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DIVISION OF ORE DRESSING AND
METALLURGY

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REPORT OF ORE DRESSING & METALLURGICAL LABORATORIES

Test No. 121.

A shipment of manganese ore weighing 2000 pounds was received April 9th, 1919, at the Testing Plant of the Ore Dressing and Metallurgical Division, from A.A.Hassan, 120 Broadway, New York, N.Y. The ore was from the Tenecape Manganese Mine, Kennetcooke Station, Nova Scotia, and consisted mainly of pyrolusite in a gangue of calcite.

A concentration test was desired on this ore to produce a product running 48% Manganese or over, and to obtain as high a recovery as possible.

The ore was in two lots, a low grade lot from the mine called Lot No. 1., and a higher grade lot from the mine dumps called Lot No. 2. Both lots were weighed and crushed to $\frac{1}{4}$ ". Lot No. 1. weighed 1193 pounds, and Lot No. 2 weighed 774 pounds. By means of a Jones sampler 66 pounds were cut out of Lot No. 1. and 45 pounds out of Lot No. 2., each quantity crushed to -30 mesh, and a small head sample taken out for analysis. This gave the following,-

	<u>Lot No.1.</u>	<u>Lot No.2.</u>
Moisture	2.22%	2.79%
Manganese	11.73%	20.34%
Iron	2.95%	2.65%
Silica	3.35%	3.15%
Phosphorus	.70%	.025%

Test No.1

121

By means of a Jones sampler, 7117 grams of Lot No. 1 and 4871 grams of Lot No. 2 were cut out of the -30 mesh material. These quantities were screened on 40 and 50 mesh making 3 sizes in each lot. All these sizes were weighed and run separately over a small Wilfley table making a concentrate, a middling, and a tailing. These products were caught in settling boxes, and the overflow from the boxes was run to a tank where the slime was allowed to settle out. The settling boxes were cleaned after running each lot and the slime tank was cleaned only after running all the lots. All the products from the tabling were dried, weighed, and sampled. The following table gives the data obtained from this first test.

Small WILFEEY TABLE TEST.

Product.	Wt. Gms.	% Mn.	Gms. Mn.	Recovery.
#1 , -30+40 Conc.	179.	24.95	44.66	30.2
#1 , -30+40 Midd.	260.	17.59	45.73	
#1 , -30+40 Tails.	1298.	3.41	44.26	
-30+40 Slimes			13.40	
#1 , -40+50 Conc.	175.	34.45	60.29	36.1
#1 , -40+50 Midd.	180.	15.59	28.06	
#1 , -40+50 Tails	981.	4.15	40.71	
-40+50 Slimes			37.87	
#1 , -50 Conc.	548.	38.39	210.38	37.3
#1 , -50 Midd	200.	11.43	22.86	
#1 , -50 Tails	1774.	6.24	110.70	
-50 Slimes			220.64	
#2 , -30+40 Conc.	143.	37.80	54.05	55.4
#2 , -30+40 Midd	192.	12.45	23.90	
#2 , -30+40 Tails	373.	3.70	13.80	
-30+40 Slimes			5.89	
#2 , -40+50 Conc.	216.	39.80	85.97	61.3
#2 , -40+50 Midd.	180.	13.65	24.57	
#2 , -40+50 Tails	450.	4.95	22.27	
-40+50 Slimes			7.50	
#2 , -50 Conc.	783.	47.65	373.10	52.7
#2 , -50 Midd.	119.	18.70	22.25	
#2 , -50 Tails	1290.	9.70	125.13	
-50 Slimes			187.59	
#1 & #2 Slimes	1322.	19.52	258.05	
#1 & #2 Loss	1325.	16.21	214.64	
T O T A L	11988.	15.23	1825.58	
#1.	1812 1548 3757	7117.	11.73	834.82
#2.	741 888 3242	4871.	20.34	990.76

Test No. 2.

A reserve portion of the $\frac{1}{2}$ " size was cut out of each lot and the remainder of the $\frac{1}{2}$ " size and the remainder of the 30 mesh size of each lot were added together to be used in Test No. 2. This gave the following weights for the test, -

Lot No. 1 1003 lbs.
 Lot No. 2 651 Lbs.

These amounts were dried, the weights after drying being, -

Lot No. 1 989.5 lbs.
 Lot No. 2 642.5 lbs.

Each lot of ore was then ground separately in a ball mill fitted with 40 mesh screens. The weights obtained from the mill were, -

Lot No. 1 964 lbs.
 Lot No. 2 628 lbs.

Each of these lots were sampled for chemical analysis and a 4 pound sample was taken from Lot No. 1 for screen analysis. The screen analysis gave, -

	Screen.	Wt.Gms	%	Cumulative %
All passed	8			
Retained on	10	3	.17	.17
" "	14	6	.34	.51
" "	20	11	.62	1.13
" "	28	135	7.60	8.73
" "	35	416	23.42	32.15
" "	48	200	11.26	43.41
" "	65	205	11.54	54.95
" "	100	184	10.36	65.31
" "	150	157	8.84	74.15
" "	200	130	7.32	81.47
Pass	200	329	18.53	
TOTALS		1776	100.00	

Both lots were run over a large Wilfley table making a concentrate, a middling, and a tailing. The middling was rerun, the resulting concentrate going in with the first concentrate, and the tailing with the first tailing. The over-flow

from the tailing settling box was pumped to a tank and the slime allowed to settle out. The tailings from each lot were separated in a launder classifier into sand and slime, the slime being run to the tank which had taken the overflow from the tailing settling box. The settling boxes were cleaned out after tabling each lot, and the slimes from each lot were allowed to collect together in the one tank. All the products except the slimes were dried. The middlings from both lots were screened on 40 mesh. The concentrates, the two sizes of middlings, and the tailings were then weighed and sampled. The concentrate from Lot No. 1 was screened on 40 mesh and the resulting sizes weighed and sampled.

