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DEPARTMENT OF MINES AND RESOURCES

BUREAU OF MINES

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Ottawa, December 2, 1946.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 2140.

Investigation of a Sample of Prince Edward Island Core Sand.

(Copy No. 5.)

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Introduction:

On a recent trip to Prince Edward Island, a member of the staff of these Laboratories was interested to learn that a Charlottetown iron foundry was using a local beach sand in its foundry cores, with satisfactory results. In accordance with the suggestion of this official, Col. C. L. MacKay, secretary treasurer and general manager of Bruce Stewart & Company, Limited, Charlottetown, P.E.I., forwarded a sample of the local sand, which is being used in their foundry. Tests have been made on this sand at the Physical Metallurgy Research Laboratories, to determine its character-

(Introduction, cont'd) -

istics and to compare it with core sands used in other Canadian iron foundries.

The sand sample was received on October 9, 1946. It was well sized, and was fairly free of dust, clay, and organic matter.

Method of Testing:

The sands were tested using the standard procedures of the American Foundrymen's Association (Foundry Sand Testing Handbook, 1944 Edition, A.F.A.).

Screen Test:

The results of the screen test are tabulated below:

TABLE I.

U.S. Screen No.		Per Cent Retained
30	-	0.2
40	-	0.6
50	-	5.3
70	-	44.3
100	-	44.1
140	-	4.1
200	-	0.7
270	-	0.1
Pan	-	0.2
A.F.A. Clay	-	0.3
A.F.A. Fineness No.	-	61.4
Per cent on three adjacent screens	-	94.7

Microscopic Examination:

Under the microscope, the sand grains were found to be subangular in shape. The grain surfaces were somewhat roughened. A photomicrograph of the sand appears in Figure 1.

(Figures 1 follows, on Page 3.)

(Microscopic Examination, cont'd) -

Figure 1.

X30.

P.E.I. CORE SAND.

Sand grains subangular in shape, with surfaces somewhat roughened.

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Mechanical Tests:

Mechanical tests made on the sand included core oil requirements, permeability, green bond, flowability of the core mixture, and hot strength. A sample of the sand was washed, and tests were made to compare the washed with the unwashed core sand. The following mixture was used in testing the sand:

2,000 grams sand.
20 grams cereal flour.
20 grams core oil.

3.4 per cent moisture.

Baked at 400° F. for 2 hours.

The results of these tests appear in Table II.

(Continued on next page)

(Mechanical Tests, cont'd) -

TABLE II.

	Unwashed Sand	Washed Sand
Permeability -	146	160
Green Compression p.s.i. -	0.3	0.2
Flowability -	89	89
Baked Tensile Strength, p.s.i. -	142	160
Weight of A.F.A. Specimen, grams -	158	155
Hot Strength:		
2100° F. -	0	
2200° F. -	2	
2300° F. -	2	
2400° F. -	2	

DISCUSSION:

This sand appears to be suitable as a core sand for iron or non-ferrous work. Its chief disadvantage is the somewhat low tensile strength of the baked core specimens. Most commercial core sands develop a tensile strength of between 190 and 250 p.s.i. with the same mixture as used in making these tests. Such sands would require less core oil than does the P.E.I. sand sample submitted, which has a tensile strength of 142 p.s.i. The tensile strength of the P.E.I. sand is somewhat improved by washing, but the values obtained are still lower than normal.

The low tensile strength of the baked specimens may be attributed to the angular grain shape, and the rough surface of the grains (Figure 1). The angular grain shape prevents the grains from making contact with each other, and lowers the surface contact area. The low density of the rammed A.F.A. specimens indicates that the sand does not pack

(Discussion, cont'd) -

well, and the void space left in the sand is quite large. The rough surface is also a contributing factor in the high core oil consumption, as the increased surface area absorbs more of the oil.

Elevated temperature tests on the P.E.I. sample indicates that it is refractory enough for either iron or non-ferrous work. There is incipient fusion at 2200° F., as indicated by the hot strength of 2 p.s.i. at that temperature. This incipient fusion covers a wide range, and the sand is not badly fused below 2400° F. Although the sand could be used for either malleable or grey iron castings, some trouble is likely to be experienced from "burn-on," or adhering sand, with heavy sections or with castings poured at high temperatures.

CONCLUSIONS:

1. The P.E.I. sand sample submitted is suitable for use in cores for iron or non-ferrous castings.

2. The baked tensile strength of standard core mixtures using this sand is lower than is usually obtained with most core sands.

3. Washing the sand will reduce its core oil requirements slightly.

4. The sand is refractory enough to make cores for malleable or grey iron castings. Incipient fusion in the range of 2200° F. to 2400° F. would be likely to cause trouble from "burn-on" with heavy sections, or with those poured at high temperatures.

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