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Grinding Media size formula

The smaller the grinding media, the greater the surface area. The most efficient particle size reduction, is achieved by utilising media with maximum available surface area, combined with sufficient mass to accept the incoming feed. The feed material slides over the surface area on the media, to which it is kept in contact by the weight of the overlying mill charge.

The media sizing formula of Bond is the proven calculation to confirm the required media size.

$$B\ Ø\ (mm) = 20.17 \sqrt{\frac{F}{K}} \cdot \sqrt[3]{\frac{Wi \cdot S}{Cs \sqrt{D}}}$$

$$C\ Ø\ (mm) = 18.15 \sqrt{\frac{F}{K}} \cdot \sqrt[3]{\frac{Wi \cdot S}{Cs \sqrt{D}}}$$

B	ball diameter in (mm)
C	Cylpebs diameter in (mm)
F	size of mill feed in micron, 80 % of new mill feed passing
Wi	Bond Work Index (KWh/t)
Cs	per cent of critical mill speed (%)
S	specific gravity of mill feed (g/cm³)
D	inside mill diameter (m)
K	proportionality constant · 350 for wet grinding · 335 for dry grinding

Subject to calculation, the nearest commercially available media size should be selected. Should the sizing formula nominate a ball sizing of 25 mm (Cylpebs size of 22 x 22 mm) or less, it is recommended to increase that sizing by a factor of 20 - 30 %.

Average Grinding Work Index listing (Wi) for different materials follows this page.

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Grinding Media size formula

Average Grinding Work Index (Wi) for different materials according to Bond:

Material	spec. gravity	Work Index
Basalt	2,91	19
Bauxite	2,20	10
Cement clinker	3,15	15
Cement raw material	2,67	10,57
Clay	2,23	7,10
Clay calcined	1,63	11,37
Coal	1,63	11,37
Coke	1,31	17
Corundum		30-35
Dolomit	2,74	13
Feldspar	2,59	12
Ferrosilicon	4,41	11
Flint	2,65	29
Fluorspar	3,01	10
Glass	2,53	14
Granite	2,66	11
Gypsum rock	2,69	7
Hematite	3,55	14
Lead ore	3,45	13
Limestone	2,65	14
Magnesite	3,06	12
Magnetite	3,88	11
Malartic		9-13
Marble		4-12
Morenci		9
Phosphate zink	2,71	11
Polash ore	2,40	9
Pyrites	4,06	10
Quartz	2,65	15
Quartzite	2,68	11
Rutile ore	2,80	14
Sandstone		11
Silica sand	2,67	16
Silicon carbide	2,75	29
Slag	2,83	11
Slag iron blast furnace	2,39	12,16
Slate	2,57	16
Zinc ore	3,64	12
Zircon sand		20

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