The slime collected in the tank in the above operations was run onto the large Wilfley table and separated into a concentrate, a middling, and a tailing. The tailing was pumped to waste and the concentrate and middling were collected, and dried. The middling was weighed and sampled, and the concentrate was sized and each size weighed and sampled.

The following table shows the data and results obtained from this test .-

LARGE WILFLEY TABLE TEST ON LOT 1.

Product	Wt. Lbs.	Mn %.	Mn Lbs.	% Mn value.	% by wt.
Conc -40 } Conc +40 }	101.5	39.10	39.686	36.10	10.57
Midd -40	12.5	35.50	4.437	4.04	1.30
Midd +40	15.5	22.20	3.441	3.13	1.62
Tails	490.0	3.04	14.896	13.55	51.04
Slime	340.5	13.94	47.460	43.18	35.47
HEADS	960.0	11.45	109.920	100.00	100.00

LARGE WILFLEY TABLE TEST ON LOT 2.

Conc.	125.5	48.55	60.930	48.39	19.98
Midd -40	20.0	49.15	9.830	7.81	3.19
Midd +40	9.5	24.50	2.327	1.85	1.51
Tails	253.0	4.80	12.144	9.64	40.29
Slimes	220.0	18.49	40.683	32.31	35.03
HEADS	628.0	20.05	125.914	100.00	100.00

LARGE WILFLEY TABLE TEST ON SLIMES LOT 1 and 2.

Conc.	10.5	41.22	4.328	4.91	1.87
Midd	32.5	36.23	11.775	13.36	5.80
Tails & Loss	517.5	13.92	72.040	81.73	92.33
TOTAL	560.5	15.73	88.143	100.00	100.00

SCREEN TEST ON CONCENTRATES LOT 1.

Size				
-40	54.5	40.35	21.991	
+40	45.0	38.80	17.460	
Loss	2.0	11.75	.235	
TOTAL	101.5	39.10	39.686	

SCREEN TEST ON CONCENTRATES FROM SLIMES.

Size.	Wt. Gms.	Mn %	Mn Gms.
+35	146.	34.74	50.720
+48	104.	34.60	35.984
+65	81.	32.67	26.463
+100	84.	34.90	29.316
+150	126.	40.80	51.408
+200	138.	46.94	64.777
-200	415.	46.34	192.311
	1094.	41.22	450.979

Test No. 3.

The reserve portion consisted of,-

Lot No. 1. 140 lbs.

Lot No. 2. 84.5 lbs.

This reserve was used for test No. 3. The ore of each lot was dried and crushed to pass 50 mesh, and then screened on 100. The different sizes of each lot were then sampled, weighed and run separately over the large Wilfley table making a concentrate, middling, and a tailing. The resulting products were collected, dried, and sampled.

The following table show the data and results obtained from this test, the slimes being figured out by differences ,-

LARGE WILFLEY TABLE TEST ON LOT 1 -50+100.

Product.	Wt.Lbs.	Mn%.	Mn.Lbs.	% Mn Value.	% by wt.
Conc.	7.0	35.85	2.51	52.2	12.4
Midd.	.7	13.90	.10	2.1	1.2
Tails	43.0	3.58	1.54	32.0	76.1
Slimes	5.8	11.38	.66	13.7	10.3
HEADS	56.5	8.51	4.81	100.0	100.0

LARGE WILFLEY TABLE TEST ON LOT 1 -100.

Conc.	12.5	40.60	5.07	46.4	15.7
Midd.	1.0	26.75	.27	2.5	1.3
Tails	40.0	6.45	2.58	23.6	50.3
Slimes	26.0	11.58	3.01	27.5	32.7
HEADS	79.5	13.75	10.93	100.0	100.0

LARGE WILFLEY TABLE TEST ON LOT 2, -50+100.

Conc.	6.2	43.80	2.72	62.1	21.4
Midd	1.0	19.60	.20	4.6	3.4
Tails	18.5	4.25	.79	18.0	63.8
Slimes	3.3	20.30	.67	15.3	11.4
HEADS	29.0	15.10	4.38	100.0	100.0

LARGE WILFLEY TABLE TEST ON LOT 2 -100.

Conc.	14.0	49.08	6.87	54.0	25.5
Midd.	1.0	27.18	.27	2.1	1.8
Tails.	22.5	1.05	.24	1.9	40.9
Slimes	17.5	30.58	5.35	42.0	31.8
HEADS	55.0	23.15	12.73	100.0	100.0

Conclusions:-

(1) The results of the tests show that the recovery of the manganese values in the ores are low. A number of manganese ores from the Maritime provinces have been received for test purposes in carload lots and smaller lots, and in all cases gravity concentration has shown a low recovery of the manganese values.

(2) The Grade of concentrates produced on this particular ore is low and could only be used for metallurgical purposes. A small quantity of high grade concentrates suitable for chemical purposes could be cut out but the grade of the remaining concentrate would be lowered.

(3) Recoveries and grade of concentrates obtained depend on the grade of the ore. The higher the grade the better recovery and grade of concentrate. This holds good on all the manganese ores tested from the Maritime provinces. There is a slight difference in some cases in the crystallization of the pyrolusite. The finer the crystallization, the finer the grinding necessary and therefore the greater loss in slimes.

(4) High recoveries and high grade products can be obtained from manganese ores by wet chemical methods and precipitation by electrolysis but these methods would be prohibited on low grade ores.