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DEPARTMENT OF MINES AND TECHNICAL SURVEYS

OTTAWA

MINES BRANCH INVESTIGATION REPORT IR 62-115

**INVESTIGATION OF IRON ORE
SUBMITTED BY WESTERN FERRIC ORES
LIMITED, VANCOUVER, B. C.**

by

W. S. JENKINS

MINERAL PROCESSING DIVISION

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INVESTIGATION OF IRON ORE SUBMITTED BY
WESTERN FERRIC ORES LIMITED, VANCOUVER, B.C.

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W. S. Jenkins*

SUMMARY OF RESULTS

The analysis of the head sample was, iron 47.3%, HCl sol iron 44.8%, titanium dioxide $<$ 0.10%, phosphorus pentoxide 0.031%, sulphur 0.25%, copper 0.01%.

Magnetic concentration of the ore was made at grinds of -10 m, -20 m, -35 m, -65 m and -200 m. The concentrates assayed, iron 56.37%, 57.58%, 61.65%, 65.66% and 67.74% respectively. The recoveries of iron were 93.8%, 96.2%, 89.1%, 91.2% and 93.3% respectively. The ratios of concentration were 1.46:1, 1.3:1, 1.7:1, $\frac{1}{2}$, 6:1, and 1.6:1 respectively.

Magnetic concentrate ground from -20 m to -150 m and reconcentrated assayed, iron 69.22%, titanium dioxide 0.12%, phosphorus pentoxide $<$ 0.005% sulphur 0.116%, silica 1.44%. The recovery of iron was 88.1% at a ratio of concentration of 1.86:1.

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INTRODUCTION

Shipment

On August 27, 1962, a shipment of iron ore, net weight 260 lb, was received at the Mineral Processing laboratories from Western Ferric Ores Limited (N.P.L.) 1718 West 5th Ave., Vancouver, B.C. The shipment was submitted by C.F. Millar, P.Eng. of Western Ferric Ores Ltd., P.O. Box 4183, Station D, Vancouver 9, B.C.

Purpose of Investigation

In his letter of July 19, 1962, Mr. Millar said that the purpose of the investigation was to determine the grind required to produce a magnetic concentrate of at least 58% Fe and preferably a 61% Fe grade, and to determine the presence of sulphides and if the sulphides would require removal from the magnetic concentrate.

Location of the Property

Western Ferric Ores Ltd., owns the Crown Prince claim (Lot 456) situated on the west coast of Vancouver Island, near Sechart Channel on Barkley Sound. Mr. Millar stated that the deposit was described in "Iron Ores of Canada" by Young and Uglow, (pp 206-209), Volume 1, British Columbia and the Yukon, Geological Survey of Canada, Economic Geology, Series No. 3.

Description of the Property

In his letter, dated July 30, 1962, Mr. Millar gave the following description:

"The Crown Prince claim had some 100 feet of tunnelling and considerable stripping done before 1902. Since that time the property has been idle, save geophysical work by several companies including ourselves. We conducted a dip needle survey and rough geophysical map of the claim area, prior to our purchasing of same in 1960".

"The dip needle anomaly measures roughly 150 ft by 400 ft and rock exposures within this zone show a magnetic-skarn mix of roughly 50:50 or perhaps 40:60 by volume. Quantities of this material are presently estimated at 500,000 tons available by open pit mining, possibly double that by underground mining".

SAMPLING AND ANALYSIS OF SHIPMENT

After samples of the shipment were selected for a mineralogical examination by the Mineral Sciences Division, Mines Branch, the ore was crushed and a head sample was obtained for chemical analysis and a semi-quantitative spectrographic analysis.

TABLE 1

Chemical Analysis* of the Head Sample

	%
Iron (total)	47.30
Iron, (HCl soluble)	44.80
Titanium dioxide	<0.10
Phosphorus pentoxide	0.031
Sulphur	0.25
Copper	0.01

*From Internal Report MS-AC-62-1001

TABLE 2

Semi-Quantitative Spectrographic Analysis**
of Head Sample

Constituents in order of decreasing abundance

Major	Fe,
Intermediate	Si, Ca, Al
Minor	Mg, Mn
Trace	Ti, V, Cu, Ni, Co, Cr, Na, Zn

**From Internal Report MS-AC-62-1037 and
S1-62-232

MINERALOGICAL EXAMINATION

The mineralogical examination was made by Dr. W. Petruk, Mineralogy Section, Mineral Sciences Division, Mines Branch, Department of Mines and Technical Surveys, Ottawa, Canada.

