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NEWARK PLANT
PIGMENT COLOR RESEARCH REPORT

Final Report

- 1) Steinlite Moisture Tester - Application to Determination of Moisture and Water Soluble Salts in Iron Blue Pigments.
- 2) Electrical Conductivity as a Measure of Water Soluble Period Cover Salts in Iron Blue Pigments.

January 8, 1948 to February 17, 1948.

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- 2) Electrical Conductivity as a Measure of Water Soluble Salts in Iron Blue Pigments.

Period Covered: January 8, 1948 to February 17, 1948.

Charge: 1100-11-95 (AI-C-95)

SUBMITTED BY: *A. R. Hanke*
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DATE SUBMITTED: May 19, 1948.

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INTRODUCTION:

The Steinlite Moisture Tester is marketed by the Fred Stein Laboratories, Atchison, Kansas. It operates on the principle that the dielectric constant of a solid is dependent upon its moisture content. It does not measure dielectric constant but measures a function of the impedance changes in a capacitor where the dielectric of the capacitor is the sample in question. It was thought that such an instrument might serve as a quick method for determining moisture in iron blue pigments. When this did not look particularly promising, the attempt was made to show some correlation between instrument reading and water soluble salts. In connection with the water soluble salt experiment, specific electrical conductivity of an aqueous slurry was also compared with water soluble salts determined gravimetrically.

Parlin has found a Steinlite Moisture Tester useful in determining the water content of "Vacuum Stock Material". Their method, TM-209-E, can be found in our OMA book under OMA-173.

CONCLUSIONS:

1. The Steinlite Moisture Meter is unsuitable for use as a control instrument for measuring moisture or water soluble salts in iron blue pigments.
2. Electrical resistance of a slurry can be used to good advantage for measuring water soluble salts of B-63-D type blues. The method fails, however, when applied in the manner of this experiment to B-216-D type blue, presumably because the treating agent is an uncontrolled variable.

OBSERVATIONS:

1. No correlation was observed between Steinlite meter reading and moisture as measured by the Brabender oven on B-216-D. The moisture range studied was 4.6% to 8.1%.
2. The correlation between Steinlite meter readings and moisture by Brabender oven on B-63-D is too poor to use as a control test. The moisture range studied was from 6.8% to 9.2%.
3. No correlation was observed between Steinlite meter readings and water soluble salts on B-216-D. The soluble salt range studied was from 0.27% to 0.47%.
4. There is only poor correlation between Steinlite meter readings and water soluble salts on B-63-D. Far better correlation is obtained with an electrical conductivity measurement on the pigment slurry. The soluble salt range studied was from 0.9% to 3.04%.

DETAILED TESTING PROCEDURES

Method for Steinlite Meter Tests.

Weigh 40 grams of pigment on a torsion balance and transfer to the instrument cell. Use no compression but simply make a reading according to the directions supplied with the instrument.

Note: The sample weight was chosen so that the sample did not quite completely fill that portion of the cell compartment between the metal plates. Under these conditions the readings were quite reproducible. If compression was used it was difficult to get the sample out of the cell.

Method for Specific Conductivity Measurements

Weigh 5 grams pigment and slurry into 70 ml of distilled water. Heat just to a boil, avoiding excessive boiling. Cool to room temperature ($+28^{\circ}\text{C}$) in period of about one hour. Place slurry in a 25 ml graduate and measure the electrical resistance using a dip type electrode of cell constant approx. 1.0. Also make a reading on the distilled water used for the experiment and treated in a manner similar to that of a determination. To calculate the conductivity use the formula $C = \frac{10^5}{R \cdot K}$

C = Specific conductivity in reciprocal ohms $\times 10^5$
R = Instrument reading in ohms
K = Cell constant which for this experiment was 0.96.

Note: In the case of B-216-D, a mixture of alcohol and water was used in place of distilled water to assure complete wetting of the pigment. The mixture consisted of one part 3-A ethyl alcohol and 2 parts distilled water by volume.

