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CIRCULAR 162

OLMSTED FULLER'S EARTH

AS A BONDING CLAY FOR FOUNDRY USE

By

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Urbana, Illinois
1950

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Introduction

An important use for clays of certain types is in the bonding of molding sands in foundries. Large tonnages of bentonite clay produced in Wyoming and Mississippi, of fireclay produced in Illinois and Ohio, and of illite clay produced in Illinois are currently used for this purpose. The American Foundrymen's Association has established laboratory tests for the evaluation of clays for foundry use. The more important of these tests determine the green compression strength, dry compression strength, and flowability of mixtures of clay and clean quartz sand with varying amounts of tempering water.

In order finally to prove the worth of a clay for foundry use, it must be tried in actual foundry practice by individual foundries, because each foundry has its own peculiar practices and because certain attributes of molding sand-clay mixtures show up only when metal is actually cast in them. On the basis of determinations of green and dry compression strength, it may be determined whether or not a clay has any potential use as a foundry bonding agent. If a clay shows strength value at least equal to those of clays currently used in foundries, obviously it has potentialities for this use and is worth actual foundry trial.

The Olmsted fuller's earth occurs in the Porters Creek formation of Paleocene age which is widespread in the extreme southern portion of Illinois. It is so designated because the commercial production of the fuller's earth was at Olmsted in Pulaski County. Lamar* has described the occurrence and some of the

* Lamar, J. E., Preliminary report on the fuller's earth deposits of Pulaski County, Illinois: Ill. Geol. Survey, Rept. Inv. 15, 1928.

properties of the earth, and Grim* has described its petrography.

The object of this brief paper is to show the potential value of the Olmsted clay as a bonding clay for molding sands.

Test Results

In tables 1, 2, and 3, attached hereto, are presented determinations of the green compression strength, dry compression strength, and flowability of sand-clay mixtures of Olmsted fuller's earth and four samples of commercial bonding clay. The determinations were made according to the procedures of the American Foundrymen's

Table 1. - GREEN COMPRESSION STRENGTH, in lb./in.2

	Olmsted Clay			Commercial Bonding Clays			
Tempering water in percent	4% Clay Mixture	6% Clay Mixture	8% Clay Mixture	4% Clay A Mixture	4% Clay B Mixture	8% Clay C Mixture	8% Clay D Mixture
1.5	8	6	4	8.5	11	8.5	6
2	6	8.5	8	6	8	7	5.5
3	4	9	18	4.5	5	5	3
4	3	6	16	4	3	2	2

Clay A - Bentonite from Wyoming

Clay B - Bentonite from Mississippi

Clay C - Fireclay from Illinois

Clay D - Fireclay from Illinois

* Grim, R. E., Petrography of the fuller's earth deposits at Olmsted, Illinois, with a brief study of some non-Illinois earths: Econ. Geol. 28, pp. 344-363, 1933; Ill. Geol. Survey, Rept. Inv. 26, 1933.

Table 2. - DRY COMPRESSION STRENGTH, in lb./in.2

Tempering water in percent	Olmsted Clay			Commercial Bonding Clays			
	4% Clay Mixture	6% Clay Mixture	8% Clay Mixture	4% Clay A Mixture	4% Clay B Mixture	8% Clay C Mixture	8% Clay D Mixture
1.5	13	35		15	12	5	10
2	25	55		50	25	12	20
3	40	60	60	100 plus	50	40	40
4	50	65	80	100 plus	58	75	68

Table 3. - FLOWABILITY (Dietert)

Tempering water in percent	Olmsted Clay			Commercial Bonding Clays			
	4% Clay Mixture	6% Clay Mixture	8% Clay Mixture	4% Clay A Mixture	4% Clay B Mixture	8% Clay C Mixture	8% Clay D Mixture
1.5	91	92	90	88	86	90	88
2	86	89	88	85	84	87	88
3	84	85	84	87	86	85	85
4	85	82	75	86	85	87	87

A - Bentonite from Wyoming

B - Bentonite from Mississippi

C - Fireclay from Illinois

D - Fireclay from Illinois

Association. The tests essentially show the compression force necessary to break a small cylindrical test piece of given size prepared by ramming in a mold a mixture of clean quartz sand, clay of the proportion given in the tables, and tempering water of the proportion given in the tables. In the case of dry strength the test piece is dried under controlled conditions before being broken under compression load. Flowability is measured by the amount of compaction between certain increments of ramming in the preparation of the test cylinders.

As shown in the tables the values for a given sand-clay mixture vary considerably with the amount of tempering water used, and the amount of variation is not the same for different clays or even for the same clay if the preparation of sand and clay is varied. In order to evaluate clays, therefore, it is essential that tests for each sand-clay mixture be run at a series of moisture contents.

It is usually true that sand-clay mixtures in foundries are used with more tempering water than the amount required to give maximum green strength, because other desired properties attain an optimum at much higher moisture contents. In the tables, therefore, evaluation should be made at the higher amounts of tempering water in order to approach actual foundry evaluation.

In green compression strength, the Olmsted clay is at least the equal of three of the four commercial clays tested. Also in dry compression strength, the Olmsted clay is about equal to three of the four commercial clays. In respect to flowability, the Olmsted clay shows substantially the same test results as the other clays.

Conclusions

On the basis of the foregoing test data, the Olmsted fuller's earth has definite promise as a bonding clay for foundry use. The Olmsted clay has been used as a fuller's earth for many years, and partially as a consequence thereof, it is known to occur in a thick bed of relatively uniform quality over a considerable area in southern Illinois under conditions of ready accessibility. At Olmsted, for example, a thick, relatively uniform bed, accessibly located, has been used for fuller's earth for many years.