Mine Hoist Cycle Time, Skip Capacity and Running Power

Hoist cycle time from depth, speed, acceleration and retardation, empty skip mass, hourly capacity, rope safety factor and running motor power.

Input parameters

Unit system: SI

Parameter	Value	Unit
Hoisting distance	600.00	m
Maximum rope speed	12.000	m/s
Acceleration	0.75000	m/s²
Retardation	0.75000	m/s²
Load and dump time	20.000	s
Skip payload	15.000	t
Rope mass per metre (all ropes)	10.500	kg/m
Rope breaking strength (all ropes)	2,000.0	kN
Operating efficiency (about 0.7)	70.000	%
Drive efficiency (about 0.85)	85.000	%
Hoisting hours per day	20.000	h

Calculated results

Parameter	Value	Unit
Cycle time	86.000	s
Empty skip mass (estimate)	8.1800	t
Suspended mass at the bottom	29.480	t
Rope safety factor	6.9180	
Hoisting capacity	439.53	t/h
Capacity per day	8,790.7	t
Running power (single skip, unbalanced)	4,081.4	kW

Notes for this case

• The skip estimate is half the payload plus 680 kg. The running power is for hoisting at full speed; size the motor on the peak accelerating and RMS power of the whole cycle, and for balanced skips the skip and rope weights largely cancel.

Formula and method

$$TC_H = \frac{H}{V_{max}} + \frac{V_{max}}{2}\left(\frac{1}{ACC} + \frac{1}{RET}\right) + T_{dl}, \quad W_S = 0.5 L_h + 680 \text{ kg}$$

$$Q = \frac{L_h E}{TC_H}, \quad PR_h = \frac{TWS \cdot g \cdot V_{max}}{EFF}$$

Variables

H	Hoisting distance	m
V_{max}	Maximum rope speed	m/s
ACC	Acceleration	m/s²
RET	Retardation	m/s²

T_{dl}	Load and dump time	s
L_h	Skip payload	kg
w_r	Rope mass per metre (all ropes)	kg/m
BS	Rope breaking strength (all ropes)	N
E	Operating efficiency (about 0.7)	-
EFF	Drive efficiency (about 0.85)	-
t_d	Hoisting hours per day	s
TC_H	Cycle time	s
W_S	Empty skip mass (estimate)	kg
TWS	Suspended mass at the bottom	kg
SF	Rope safety factor	-
Q	Hoisting capacity	kg/s
Q_d	Capacity per day	kg
PR_h	Running power (single skip, unbalanced)	W

Method and standards

Hoisting equations (Edwards).

Assumptions and limits

- Trapezoidal speed profile; creep speeds neglected.

Report details

Report reference	FCC-4BPC-EWGP (the same inputs always give the same reference)
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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/mine-design/mine-hoist-cycle-capacity-power

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.