Comminution Energy by Morrell's Mi Equation

Specific comminution energy and power by Morrell's size-dependent equation, using the Mia, Mib, Mic or Mih work index parameter from SMC and Bond tests.

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

Input parameters

Unit system: SI

Parameter	Value	Unit
Work index parameter (Mia, Mib, Mic or Mih)	18.800	kWh/t
Feed 80 % passing size	750.00	µm
Product 80 % passing size	106.00	µm
Throughput	500.00	t/h

Calculated results

Parameter	Value	Unit
Specific energy	8.3756	kWh/t
Power	4,187.8	kW
Exponent at the feed size	-0.29575	
Exponent at the product size	-0.29511	

Notes for this case

• Use Mia for AG/SAG milling above 750 µm, Mib for ball milling below 750 µm, Mic for conventional crushers and Mih for HPGRs (Morrell, 2009). Mib comes from a Bond ball-mill test with its closing screen.

Formula and method

$$W = 4M_i \left(P^{f(P)} - F^{f(F)}\right), \quad f(x) = -\left(0.295 + \frac{x}{10^6}\right) \ (x \text{ in } \mu\text{m})$$

Variables

M_i	Work index parameter (Mia, Mib, Mic or Mih)	J/kg
F	Feed 80 % passing size	m
P	Product 80 % passing size	m
T	Throughput	kg/s
W	Specific energy	J/kg
P_W	Power	W
$f(F)$	Exponent at the feed size	-
$f(P)$	Exponent at the product size	-

Method and standards

Morrell's energy equation.

Assumptions and limits

- Morrell's calibration database.

References

• Wills and Finch
• Wills' Mineral Processing Technology
• 8th ed. (Butterworth-Heinemann, 2016)
• ch. 5
• eqs. 5.6-5.7 (Morrell, 2004, 2006, 2009) and Example 5.1

Report details

Report reference	FCC-RRT1-Q91T (the same inputs always give the same reference)
Generated	17 November 2026, 19:35 UTC
Calculator	Comminution Energy by Morrell's Mi Equation
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/morrell-mi-specific-energy

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.