The results were reported in the Mines Branch Investigation Report IR 62-84, "Mineralogical Examination of an Iron Ore from Crown Prince Claim on Vancouver Island, B.C. for Western Ferric Ores, Limited," dated November 1, 1962.

Copies of this report have been sent to Western Ferric Ores Limited.

GENERAL PROCEDURE AND RESULTS

Samples of the ore were magnetically concentrated at grinds of -10 m, -20 m, -35 m, -65 m, -150 m and -200 m. -20 m concentrate was reground and reconcentrated at -150 m.

TABLE 3

Summary of Results of Magnetic Concentration

Test	Grind	Weight % of Conc	Analysis of Conc %**					Recovery of Iron %	R/C
			Fe	TiO ₂	P ₂ O ₅	S	SiO ₂		
1	-200 m	61.6	67.74	0.12	0.030	0.12	2.44	93.3	1.6:1
2	-10 m	68.4	56.37	0.16	0.032	0.20	8.76	93.8	1.46:1
3	-35 m	60.4	61.65	0.10	0.028	0.13	5.92	89.1	1.7:1
4*	-65 m	63.8	65.66	0.17	0.025	0.12	3.60	91.2	1.6:1
5	-20 m Conc reground	74.5	57.51	0.10	0.04	0.19	7.96	96.2	1.34:1
	-150 m Conc	53.9	69.22	0.12	0.005	0.116	1.44	88.1	1.86:1

*Copper in conc 0.005%

**From Internal Reports MS-AC-62-1008, 1197

DETAILS OF TESTS

Test 1 Magnetic Concentration by Davis Tube

A portion of the head sample, ground to -200 m, was concentrated by the Davis tube separator. A concentrate and a tailing were produced.

TABLE 4

Results of Magnetic Concentration of -200 m Ore by the
Davis Tube

Product	Weight, %	Analysis, %**		Distn, % Fe	R/C
		Fe	SiO ₂		
Feed*	100.0	44.74		100.0	
Mag conc	61.6	67.74	2.44	93.3	1.6:1
Tailing	38.4	7.84	-	6.7	

*Calculated

**From Internal Report MS-AC-62-1258

R/C = Ratio of Concentration

Additional analyses of the conc;

TiO₂ 0.12%, S 0.12%, P₂O₅ 0.030%

Test 2 Magnetic Concentration of -10 m Ore
by Ball-Norton Separator

A sample of -10 m ore was concentrated by a Ball-Norton dry belt separator. The products of the test were a concentrate and a tailing.

TABLE 5

Results of Magnetic Concentration of -10 M Ore

Product	Weight, %	Analysis, %**		Distn, % Fe	R/C
		Fe	SiO ₂		
Feed*	100.0	41.1		100.0	
Mag conc	68.4	56.37	8.76	93.8	1.46:1
Tailing	31.6	8.03	-	6.2	

*Calculated

**From Internal Report MS-AC-62-1197

Additional analyses of the conc:

S 0.20%, TiO₂ 0.16%, P₂O₅ 0.032%

Test 3 Magnetic Concentration of -35 m Ore
by Jeffrey-Steffensen Separator

A sample of -35 m ore was concentrated by a Jeffrey-Steffensen wet drum separator. The products were a concentrate, a middling, and a tailing.

TABLE 6

Results of Magnetic Concentration of -35 m Ore

Product	Weight, %	Analysis, %**		Distn, % Fe	R/C
		Fe	SiO ₂		
Feed*	100.0	41.8		100.0	
Mag conc	60.4	61.65	5.92	89.1	1.7:1
Midd	4.7	43.98	-	5.0	
Tailing	34.9	7.15	-	5.9	

*Calculated

**From Internal Report MS-AC-62-1197

Additional analyses of the conc:

S 0.13%, TiO₂ 0.10%, P₂O₅ 0.028%

Test 4 Magnetic Concentration of -65 m Ore
by Jeffrey-Steffensen Separator

A sample of -65 m ore was concentrated by the Jeffrey-Steffensen separator which produced a concentrate, a middling and a tailing. A screen sizing test was made on the concentrate.

