July 9, 1935

Copies to:

Z. Phelps & C.H. Rupperecht
C. A. McCorkle, Wilm.
J. F. Daley, Wilm.
L. E. Kelly, Newark
E. R. Allen, Newark
R. A. Kaiser, Newark
F. E. Bolton, Newark

COLOR SALES SERVICE SPECIAL REPORTEVALUATION OF MING ORANGE (Kentucky)

File: 101.1

INTRODUCTION:

This work was undertaken to evaluate the characteristics and probable future of the Molybdated Chrome Orange put on the market by Kentucky Color & Chemical Company under the name of "Ming Orange". The chemically similar I.C.I. Scarlet Chrome was included, as well as a tentative match prepared by dry blend from our present standard pigments, CS-7919.

SCOPE OF THE STUDY:

Evaluations were made in printing ink, paint, and linoleum (both inlaid and print) formulations.

SUMMARY & CONCLUSIONS:

General Observations:- In comparison to the current Chrome Oranges, the Ming Orange and the I.C.I. Scarlet Chrome possess greater brilliancy of mass tone, high strength, cleanness of tint, and high hiding power. The light fastness, both in mass tone and tint, is, however, distinctly inferior to Chrome Oranges.

The I.C.I. Scarlet Chrome is redder in shade than the Ming Orange, but is rated as fully equal to it, and in some properties--notably brilliance,--superior.

Our tentative dry blend match CS-7919, for Ming Orange was formulated as follows:

YO-263-D	75%
RE-384-D	2%
RE-390-D	23%

Altho certain deficiencies in this blend are evident, the comparisons indicate the probability of competing successfully against Ming Orange with a pigment formulated along these general lines. Suggestions for possible future study are offered in a later section of this report.

Properties in Printing Ink:- Ming Orange ground to a satisfactory ink, and gave a proof of fair quality - equal, if not superior to YO-263-D. The I.C.I. Scarlet Chrome also produced a satisfactory ink and printed with a redder, brighter tone and slightly better quality (freedom from mottling) than the Ming Orange. CS-7919 gave a thinner, the still workable ink, but did not distribute well on the plate, and mottled badly on the print. This is probably due in large measure to its appreciable barytes content. Both Ming Orange and Scarlet Chrome would be adjudged satisfactory for use in printing ink wherever Chrome Orange would be applicable, and superior to Chrome Orange in all properties save light resistance, in which latter property they are inferior.

Properties in Paint:- Ming Orange and I.C.I. Scarlet Chrome disperse satisfactorily in paint vehicles, and are superior to Chrome

Orange (YO-38-D) in brilliance, gloss, and hiding power. Our observations check Kentucky's claims that King Orange has approximately 2.6 times the hiding power of a Chrome Orange. The I.C.I. Scarlet Chrome, altho redder in shade, is brighter than King Orange. Both pigments show much greater freedom from hard settling than YO-38-D. It was observed that neither King Orange nor the Scarlet Chrome exhibited that sensitivity to grinding so characteristic of Chrome Oranges. The light stability (based on fadeometer tests and two month outdoor exposure) of the competitive products is decidedly inferior to Chrome Orange.

CS-7919 is equal to King Orange in brilliance, slightly poorer in hiding power (altho still greatly superior to YO-38-D), superior in light resistance, but inferior in gloss. The latter property could undoubtedly be improved by substitution of clay or asbestos for the barytes in CS-7919.

King Orange could be used advantageously in paint for all purposes where light resistance is non-essential. The idea of the excellent light resistance of Chrome Orange is, however, well established in the paint trade and would present a decided obstacle to the penetration of King Orange into this field.

Properties in linoleum:- The brilliance, and particularly the high strength of the King Orange and Scarlet Chrome give them important advantages over Chrome Orange in linoleum, both in print and inlay work. The deficiency in light resistance is likewise apparent in these applications, but is felt to be a less serious obstacle in linoleum work than in paint or printing ink. The linoleum field is considered the one into which King Orange is most likely to penetrate.

CS-7919 is an excellent match for King Orange in both inlaid and print linoleum and is superior in light resistance in both full shade and tint. In print linoleum it shows slightly lower gloss. Preliminary cost figures indicated that CS-7919 will show a cost of approximately 19¢ for a full shade match to King Orange, and 27¢ for a tint match. The most recent quotation for King Orange is 29¢, at which figure CS-7919 would be more economical in full shade or tint.

Suggestions for future work:- CS-7919, altho approximating King Orange in printing ink, paint and linoleum, is not regarded as the final answer in any one of these fields, and has been formulated as a possible guide and starting point for further research study. The plant has, moreover, objected to a dry mix of the ingredients comprising CS-7919 on the ground that it would be extremely difficult to standardize. Past experience on similar blends justifies this objection. A wet blend of YO-263-D and the Toners (RT-261-D and RT-359-D) might be more satisfactory from an operating standpoint. On the other hand, mixed colors may not in all cases be as satisfactory as single pigments. Mixtures, especially, of Chrome Orange with organic pigments have frequently been looked on with disfavor. The possibility of blending straight organic pigments (for instance, Permanent Red 2-B, CS-7779, and new type organic oranges) either as Toners, or suitably extended should be investigated. If extended, the suitability of the substrate for the various fields of application must receive consideration.

