O T T A W A July 25th, 1944.

IR 1689

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1689.

Concentration of Specular Hematite from the Mississagi Area, Ontario.

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Shipment:

A shipment of 1,939 pounds of specular hematite ore was received on May 10th, 1944. The shipment was made at the direction of Dr. Robert W. Brewals, 790 Eglinton Avenue West, Toronto 10, Ontario.

Location of Property:

This ore was stated to be from a property located in Township 1B, Mississagi area, approximately 32 miles north of Blind River, Ontario.

Purpose of the Investigation:

The shipment was made to determine the grade of the ore and to carry out concentration tests.

Sampling and Analysis:

The ore was crushed and sampled by standard methods and was found to contain:

Acid soluble iron	-	40.99 per cent.
Total iron	-	41.17 "
Sulphur	-	1.51 "
Phosphorus	-	0.04 "
Silica	-	37.88 "
Manganese	-	Trace.

Results of Experimental Tests:

The rather intimate association of quartz and hematite indicates that to free the minerals from each other the ore requires crushing to approximately ¼ inch.

Jig concentration is the cheapest and most practical method to concentrate hematite. However, the mineral particles must be comparatively coarse (+ 10 mesh) for successful jigging. Sizes finer than this require table concentration.

On crushing the ore to -¼ inch, due to the friable nature of specularite, 20.4 per cent of the weight of feed, containing 20 per cent of the iron, passed through a 10-mesh screen.

Jig concentration of the sizes coarser than 10 mesh, with no recrushing of the middlings and tailings from the coarser sizes, resulted in a recovery of 58.6 per cent of the iron. 35.6 per cent of the weight of feed was recovered as a concentrate assaying 62.77 per cent iron, 0.76 per cent sulphur, 0.004 per cent phosphorus, and 9.8 per cent insoluble.

Character of the Ore:

The specular hematite was dispersed through a quartz gangue in coarse to fine particles. Some of the hematite particles contained inclusions of gangue as finely divided particles. Pyrite was present also as coarse to fine crystals and grains

(Character of the Ore, cont'd) -

dispersed in the gangue.

The hematite was extremely friable.

Investigative Procedure:

The ore was crushed minus ¼ inch for concentration. A screen analysis of the ore was made. Samples were concentrated by jigging at various sizes.

EXPERIMENTAL TESTS:

Test No. 1. - Screen Analysis.

A screen analysis was made to determine the distribution of iron in the various sized fractions resulting from screening the ore on the 8, 14, 20, 35, 48, 65 and 100 mesh screens.

Product	Weight, per cent	Assays, Fe, per cent	Distribution of iron, per cent
Feed	100.0	36.26	100.0
-¼"+8 mesh	41.7	36.90	42.4
-8+14 mesh	17.0	32.63	15.3
-14+20 "	5.7	30.11	4.8
-20+35 "	10.1	30.14	8.4
-35+48 "	4.3	29.68	3.5
-48+65 "	3.3	29.78	2.7
-65+100 "	2.5	32.13	2.2
-100 "	15.4	48.80	20.7

Test No. 2. - Jig Concentration Tests.

A sample of the ore, crushed minus ¼ inch, was used for this test. The ore was screened on 6, 8, and 10 mesh screens. The screen fractions -¼ inch+6 mesh, -6+8 mesh, and -8+10 mesh were concentrated. The minus 10 mesh material resulting from crushing was sampled and assayed.

Each of the fractions was concentrated separately in

(Test No. 2, cont'd) -

a General Engineering Company 2-compartment laboratory jig. The jig was adjusted for each size of feed to give a clean hematite concentrate from the first compartment. A middling and tailing were obtained from the second compartment. This middling consisted of gangue-attached hematite. The jig bed formed in each compartment was removed after each fraction was concentrated. This was sampled and assayed in order to determine the overall assays for each test.

In practice the jig bed remains in the jig, as no jig products can be obtained until the proper jig bed is formed in each compartment.

It was noted that some slimes were formed by abrasion of the particles in the jig. This material flowed out of the jig with the overflowing water and is part of the loss sustained in jigging this type of ore.

