Bond Work Index Report

1. Objective

The grindability test determines the hardness of the ore and the Work Index obtained is important in the design of a grinding circuit. The Work Index is used when determining the size of the mill and grinding power required to produce the required ore throughput in a ball mill.

2. Procedure

2.1. Bond Ball Mill Grindability

The sample was crushed to 100% passing 6 mesh (3.35mm), from this a 700 cc volume was measured and weighed to be used as feed for the Bond Mill. A feed particle size analysis was performed to determine feed P80 and % -106 micron.

The sample was milled for 100 revolutions and passed over a 150 mesh (106µm) sieve, the undersize was removed from the samples, weighed, and new sample was added to the feed to maintain the initial sample weights. The number of rotations for the next milling was calculated based on the undersize sample weights. This was repeated until the milling produced stable results for three consecutive cycles.

The Work Index was calculated based on the results of the test.

3. Results

3.1. Bond Grindability

The grindability was calculated to be 1.21 g net undersize/revolution by averaging the results from the last 3 runs on the Bond Mill. The grindability is defined as the ease at which a mineral particle is reduced to a predetermined size and used to calculate the Work Index.

The feed and final undersize particle size analysis as well as the grindability test data sheet are found in the appendix.

The work index was calculated to be **14.6 KWh/t** using the following equation:

$$W_i = \frac{44.5}{P_i^{0.23}} \times G_{bg}^{0.82}\left[\frac{10}{\sqrt{P_{80}}} - \frac{10}{\sqrt{F_{80}}}\right]$$

Where:

F80 is the size in microns at which 80 percent of the new feed to ball mill passes

P80 is the size in microns at which 80 percent of the last cycle sieve undersize product passes

Pi is the sieve opening in microns

G is the grindability (net undersize g /revolution)

4. Discussion of Results

Work index of 14.6 kWh/t, from the Bond Ball Mill is indicative of a hard ore.

The hardness indexes are defined as follows:

Property	Soft	Medium	Hard	Very Hard
Bond WI (kWh/t)	7 - 9	9 - 14	14 - 20	> 20

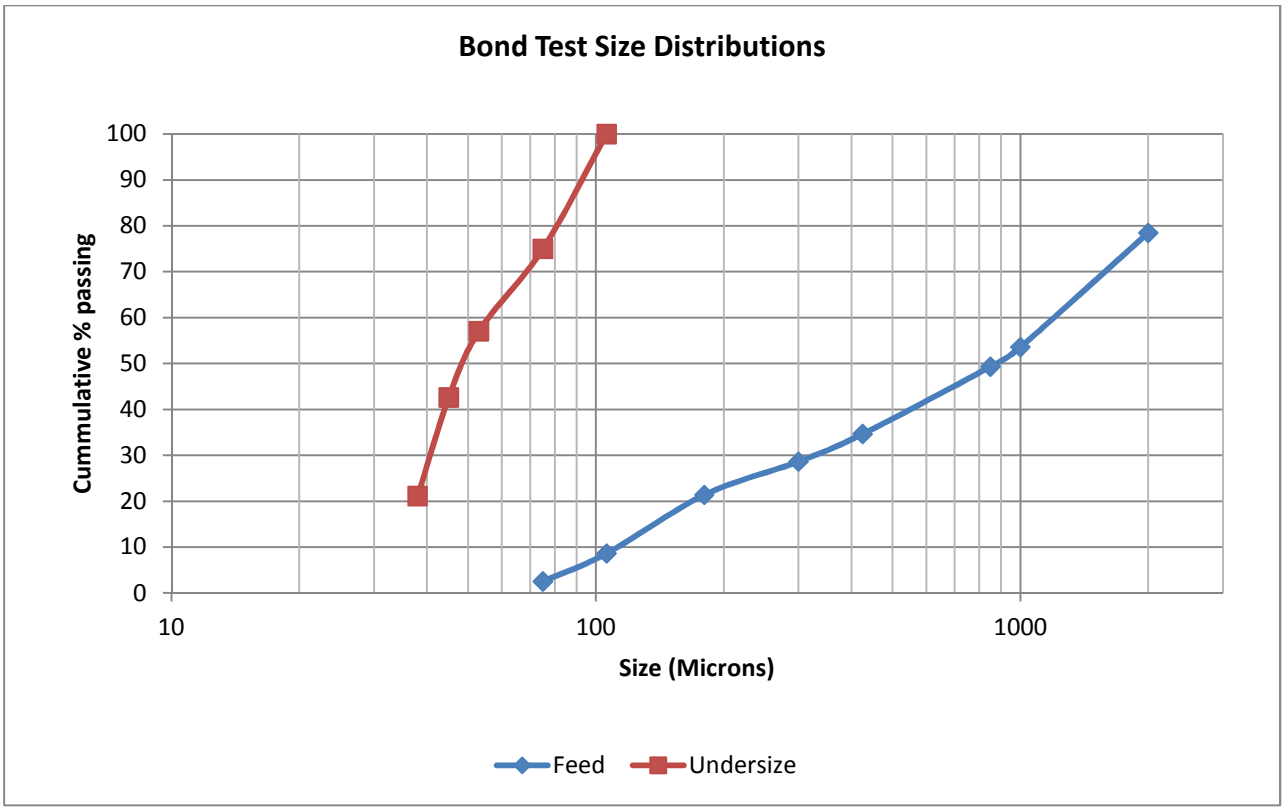
Particle Size Analysis used for the Bond Ball Mill calculations:

Feed Particle Size Analysis:

Mesh (microns)	Weight (g)	Weight %	Cumulative Retained %	Cumulative Passing %
2000	97.11	21.54	21.54	78.46
1000	112.26	24.90	46.44	53.56
850	19.13	4.24	50.68	49.32
425	66.14	14.67	65.35	34.65
300	27.19	6.03	71.38	28.62
180	32.71	7.26	78.64	21.36
106	57.52	12.76	91.39	8.61
75	27.49	6.10	97.49	2.51
Pan	11.31	2.51	100	0
Total	450.86	100		

Final Undersize Particle Size Analysis:

Mesh (microns)	Weight (g)	Weight %	Cumulative Retained %	Cumulative Passing %
106	0	0	0	100
75	81.57	25.02	25.02	74.98
53	58.48	17.94	42.96	57.04
45	47.09	14.45	57.41	42.59
38	70.03	21.48	78.89	21.11
Pan	68.81	21.11	100.00	0.00
Total	325.98	100.00		


Bond Test Size Distributions
Cummulative % passing
100
90
80
70
60
50
40
30
20
10
0
10
100
1000
Size (Microns)
Feed
Undersize

Grindability Test data:

Fresh Feed	% Undersize	Feed Undersize	# of Revolutions	Oversize (g)	Undersize(g)	Net Undersize(g)	Net undersize/rev	% Circulating Load
1146	8.61%	98.67	100	840	306	207	2.07	275%
306	8.61%	26.35	158	924	222	196	1.24	416%
222	8.61%	19.11	249	852	294	275	1.10	290%
294	8.61%	25.31	274	812	334	309	1.13	243%
334	8.61%	28.76	265	804	342	313	1.18	235%
342	8.61%	29.45	252	812	334	305	1.21	243%
334	8.61%	28.76	247	812	334	305	1.24	243%
334	8.61%	28.76	242	820	326	297	1.23	252%
326	8.61%	28.07	243	826	320	292	1.20	258%
320	8.61%	27.55	250	818	328	300	1.20	249%
328	8.61%	28.24	249	814	332	304	1.22	245%
332	8.61%	28.59	245	818	328	299	1.22	249%