Clear cut decisions and recommendations are not possible on the basis of the present data. The ideal situation would be to offer

both Scarlet Chrome, and a counterpart developed from our own pigments and work out with the trade the proper place for pigments of this type.

EXPERIMENTAL DATA:

<u>Subent</u>	<u>Ming</u>	<u>Manganese</u>	<u>Strength</u>	<u>Tint</u>	<u>Light Fastness</u>
Mix #1					
75% YC-263-D	vs. Orange	vs red,	weak	vs yel.	decidedly better
25% RE-384-D	C-37669	bright		vs clean	
23% RE-390-D					

145 parts Mix #1 = 100 parts C-37669.

Mix #2					
93.7% YC-263-D	C-	bright,	equal	vs red	decidedly better
.65 RT-281-D	vs. 37669	vs red		clean	
5.65 RT-389-D		clean			

Subents were made 3:1 in Acid Refined Linseed Oil.

Mix #2 was not evaluated in printing ink, paint or linoleum.

Cost of Ingredients in Mixes

Mix #1 (Manganese)

YC-263-D	.75 lb. @ \$0.15	= \$0.1125	Ming Orange,
RE-384-D	.02 lb. @ \$0.40	= 0.008	C-37669 @ \$0.29/lb.
RE-390-D	.23 lb. @ \$0.356	= 0.077	
		<u>\$0.1975/lb.</u>	

Mix #2 (Tint)

Since this mix is 45% weak vs. Ming Orange the cost of ingredients necessarily increases for more color is used to obtain the match.

Hence, \$0.1975 x 1.45 = \$0.286/lb.

Mix #3

YC-263-D	.937 lb. @ \$0.15	= \$0.1395
RT-281-D	.0065 " @ \$1.50	= 0.0097
RT-389-D	.0565 " @ \$2.25	= 0.127
		<u>\$0.2762/lb.</u>

The above figures show that we should be able to compete with Ming Orange.

Printing Ink

Studies on Molybdated Chrome Oranges some years ago indicated that the product was poor in ink properties and unsuited to the requirements of the Printing Ink trade. The newly-introduced Ming Orange has, however, been reported as being used in ink work. Comparative grinds were, therefore, made of Kentucky's Ming Orange, I.C.I. Scarlet Chrome, and CC-7919 (our tentative match for Ming Orange). YC-263-D was carried

as a control, it is considerably yellower than King Orange, but is the darkest Chrome Orange possessing desirable ink properties.

Grinds were made at 3:1 in #1 Transparent Lithographic Varnish.

Tabulation of Ink Properties.

	Mixing Time	Texture 2X 4X	Body	Length	Flow	Strength 1-50	Tint
CS-7919	0'40"	18- 19-	Std.	---	6	---	---
C-37669	4'10"	19 19+	Heavy	C.K.	2	strong 30%	s. bl.
C-37713	0'25"	18+ 19-	Heavy	vs short	0	About equal	blue
YO-283-D	0'35"	19 20	L. softer	C.Y.	8	s. weak	yellow

	Proofs Litho Label	Spindowns	Sp. Gr.
CS-7919	---	---	5.251
C-37669	better qual.	s. str.	5.613
C-37713	" "	" "	5.076
YO-283-D	" "	yellow	6.273

CS-7919 (Our blend) C-37669 (King Orange) C-37713 (Scarlet Chrome)

Paint

All the pigments were ground as mill bases in an Ebercol 4 hr. type vehicle (V-3047). Neither of the C-3 or the CS-3 had that tendency of being sensitive to grinding which is characteristic of Chrome Oranges.

Mill Bases

	YO-38-D	- 80%	} 2 passes
	V-3047	- 20%	
Our blend	CS-7919	- 75%	} 4 passes
	V-3047	- 25%	
(Scarlet Chrome)	C-37713	- 75%	} 2 passes
	V-3047	- 25%	
(King Orange)	C-37669	- 70%	} 2 passes
	V-3047	- 30%	

CS-7919 did not grind out as readily as the competitive products or YO-38-D.

Kentucky's product (C-37669) returned a heavier consistency paste than our blend or I.I.I.'s product.

The consistencies of the pastes line up as follows:

1. C-37669 - 70% pigment concentration - heaviest
2. C-37713 - 75% " " - vs thinner than 1
3. CS-7919 - 75% " " - equal 2
4. YO-38-D - 80% " " - noticeably thinner than 1

Ready Mixed Enamels

1 $\frac{1}{2}$ and 2 $\frac{1}{2}$ gallon enamels were prepared from the above mill bases. In the case of YC-38-1 2.8 $\frac{1}{2}$ /gal. and 5.2 $\frac{1}{2}$ /gal. were made ready since this orange has 2.8 times the hiding power of the ordinary types of chrome oranges.

