CANADA

DEPARTMENT OF ENERGY, MINES AND RESOURCES

OTTAWA

MINES BRANCH INVESTIGATION REPORT IR 66-99

WORK INDEX DETERMINATION OF SILICIFIED PORPHYRY ORE FROM EAST MALARTIC MINES LIMITED, NORRIE, QUEBEC

by

T.F. BERRY

MINERAL PROCESSING DIVISION

NOTE: THIS REPORT RELATES ESSENTIALLY TO THE SAMPLES AS RECEIVED. THE REPORT AND ANY CORRESPONDENCE CONNECTED THEREWITH SHALL NOT BE USED IN FULL OR IN PART AS PUBLICITY OR ADVERTISING MATTER.

COPY NO. 10

1867 1967

DECEMBER 6, 1966

Industrial Confidential

Mines Branch Investigation Report IR 66-99

WORK INDEX DETERMINATION OF SILICIFIED PORPHYRY ORE FROM EAST MALARTIC MINES LIMITED, NORRIE, QUEBEC

by

T. F. Berry*

- - - - -

SUMMARY OF RESULTS

The East Malartic silicified porphyry ore had a calculated average comparative work index of 21.3 kWh/short ton.

---

*Technical Officer, Non-Ferrous Minerals Section, Mineral Processing Division, Mines Branch, Department of Energy, Mines and Resources, Ottawa, Canada.

INTRODUCTION

On August 8, 1966 Mr. J. W. Keyes, Mill Superintendent of East Malartic Mines Limited, Norrie, Quebec, asked the Mineral Processing Division of the Mines Branch to determine the grindability of a sample of silicified porphyry ore.

Shipment

A 50 lb sample of silicified porphyry ore was received from the Extraction Metallurgy Division of the Mines Branch and the investigation was given the project number MP-OD-6619.

DETAILS OF INVESTIGATION

A quantity of the East Malartic ore and a reference ore was crushed to -10 mesh and samples of each of these ores were handled according to the Mines Branch procedure[1]. The results which were obtained are shown in Tables 1 and 2. These results were plotted on log-log paper (microns vs percent passing) and from these curves the 80% passing points for "F" and "P" in microns for the ball mill feeds and products respectively were recorded in Table 3.

Using this information in the equation developed by F. C. Bond[2]

$$Wi\left(\frac{10}{\sqrt{P}} - \frac{10}{\sqrt{F}}\right) = Wi_a\left(\frac{10}{\sqrt{P_a}} - \frac{10}{\sqrt{F_a}}\right) \quad \text{where}$$

subscript "a" refers to reference ore, a calculated comparative work index for the East Malartic ore was determined.

TABLE 1

Results of Screen and Infrasizer Tests on Reference Ore

Particle Size	Feed		15 min		25 min		35 min	
	% ret	% Pass	% ret	% Pass	% ret	% Pass	% ret	% Pass
+10 mesh	0.5	99.5	-	-	-	-	-	-
+14 "	21.6	77.9	-	-	-	-	-	-
+20 "	18.0	59.9	-	-	-	-	-	-
+28 "	12.3	47.6	0.3	99.7	-	-	-	-
+35 "	9.8	37.8	0.3	99.4	-	-	-	-
+48 "	6.7	31.1	1.8	97.6	-	-	-	-
+65 "	6.3	24.8	11.3	86.3	0.7	99.3	0.1	99.9
+100 "	5.2	19.6	17.8	68.5	7.2	92.1	2.0	97.9
+150 "	3.5	16.1	12.4	56.1	12.6	79.5	7.8	90.1
+200 "	3.4	12.7	13.7	42.4	16.0	63.5	14.4	75.7
+325 "	2.4	10.3	9.4	33.0	-	-	-	-
-325 "	10.3	-	33.0	-	-	-	-	-
+56 microns	-	-	-	-	4.3	59.2	6.1	69.6
+40 "	-	-	-	-	12.4	46.8	14.1	55.5
+28 "	-	-	-	-	8.9	37.9	10.8	44.7
+20 "	-	-	-	-	7.7	30.2	9.3	35.4
+14 "	-	-	-	-	6.0	24.2	7.0	28.4
+10 "	-	-	-	-	4.6	19.6	5.5	22.9
-10 "	-	-	-	-	19.6	-	22.9	-
Total	100.0	-	100.0	-	100.0	-	100.0	-

TABLE 2

Results of Screen and Infrasizer Tests on East Malartic Ore

Particle Size	Feed		15 min		25 min		35 min	
	% ret	% Pass	% ret	% Pass	% ret	% Pass	% ret	% Pass
+10 mesh	0.9	99.1	-	-	-	-	-	-
+14 "	22.8	76.3	-	-	-	-	-	-
+20 "	25.8	50.5	-	-	-	-	-	-
+28 "	17.0	33.5	0.3	99.7	-	-	-	-
+35 "	10.2	23.3	1.2	98.5	-	-	-	-
+48 "	5.9	17.4	5.2	93.3	0.1	99.9		
+65 "	4.6	12.8	18.2	75.1	2.0	97.9	0.4	99.6
+100 "	3.4	9.4	17.7	57.4	12.6	85.3	3.9	95.7
+150 "	2.2	7.2	12.1	45.3	13.5	71.8	10.0	85.7
+200 "	1.8	5.4	11.4	33.9	16.5	55.3	15.6	70.1
+325 "	1.3	4.1	7.8	26.1	-	-	-	-
-325 "	4.1	-	26.1	-	-	-	-	-
+56 microns	-	-	-	-	4.0	51.3	6.9	63.2
+40 "	-	-	-	-	12.0	38.3	13.7	49.5
+28 "	-	-	-	-	8.5	30.8	10.2	39.3
+20 "	-	-	-	-	6.9	23.9	9.0	30.3
+14 "	-	-	-	-	5.8	18.1	7.3	23.0
+10 "	-	-	-	-	4.6	13.5	5.6	17.4
-10 "	-	-	-	-	13.5	-	17.4	-
Total	100.0	-	100.0	-	100.0	-	100.0	-

TABLE 3

80% Passing Points of Feeds (F) and Products (P) and Calculated Work Indices

Sample	Reference Ore Microns	East Malartic Ore Microns	Work Index kWh/short ton
Feed	1225	1275	
15 min grind	191	230	20.2
25 " "	110	133	22.2
35 " "	76	88	21.4

CONCLUSIONS

When compared against a reference ore of known work index (19.5 kWh/short ton) the East Malartic silicified porphyry ore had a calculated average work index of 21.3 kWh/short ton.

REFERENCES

1. Berry, T. F. and Bruce R. W., "A Simple Method of Determining the Grindability of Ores", Proceedings of the Third Annual Meeting of the Canadian Gold Metallurgists, Jan. 1966, pp 41-49, Can. Min. Journal July 1966, Vol. 87, No. 7 pp. 63-65.

2. Bond F. C. "The Third Theory of Comminutation", A. I. M. E. Trans., 1952, pp. 193, 484. Mining Engineering May 1952.

TFB:cc