TABLE 7

Results of Magnetic Concentration of -65 M Ore

Product	Weight, %	Analysis, %**			Distn, % Fe	R/C
		Fe	TiO ₂	SiO ₂		
Feed*	100.0	45.91			100.0	
Mag conc	63.8	65.66	0.17	3.60	91.2	1.6:1
Midds	3.4	46.80	-	-	3.5	
Tailing	32.8	7.42	-	-	5.3	

*Calculated

**From Internal Report MS-AC-62-1008

Additional analysis on conc:

S 0.12%, Cu 0.005%, P₂O₅ 0.025%

TABLE 8

Screen Test on Magnetic Concentrate

Mesh	Wt %
+65	0.8
+100	11.3
+150	15.2
+200	16.0
+325	22.0
-325	34.7
	100.0

Test 5 Magnetic Concentration of -20 M Ore.Minus 20 M
Concentrate Ground to -150 M and Reconcentrated

A sample of -20 m ore was concentrated by a Crockett laboratory wet belt separator. The concentrate was reprocessed. The products were a concentrate, a middling from reprocessing the concentrate and a tailing. A portion of the cleaned concentrate was stage ground to -150 m and reconcentrated by the Jeffrey-Steffensen wet drum separator. The products of the Jeffrey-Steffensen separator were a concentrate, a middling and a tailing.

TABLE 9

Results of Magnetic Concentration

Feed -20 m ore

Product	Weight, %		Analysis, %**			Distn %		R/C
	In test	In orig feed	Fe	TiO ₂	SiO ₂	In test Fe	In orig feed Fe	
Feed*	100.0	/	44.56			100.0	/	1.34:1
Mag conc -20m	74.5	/	57.51	0.10	7.96	96.2	/	
Midd	2.2	/	9.64	-	-	0.5	/	
Tailing	23.3	/	6.45	-	-	3.3	/	
Combined midd & tailing*	25.5	/	6.72	-	-	3.8	/	
Reconcentration of -20 m Concentrate ground to -150 m								
Feed*	100.0	74.5	54.61			100.0	96.2	1.86:1
Mag conc -150m	72.3	53.9	69.22	0.12	1.44	91.6	88.1	
Midd	2.8	2.1	57.99	-	-	3.0	2.9	
Tailing	24.9	18.5	11.77	-	-	5.4	5.2	
Combined* conc & midd	75.1	56.0	68.76	-	-	94.6	91.0	1.79:1

*Calculated

**From Internal Report MS-AC-62-1197, 1258

Additional analyses of both concentrates

	-20 m conc	-150 m conc
Sulphur	0.19 %	0.116 %
Phosphorus pentoxide	0.04 %	<0.005 %
Copper	0.005%	0.002 %
Insol	-	2.18 %

CONCLUSIONS

The results of the investigation showed that the required grade of 61% iron could be made at a grind of -35 m. The -35 m concentrate assayed, iron 61.65%, titanium dioxide 0.10%, phosphorus pentoxide 0.028%, sulphur 0.13% and silica 5.92%.

Finer grinds released more silica but had little effect on eliminating titanium dioxide and sulphur. The phosphorus pentoxide was found to be approximately 0.03% in all the concentrates except the -150 m concentrate produced from reground -20 m concentrate. It is expected that sintering or

pelletizing the concentrate would eliminate most of the remaining sulphur.

ACKNOWLEDGEMENTS

The chemical and spectrographic analyses were made in the Mineral Sciences Division. The spectrographic analysis was made by Miss E. M. Kranck, Spectrographic Laboratory, Dr. A. H. Gillieson, Head. The chemical analyses of the ore and test products were made in the Analytical Chemistry Subdivision by D. J. Charette, F. W. Brethour, J. Hole, H. Lauder, W. L. Chase, Section Head for Mr. W. R. Inman, Chief Chemist.