The hiding tests were made on aluminum panels (with black stripe) and the regulation Prebe Hiding Power Chart.

The results are as follows:

Enamels containing 1 $\frac{1}{2}$ gallon. YC-38-1 2.8 $\frac{1}{2}$ /gal.)	1.	C-37713 -	---
	2.	C-37669 -	trace less
	3.	YC-38-1 -	equal to #2
	4.	YC-7919 -	trace less than #2.

Enamels containing 2 $\frac{1}{2}$ gal. YC-38-1 5.2 $\frac{1}{2}$ /gal.)	1.	YC-38-1 -	---
	2.	C-37669 -	noticeably less
	3.	C-37713 -	2.8 $\frac{1}{2}$ trace less than #2
	4.	YC-7919 -	considerably less than #2

Light resistance - In this respect the YC-7919 and YC-38-1 are decidedly superior to King Orange. The Pearlst Chrome, on a 34 day outside exposure test at Newark, is inferior to Chrome Orange, but distinctly superior to King Orange in color-retention.

Can stability - (10 day shelf storage test). The following observations show a trend of the settling characteristics.

1. C-37713 - No vehicle separation, very soft settling.
2. YC-7919 - clear vehicle separation, very soft settling.
3. C-37669 - No vehicle separation, soft settling.
4. YC-38-1 - clear vehicle separation, hard settling.

Linoleum (Inlaid)

Using Mix #1 (75% - YO-263-D
(25% - R-384-D
(25% - R-390-D

an excellent match was obtained in masonite and tint.

Headline:

Mix #1 vs. C-37669	<u>Masonite</u> vs Red	<u>Strength</u> vs str.	<u>Tint</u> vs str.	<u>Light- fastness</u> sl. better
--------------------	---------------------------	----------------------------	------------------------	--

The above relationship remained unaltered when the Mix #1 and C-37669 were reduced to various pigment concentrations both in masonite and in tint.

The formulas used in these tests are as follows:

<u>Masonite</u>		<u>Tint</u>
<u>Master batch</u>		<u>Master batch</u>
Cement	33-1/3% -	Cement
wood flour	" -	wood flour
Whiting	" -	Duolich

<u>Masonite</u>	<u>Mix #1</u>	<u>Tint</u>	<u>Mix #1</u>
C-37669	C-37669	C-37669	C-37669
100 gm. masterbatch	100 gm.	100 gm. masterbatch	100 gm.
1.0 gm. color	1.45 gm.	1.0 gm. color	1.45 gm.

Since Mix #1 was 45% weak it was necessary to add more color pigment to obtain a color intensity equal to the King Orange.

The cost of the ingredients in this mix appears under item (2) under Cost of Ingredients in "Specs."

Indications from the above work are that a few minor changes in color mix and color master-batch ratio will give rise to a product superior to King Orange (C-37669) in all respects.

Linoleum (Print)

For this work a 1000 gm. mix - C-7919 - (75% YO-263-D
(25% R-384-D - Mix #1
(25% R-390-D

was made up so as to ensure a uniform print ink.

C-7919 in print linoleum very closely approximates King Orange in shade, but is definitely yellow against I.C.I. Carlet Chrome - 7771.

In illustrations we show a decided superiority vs King Orange and I.C.I. Carlet Chrome.

The ink is slightly less lustrous as compared with the competitive samples of chrome on print. However, we feel that a slight re-formulation will offset the difference in gloss.

The print linoleum inks were made as follows:

7.4 850 Orange pigment
 .74 8.6 ZnO
 26.66 310.0 Graining Vehicle

Thin 100 parts of paste with the following:

1 pts. 126
 3 18
 3-1/2 37
 3-1/2 38

If too heavy to print, thin down with a mix of (50 pts. 126)
 (10 37) --
 (10 38)

appears in next tabulation as "Additional Thinner."

The linoleum prints were made with inks that very nearly equalled each other in consistency. This was determined by the former apparatus.

	<u>former Reading</u>	<u>wt. of Additional Thinner</u>
7919	100 revolutions	
	11.5 sec/125 gm.	10.0 gm.
C-37669	22. " "	10.0 gm.
C-37713	22. " "	15.0 gm.
12 C-7919	18.5 " "	- "

	<u>Sp. Gr.</u>	<u>Wtg. Ink</u>	<u>Gals./lb.</u>	<u>lbs./solid gal</u>
C-37669 (King Orange)	6.03	5.813	.0199	50.2
C-7919 (our Match)	5.59	5.281	.0215	47.4
C-37723 (Scarlet Chrome I.C.I.)	5.32	5.075	.0226	44.3