SAG Mill Specific Energy from the SAG Grindability Index

SAG mill specific energy from the SGI or SPI test time and the transfer size, with Amelunxen's published constants and the pebble-crusher factor.

Method: Wills and Finch; Wills' Mineral Processing Technology; ...

Input parameters

Unit system: SI

Parameter	Value	Unit
SGI test time to 80 % passing 1.7 mm	100.00	min
Transfer size (SAG circuit product, 80 % passing)	1,700.0	µm
Constant K	5.9000	
Exponent n	0.55000	
Circuit	Without pebble crusher (f = 1.0)	
Throughput	1,500.0	t/h

Calculated results

Parameter	Value	Unit
SAG specific energy	9.6046	kWh/t
SAG mill power	14,407	kW
Circuit factor used	1.0000	

Notes for this case

- K = 5.9 and n = 0.55 are Amelunxen et al. (2014), calibrated mostly on porphyry ores of the Americas; the proprietary SPI equation uses its own constants. Use for variability and early design, not final sizing.

Formula and method

$$E_{SAG} = K \left(\frac{M}{\sqrt{P_{80}}} \right)^{n} f_{SAG}$$

Variables

M	SGI test time to 80 % passing 1.7 mm	s
P_{80}	Transfer size (SAG circuit product, 80 % passing)	m
K	Constant K	-
n	Exponent n	-
f_{SAG}	Circuit	-
T	Throughput	kg/s
E_{SAG}	SAG specific energy	J/kg
P	SAG mill power	W

Method and standards

SGI energy equation.

Assumptions and limits

- Amelunxen calibration.

References

- Wills and Finch
- Wills' Mineral Processing Technology

- 8th ed. (Butterworth-Heinemann, 2016)
- ch. 5
- eq. 5.10 (Starkey and Dobby, 1996; Amelunxen et al., 2014)

Report details

Report reference	FCC-GG9X-370R (the same inputs always give the same reference)
Generated	17 November 2026, 19:46 UTC
Calculator	SAG Mill Specific Energy from the SAG Grindability Index
Method last reviewed	17 November 2026
Software release	FireCAD Calc, release of 17 November 2026
Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/civil/mining-minerals/sag-mill-sgi-energy

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.