

*J. D. Johnston.*

O T T A W A

October 7th, 1943.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1511.

Sink-and-Float Tests on a Sample of Manganese  
Ore from Brigus, Newfoundland.

Bureau of Mines  
Division of Metallic  
Minerals

Ore Dressing  
and Metallurgical  
Laboratories

CANADA

DEPARTMENT  
OF  
MINES AND RESOURCES

Mines and Geology Branch

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Ore from Brigus, Newfoundland.

Shipments:

Three bags of ore, total weight about 200 pounds, were received on July 23rd, 1943. The samples were submitted by R. M. Macaulay, Mining Engineer, 598 Grosvenor Avenue, Westmount, Quebec, on behalf of Mr. Fernand Roy, Brigus Manganese Limited, 3421 Durocher Avenue, Montreal, Quebec.

Location of Property:

This ore was taken from a property located at Brigus, Newfoundland. Brigus is situated at the lower end of Conception Bay near the eastern extremity of the island.

Character of the Ore:

A complete description of a former shipment of ore from this property is to be found in Report of Investigation No. 1350, January 29th, 1943. The present sample, although lower in grade, is of essentially the same character.

A head sample assay of this ore, calculated from the products of a test, is as follows:

Manganese	-	27.76 per cent.
Silica	-	24.97 "

CONCLUSIONS:

On the basis of previous tests on an earlier shipment of ore it had been estimated that as much as 75 per cent of the manganese might be recovered by this process as a high-grade product low in silica if it should be found possible to treat the ore at a coarse size and so eliminate the production of a large amount of untreatable fines. It has now been found possible to treat ore up to  $1\frac{1}{2}$  inch in size, reducing the minus 8 mesh fines to about 14 per cent of the original ore, but only 59 per cent of the manganese has been recovered in a marketable product assaying 42.03 per cent Mn, 6.88 per cent  $SiO_2$ .

The present shipment of ore is lower in grade than the ore on which the original estimate of recovery was made, and this may or may not have had some influence on the low recovery obtained.

Roasting the sink product drives off carbon dioxide and water of crystallization, thus bringing up the grade of the product to 55.71 per cent Mn, 9.12 per cent  $SiO_2$ , but the lumps break down and thus wipe out the advantage to be gained by having a coarse product for sale.

Details of Investigation:

The ore was crushed to  $-1\frac{1}{2}$  inch and screened on 8 mesh. The  $-1\frac{1}{2}$ " + 8 mesh fraction was then further fractionated on a series of screens to give the following sizes:

$-1\frac{1}{2}$ " +  $1\frac{1}{4}$ "  
 $-1\frac{1}{4}$ " +  $1\frac{1}{8}$ "  
 $-1\frac{1}{8}$ " +  $7/8$ "  
 $-7/8$ " +  $3/4$ "  
 $-3/4$ " +  $5/8$ "  
 $-5/8$ " +  $1/2$ "  
 $-1/2$ " +  $3/8$ "  
 $-3/8$ " + 8 mesh.

Density separations were made on each of the above fractions, the products being weighed and assayed as reported in the size density analysis table. From an examination of this table it will be noted that all products lighter than 2.70 contain so much silica that they have to be rejected. It may also be noted that good grade products have been obtained from the coarsest fractions treated. As to the fine sizes, the loss in the reject seems high in some of the finer ones but in the absence of any other method of treatment nothing remains but to treat them by this process.

(Size-Density Analysis follows,  
on Pages 4, 5, and 6.)

SIZE-DENSITY ANALYSIS FOR BRIGUS MANGANESE ORE.

Size Fractions	-6+8 Mesh			-4+6 Mesh			-3+4 Mesh			-3/8"+3 Mesh		
	- Weight Proportions -											
DENSITY FRACTIONS	% Size frac- tion	% S.F. feed	% Size frac- tion	% S.F. feed	% Size frac- tion	% S.F. feed	% Size frac- tion	% S.F. feed	% Size frac- tion	% S.F. feed	% Size frac- tion	% S.F. feed
Float @ 2.625	75.21	3.36	68.49	3.48	60.73	3.89	55.10	4.90				
Float @ 2.675; sink @ 2.625	8.98	0.40	7.78	0.39	7.10	0.45	8.18	0.73				
Float @ 2.70; sink @ 2.675	4.30	0.19	3.31	0.17	3.50	0.22	2.75	0.24				
Sink @ 2.70	11.51	0.51	20.42	1.04	28.67	1.84	33.97	3.02				
TOTAL -	100.00	4.46	100.00	5.08	100.00	6.40	100.00	8.89				
	Assays, per cent			Assays, per cent			Assays, per cent			Assays, per cent		
	Mn	SiO <sub>2</sub>	LOI*	Mn	SiO <sub>2</sub>	LOI.	Mn	SiO <sub>2</sub>	LOI.	Mn	SiO <sub>2</sub>	LOI.
Float @ 2.625	24.70	28.24	12.08	22.36	31.12	11.15	21.11	32.15	10.74	10.40	46.21	7.32
Float @ 2.675; sink @ 2.625	28.77	23.84	15.48	25.85	26.98	13.76	21.98	32.53	11.49	18.44	36.70	10.32
Float @ 2.70; sink @ 2.675	32.34	17.61	16.96	30.56	21.81	14.89	28.16	24.34	13.58	19.20	35.79	10.20
Sink @ 2.70	40.22	6.90	23.51	40.34	7.64	23.10	39.87	8.81	22.66	40.03	9.02	22.98

\* Loss on Ignition.

