

Cross Index

Georgia Kaolin Co.
Emulsion Paints
W-1

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MEMORANDUM REPORT #M-318

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AQUEOUS VISCOSITY OF CHINA CLAY

This report is to record the work performed on the application of an aqueous viscosity test to various samples of China Clay. Production difficulties in Speed-Easy Flat indicated the need for some test to insure satisfactory performance of China Clays, such as our W-1, because the oil absorption test was inadequate in an aqueous system. Samples of W-1 within our specifications of oil absorption produced finished products of marked differences in package viscosity.

The Georgia Kaolin Company developed an aqueous viscosity test for control of China Clay's designed for water paints. A sample of "Hydrite" clay DS-20133 (Georgia Kaolin's water paint type) and the satisfactory and unsatisfactory samples of W-1 were evaluated by this aqueous viscosity test.

Summary

(a) It was possible to apply the recommended aqueous viscosity test to a sample of "Hydrite" clay and obtain satisfactory results.

(b) Revision of Georgia Kaolin test was required to test samples of W-1 because the test mixture was too viscous. This was accomplished by lowering the clay content of the test mixture.

Significant differences in aqueous viscosity of W-1 samples were noted.

(c) The test appeared somewhat empirical and additional work would be required to refine it to a point of assured reliability for use as a control test.

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Details

Scope and Principle of Test

The flow properties of the clay are evaluated by making it down in an aqueous suspension under precisely controlled conditions of solids content and reagent dosage. During preparation of the clay water suspension, it is subjected to sufficient hydraulic shearing (mechanical working) to insure a thorough wetting of the particles and elimination of entrained air.

Before measurement, the solids content of the suspension is very accurately adjusted to a specific solids, and dispersing reagent is introduced in precise incremental dosage before each viscosity measurement until optimum fluidity is attained and finally exceeded by one incremental dosage.

The procedure described below was the Georgia Kaolin Test for testing W-1 samples. A copy of the standard aqueous viscosity test of Georgia Kaolin is in our file.

Equipment and Materials

- (a) Brookfield Special 4 speed Viscosimeter Model RVF. Speeds 10, 20, 50, 100 R.P.M.
- (b) High speed mixer capable of 10,000 R.P.M. (air mixer was used).
- (c) Aluminum pycnometer - E & A #3-247
- (d) Balances
- (e) Beakers, pipettes
- (f) Screen, 100 mesh
- (g) Calgon Solution 50%
- (h) Stark - Dean assembly for moisture determination
- (i) Thermometer, 0-110°C.

Procedure

The modified procedure was the same as Georgia Kaolin's test except that the solids content was lowered from 71% solids to 63.5% and this solids content was determined by balance of materials and not by a pycnometer.

- (1) Determine moisture of sample and calculate weight of sample to contain 500 g. of clay dry basis.

$$\frac{500 \text{ g.}}{1.00 - \% \text{ moisture}} = \text{weight of sample}$$

- (2) Weigh up clay to contain 500 g. dry basis.
- (3) Place amt. of distilled water in a cup to give 63.5% solids.
- (4) Pipette 3.0 ml. 50% Calgon solution into cup.
- (5) Place cup on mixer, start motor at slow speed.
- (6) Add clay in small increments, allowing to stir in uniformly between additions.
- (7) When all clay is added, agitate at high speed (approximately 7000 - 10,000 R.P.M.) for 30 minutes.
- (8) Remove from mixer and screen thru a 100 mesh screen.
- (9) Weigh 340 g. of mixture and adjust to 26°C.
- (10) Measure viscosity on Brookfield at 10, 20, 50, 100 R.P.M. with #3 spindle.
- (11) Add to (9) .22 ml. of 50% Calgon solution (equivalent to .05%) increasing to .35% and again measure the viscosity.
- (12) Repeat (11) for a dosage of .4% and if a decrease is noted repeat (11) until an increase is noted.

This test should give datum as follows:

- (1) The reagent demand of the clay.
- (2) The viscosity characteristics to be expected, when properly correlated to the mixing conditions.

Experimental Results

(A) Aqueous viscosity testing of "Hydrite" Clay DS-20133. Georgia Kaolin Company's recommended test was used, which is not described in this report.

Moisture in clay .6%
 Used: 504 g. clay (500 g. dry basis)
 190 ml. distilled water
 3.0 ml. 50% Calgon solution

To 310 g. of the clay-water mixture added 5.6 ml. of distilled water. The specific gravity was not determined but the adjustment to 71% solids was made on a balance of materials at 26°C.

Brookfield Viscosimeter Values using #3 spindle and model RVF were:

- 4 -

<u>Dosage</u>	<u>R. P. M.</u>				
	10	20	50	100	
Test samples initially	7.0	5.75	3.6	3.0	Poises
Added .22 ml. 50% Calgon soln. to test samples	15.5	9.5	5.4	-	Poises
Added additional .22 ml. 50% Calgon soln. to test sample	20.0	12.2	6.6	-	Poises
Added additional .22 ml. 50% Calgon soln. to test sample	22.5	13.6	7.5	-	Poises

(B) Aqueous viscosity testing of China Clay, W-1, RS-4614
(satisfactory clay for Speed-Easy Flat) by the revised method described
perviously. The solids content initially was 65.5%.

Moisture in clay 1.6%

Used: 405 g. clay (400 g. dry basis)
200 ml. distilled water
2.4 ml. 50% Calgon solution

Weigh out 330 g. of clay-water mixture and adjust to 26°C.
Viscosity measurements were beyond the range of the instrument, so
the mixture was reduced to 63.5% solids by 10 ml. of distilled water.

Brookfield Viscosimeter Values using #3 spindle and model
RVF were:

<u>Dosage</u>	<u>R. P. M.</u>				
	10	20	50	100	
Test sample initially	13.5	9.75	7.7	5.9	Poises
Added .22 ml. 50% Calgon soln. to test sample	16.0	11.75	7.6	6.2	Poises
Added additional .22 ml. 50% Calgon soln. to test sample	22.0	17.0	10.8	7.3	Poises

(C) Aqueous viscosity testing of China Clay, W-1, RS-4792
(unsatisfactory clay for Speed-Easy Flat) by the revised method de-
scribed previously.

Moisture in clay 1.6%

Used: 506 g. clay (500 g. dry basis)
282 ml. distilled water
3.0 ml. Calgon solution 50%

Weighed out 340 g. of clay-water mixture and adjusted to
26°C.

Brookfield Viscosimeter Values using #3 spindle and model
RVF were:

- 5 -

<u>Dosage</u>	<u>R. P. M.</u>				
	<u>10</u>	<u>20</u>	<u>50</u>	<u>100</u>	
Test sample initially	29	21.8	15.3	-	Poises
Added .22 ml. 50% Calgon soln. to test sample	25	18.5	12.0	-	Poises
Added additional .22 ml. 50% Calgon soln. to test sample	23	16.0	10.6	8.4	Poises
Added additional .22 ml. 50% Calgon soln. to test sample	25	17.5	11.5	8.2	Poises
Added additional .22 ml. 50% Calgon soln. to test sample	27	18.0	11.9	8.2	Poises

Further experimental details can be found in Notebook #3638; pp. 151-153, 155-157, 163-165.

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