Method for Water Soluble Salts

This followed the standard procedure for water soluble salts listed as KCR-50. The determinations were made by the Plant Analytical Laboratory.

Method for Moisture

The Brabender oven was used and the sample was heated to 160°C for one hour. The determinations were made by the Plant Analytical Laboratory.

DATA

TABLE I

Moisture - Water Soluble Salts - Resistance -
Steinlite Meter Readings on B-216-D.

<u>B-216-D</u> <u>Lot No.</u>	<u>Resistance</u> <u>Reading</u> <u>R(ohms)</u>	<u>Specific</u> <u>Conductivity</u> <u>($\frac{10^5}{\text{ohm}}$)</u> <u>(RX 0.96)</u>	<u>Steinlite</u> <u>Readings</u>	<u>Percent</u> <u>Moisture</u>	<u>Percent</u> <u>Water Soluble</u> <u>Salts</u>
52234	15300	6.8	D-25	8.1	0.47
52523	7100	14.7	D-33	5.8	
52524	9100	11.5	D-40	5.0	
52546	6800	15.4	D-17	5.0	
52548	13600	7.6	D-55	5.9	0.27
52618	10600	9.8	D-43	4.7	
52704	4800	21.7	D-23	5.1	0.32
52779	6150	17.0	D-147	4.9	0.39
52803	9400	11.1	D-26	6.1	
52619	11650	8.9	D-60	4.6	0.33
Solvent	390000	0.3	-	-	-

TABLE II

Moisture - Water Soluble Salts - Resistance -
Steinlite Meter Readings on B-63-D

<u>B-63-D</u>	<u>Resistance</u> <u>Reading</u> <u>R(ohms)</u>	<u>Specific</u> <u>Conductivity</u> <u>($\frac{10^5}{\text{ohm}}$)</u> <u>(RX 0.92)</u>	<u>Steinlite</u> <u>Readings</u>	<u>Percent</u> <u>Moisture</u>	<u>Percent</u> <u>Water Soluble</u> <u>Salts</u>
52525	338	308	D-110	9.2	3.04
84402	540	193	D-98	9.2	1.84
52413	780	134	D-48	7.5	1.61
52660	715	146	D-56	6.8	1.16
52270	1350	77	D-40	7.7	0.90
SD-48476	1210	86	D-77	-	0.87
Dist. H ₂ O	580,000	0.2	-	-	-

DISCUSSION OF RESULTS:

The correlation charts clearly show that with B-216-D no correlation exists under the conditions of the experiment. It is probably true that if a wider range of moisture or water soluble salts had been studied, a correlation could be shown but at best it would be too poor for practical use. The Steinlite meter reading on one sample was so far removed from the other readings that it could not be plotted on the chart. Its moisture and water soluble salt content was reasonable but it was bulkier than the other samples. No test was made but it is thought that this sample contained more than the customary amount of treating agent. It is felt that variation in treating agent along with variation in moisture and water soluble salts, makes it unlikely that the Steinlite tester can find a use in the control testing of iron blue pigments, particularly if they contain a treating agent.

The results on B-63-D show correlation but the correlation is not good. It is doubtful that Steinlite meter readings are good enough for control testing. Electrical conductivity shows up as the best for water soluble salts and may well prove to be of value in determining water soluble salts in some iron blue pigments.

REFERENCE:

N.B. 1285-1

KRUPIA & EMMER CO. N. Y. NO. 88-16
 Millimeter, 3 mm. line spaced, on line heavy.
 MADE IN U.S.A.