SIZE-DENSITY ANALYSIS FOR BRIGUS MANGANESE ORE, CONTINUED.

Size Fractions	-1/2" + 3/8"			-5/8" + 1/2"			-3/4" + 5/8"			-7/8" + 3/4"		
	- Weight Proportions -											
DENSITY FRACTIONS	% Size frac- tion	% S.F. feed	% Size frac- tion	% S.F. feed	% Size frac- tion	% S.F. feed	% Size frac- tion	% S.F. feed	% Size frac- tion	% S.F. feed		
Float @ 2.625	48.58	6.30	44.93	5.11	37.05	4.06	37.94	4.30				
Float @ 2.675; sink @ 2.625	8.23	1.07	4.02	0.46	7.10	0.78	6.29	0.71				
Float @ 2.70; sink @ 2.675	2.74	0.36	1.32	0.15	1.68	0.18	2.87	0.32				
Sink @ 2.70	40.45	5.25	49.73	5.65	54.17	5.93	52.90	5.99				
TOTAL	100.00	12.98	100.00	11.37	100.00	10.95	100.00	11.32				
	Assays, per cent			Assays, per cent			Assays, per cent			Assays, per cent		
	Mn	SiO2	LOI*	Mn	SiO2	LOI	Mn	SiO2	LOI	Mn	SiO2	LOI
Float @ 2.625	15.63	40.78	8.28	15.48	41.72	8.70	11.10	47.66	8.02	12.98	46.02	8.73
Float @ 2.675; sink @ 2.625	19.11	36.64	10.64	13.04	43.92	8.79	11.73	46.81	7.65	16.87	41.98	9.59
Float @ 2.70; sink @ 2.675	26.23	28.52	12.45	33.30	22.78	12.54	6.73	30.71	6.34	18.28	40.72	9.39
Sink @ 2.70	42.22	6.38	24.75	42.22	6.28	25.21	42.37	6.03	25.53	40.97	8.01	24.88

\* Loss on Ignition.

SIZE-DENSITY ANALYSIS FOR BRIGUS MANGANESE ORE, CONTINUED.

Size Fractions	-1" + 7/8"		-1 1/4" + 1"		-1 1/2" + 1 1/4"		Total		
	- Weight Proportions -								
DENSITY FRACTIONS	% Size frac- tion	% S.F. feed	% Size frac- tion	% S.F. feed	% Size frac- tion	% S.F. feed	% Size frac- tion	% S.F. feed	
Float @ 2.625	30.83	2.66	28.98	2.39	40.24	4.69	45.13	45.14	
Float @ 2.675; sink @ 2.625	8.26	0.71	4.56	0.38	11.42	1.33	7.41	7.41	
Float @ 2.70; sink @ 2.675	-	-	-	-	0.92	0.11	1.95	1.94	
Sink @ 2.70	60.91	5.27	66.46	5.49	47.42	5.52	45.51	45.51	
TOTAL	100.00	8.64	100.00	8.26	100.00	11.65	100.00	100.00	
	Assays, per cent			Assays, per cent			Assays, per cent		
	Mn	SiO <sub>2</sub>	LOI*	Mn	SiO <sub>2</sub>	LOI	Mn	SiO <sub>2</sub>	LOI
Float @ 2.625	18.45	35.97	10.92	14.85	42.05	9.64	15.95	40.95	9.65
Float @ 2.675; sink @ 2.625	28.91	26.11	13.36	7.15	49.04	6.94	4.77	51.37	5.68
Float @ 2.70; sink @ 2.675	-	-	-	-	-	-	46.18	6.16	16.56
Sink @ 2.70	42.53	6.36	24.80	43.47	6.04	24.49	42.84	7.02	23.98

\* Loss on Ignition.

(Details of Investigation, cont'd) -

The following table has been compiled from the size-density analysis by collecting and averaging together all products lighter than 2.70 and all those heavier than 2.70. The resulting table gives figures for grade and recovery in the products of a separation at 2.70 on ore in the size range  $-1\frac{1}{2}''+8$  mesh.

Summary of Results

Product	Weight,		Assays,		DISTRIBUTION,	
	per cent	per cent	Mn	SiO <sub>2</sub>	Mn	SiO <sub>2</sub>
-8 mesh fines	14.20	25.39	26.34	12.99	14.98	
Float @ 2.70	46.75	16.56	39.66	27.89	74.26	
Total reject	60.95	18.62	36.55	40.38	89.24	
Sink @ 2.70	39.05	42.03	6.88	59.12	10.76	
Feed (cal.)	100.00	27.76	24.97	100.00	100.00	
Sink @ 2.70, roasted	29.46	55.71	9.12	59.12	10.76	

This table shows that almost 75 per cent of the silica has been eliminated in the float at 2.70 while only 10.76 per cent of it remains with the sink product.

A loss in weight of 24.56 per cent on roasting the sink product is indicated, but unfortunately the particles break down rather badly and any advantage to be had by having a coarse product for sale is largely nullified by this operation.

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