Each of the jig products was weighed and assayed and from these results assays of the combined jig products were calculated, thus giving an indication of the overall recovery and grade of a concentrate to be expected from a mill feed of the same type.

Results of Jig Concentration Tests -

Calculated Values of Feed.

Product	Weight, per cent	Assays, per cent			Distribution, per cent		
		Fe	Insoluble	S	Fe	Insoluble	S
Feed	100.0	37.27	45.50	1.05	100.0	100.0	100.0
-¼"+6	27.3	38.07	43.00	1.02	27.9	25.8	26.6
-6+8	36.2	37.53	45.76	0.90	36.5	36.4	31.1
-8+10	16.1	36.56	47.23	0.95	15.8	16.7	14.6
-10	20.4	36.29	46.96	1.42	19.8	21.1	27.7

(Continued on next page)

(Test No. 2, cont'd) -
Results of Jig Concentration Tests, cont'd -

Jig Concentration of -¼+6 Mesh Feed.

Product	Weight, per cent	Assays, per cent			Distribution, per cent		
		Fe	Insoluble	S	Fe	Insoluble	S
Feed	100.0	38.07	43.00	1.02	100.0	100.0	100.0
Conc.	25.7	63.20	7.46	0.55	42.7	4.5	13.8
Middling	8.2	42.63	36.44	1.67	9.1	6.9	13.4
Tailing	40.5	14.33	76.84	1.04	15.2	72.3	41.2
Jig beds	25.6	48.95	27.36	1.26	33.0	16.3	31.6

Jig Concentration of -6+8 Mesh Feed.

Feed	100.0	37.53	45.76	0.90	100.0	100.0	100.0
Conc.	40.0	63.02	10.32	0.73	67.2	9.0	32.6
Middling	18.6	37.71	44.83	1.38	18.7	18.3	28.6
Tailing	27.7	9.76	84.68	0.74	7.2	51.3	22.9
Jig beds	13.7	18.89	72.02	1.05	6.9	21.4	15.9

Jig Concentration of -8+10 Mesh Feed.

Feed	100.0	36.56	47.23	0.95	100.0	100.0	100.0
Conc.	41.5	61.86	11.18	1.07	70.2	9.8	46.7
Middling	6.8	12.31	82.56	0.79	2.3	11.9	5.7
Tailing	18.5	8.27	88.24	0.47	4.2	34.6	9.2
Jig beds	33.2	25.68	62.20	1.10	23.3	43.7	38.4

Summary of the Test:

Combined Results.

Product	Weight, per cent	Assays, per cent			Distribution, per cent			Ration of concentration
		Fe	Insol.	S	Fe	Insol.	S	
Feed	100.0	37.01	45.17	1.04	100.0	100.0	100.0	
Conc.	27.9	62.77	9.80	0.76	47.3	6.1	20.5	3.58:1.
Middling	10.0	36.11	46.96	1.38	9.8	10.4	13.3	10.0:1.
Tailing	23.9	11.69	81.49	0.85	7.5	43.1	19.5	
Jig beds	17.1	33.26	50.75	1.15	15.4	19.2	18.8	
Slimes	0.7	-	-	-	-	-	-	
-10 mesh ore	20.4	36.29	46.96	1.42	20.0	21.2	27.9	

Elimination of the jig bed by calculation raised the recovery in the concentrate to 58.6 per cent of the iron in the feed.

The combined concentrate contained:

Iron	-	62.77 per cent
Sulphur	-	0.76 "
Phosphorus	-	0.004 "
Insoluble	-	9.80 "

CONCLUSIONS:

The investigation discloses that only 58.6 per cent of the iron was recovered in a concentrate assaying 62.7 per cent iron and that the concentrate contained impurities of 9.8 per cent insoluble, 0.76 per cent sulphur and 0.004 per cent phosphorus.

The middlings and tailings from the coarser sizes would have to be recrushed to free the attached particles. This would increase the recovery but the loss on the fines (minus 10 mesh) would become excessive.

This type of ore is not suited to gravity concentration, due to the characteristics and mineral associations. The higher costs of table or flotation concentration would also tend to make the operation unprofitable.

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