Correlation Charts for B-216-D

% Moisture

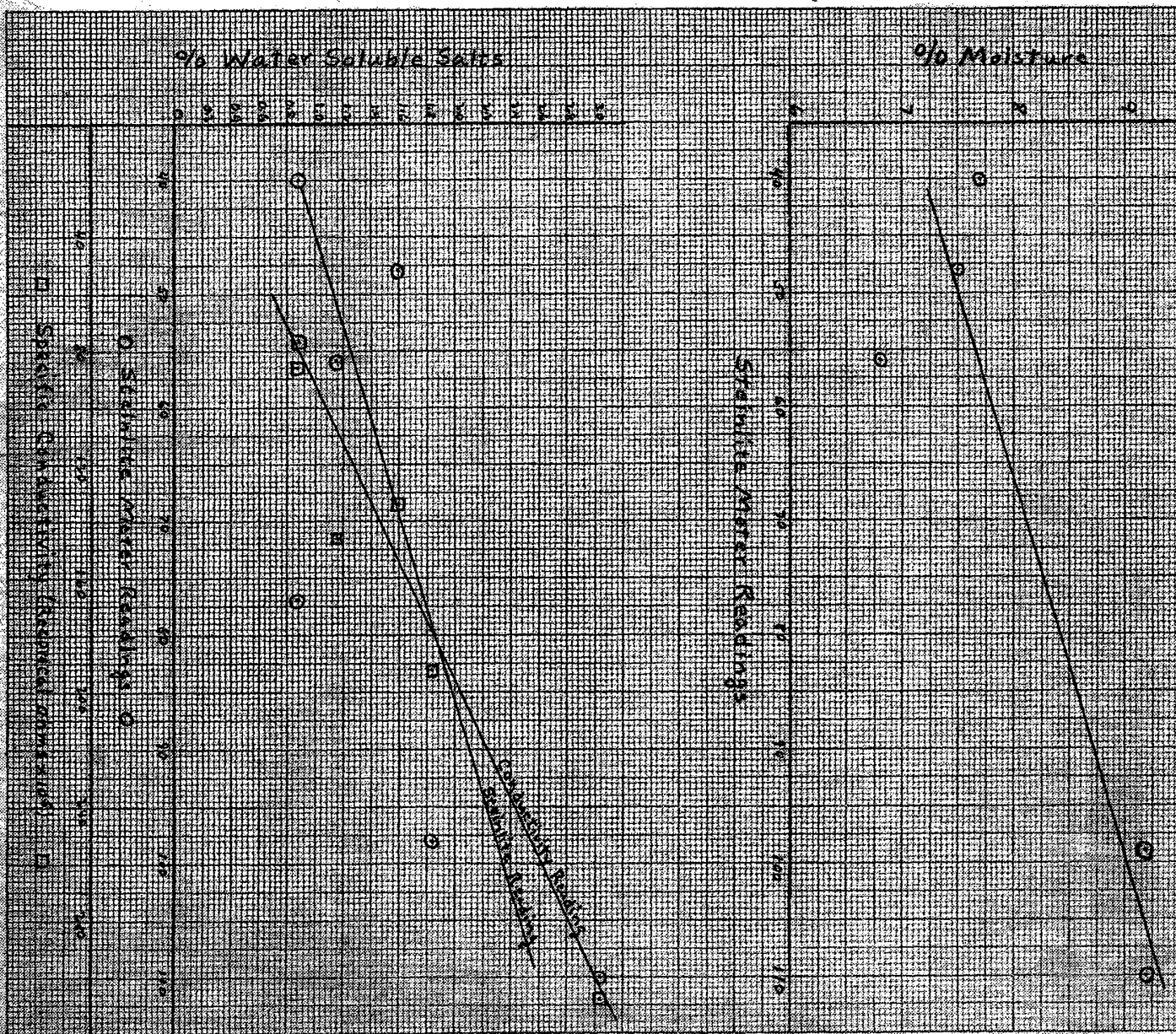
Steinlite Meter Readings

% Water Soluble Salts

Steinlite Meter Readings

Specific Conductivity (Reciprocal ohms x 10⁻³)

KEUFFEL & ESSER CO., N. Y. NO. 335-16
Millimeters: 5 mm. lines accented, cm. lines heavy.
MADE IN U. S. A.



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