

W1.64

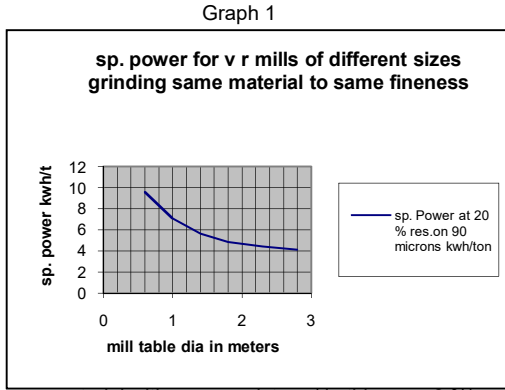
**power consumption and sizing
of Ring Ball - E Mills**

A vertical mill grinding material (raw material or coal) with a Hardgrove Index of 78, i.e. a Bonds Index of 8.25 and moisture of 8 % requires a sp.power of 4.1 kwh.t for mill only.for a mill with a table dia. of 2.8 m.
Same mill will give widely different outputs according to grindability of material.
Sp. Power also depends on size of mill. Large mills will require in grinding less Sp.Power as compared to small mills, other things remaining same.

Sp. power of 4.1 for a mill with table dia 2.8 meters, mentioned above, would increase progressively for tables (i.e. mills) of smaller diameters.
see Table 1 and Graph 1

Table 1

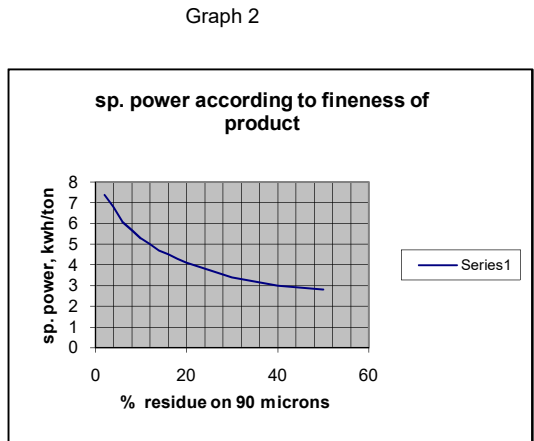
Table diameter meters	sp. Power at 20 % res.on 90 microns kwh/ton
2.8	4.1
2.3	4.4
1.8	4.85
1.4	5.6
1	7.1
0.6	9.6



For the same mill, grinding same material with same moisture (in this case 8 %) Hardgrove 78, BWI 8.25, Sp. Power varies according to fineness of product see Table 2 and Graph 2

Table 2

% residue on 90 microns	sp. Power kwh/ton	ratio
2	7.4	1.8
4	6.8	1.66
6	6.1	1.49
8	5.7	1.39
10	5.3	1.29
12	5	1.22
14	4.7	1.15
16	4.5	1.1
18	4.3	1.05
20	4.1	1
30	3.4	0.83
40	3	0.73
50	2.8	0.68

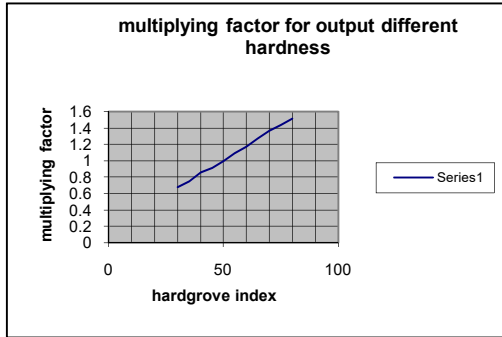


Sp. Power and hence capacity varies according to hardness; for vertical mills, Hardgrove Index is more logical to express grindability of material.
For product of fineness of 80 % passing, 90 microns, output would vary according to H.G.I. As per Table 3 and Graph 3 below.

Table 3

H.G.I.	capacity factor
30	0.68
35	0.75
40	0.86
45	0.91
50	1
55	1.09
60	1.17
65	1.27
70	1.36
75	1.43
80	1.51

Graph 3

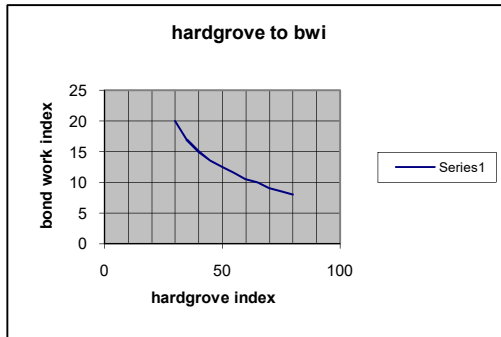


H.G.I. Can be found out if B.W.I.is known and vice versa.
as shown below in Table 4 and Graph 4

Table 4

H.G.I.	B.W.I.
30	20
35	17
40	15
45	13.5
50	12.5
55	11.5
60	10.5
65	10
70	9
75	8.5
80	8

Graph 4



There are no universal formulae like Bonds to arrive at Specific Power from a given Hardgrove index grinding from a given feed size to a given product fineness.

There are also no formulae to arrive at a mill power from its size like table dia, diameter of roller, sped of mill and pressure exerted by rollers.

Each manufacturer has its own configuration of rollers and their profile.

Each one tests samples and arrives at Sp. Power for required in his own way.

Vertical mills are made in standard sizes of table dia and roller dia. And a given size mill will draw a definite power. Its output would vary greatly according to grindability of material

Vertical mills being airswept mills there is normally no difficulty in drying higher quantities of feed moisture compared to ball mills