Scraper Cycle, Fleet Production and Scrapers per Pusher

Scraper load in bank measure, theoretical and corrected cycle time from haul distance and speeds, fleet production and scrapers one pusher dozer can serve.

Input parameters

Unit system: SI

Parameter	Value	Unit
Scraper heaped capacity (loose)	24.000	m³
Swell factor (bank per loose)	0.80000	
Load time	0.70000	min
Spread time	0.60000	min
One-way haul distance	1,200.0	m
Average loaded speed	20.000	km/h
Average return speed	30.000	km/h
Wait and delay time per cycle	0.50000	min
Scrapers in the fleet	4.0000	
Operating efficiency	83.000	%
Pusher cycle time (no waiting)	1.2500	min
Bank density	1,900.0	kg/m³

Calculated results

Parameter	Value	Unit
Scraper load (bank)	19.200	m³
Theoretical cycle time	7.3000	min
Corrected cycle time	7.8000	min
Fleet production (bank)	490.34	m³/h
Fleet production by mass	931.64	t/h
Scrapers one pusher can serve	5.8400	

Notes for this case

• Typical load times are 0.4-1.0 min for push-loaded conventional scrapers and 0.6-1.3 min for elevating scrapers; pusher cycles are 0.75-1.8 min back-track and 0.6-1.4 min chain or shuttle loading (Hays). Multiply the pusher cycle by 1.2 for tandem pushers.

Formula and method

$$L_h = C_s\,SF,\quad T_{ch} = T_l + \frac{D}{V_l} + T_{dp} + \frac{D}{V_e},\quad P_h = \frac{60 N_h L_h E}{T_{ch} + T_w + T_d},\quad N_s = \frac{T_{ch}}{T_{pc}}$$

Variables

C_s	Scraper heaped capacity (loose)	m³
SF	Swell factor (bank per loose)	-
T_l	Load time	s
T_{dp}	Spread time	s
D	One-way haul distance	m
V_l	Average loaded speed	m/s

V_e	Average return speed	m/s
$T_w + T_d$	Wait and delay time per cycle	s
N_h	Scrapers in the fleet	-
E	Operating efficiency	-
T_{pc}	Pusher cycle time (no waiting)	s
BD	Bank density	kg/m³
L_h	Scraper load (bank)	m³
T_{ch}	Theoretical cycle time	s
TC_{ch}	Corrected cycle time	s
P_h	Fleet production (bank)	m³/s
P_t	Fleet production by mass	kg/s
N_s	Scrapers one pusher can serve	-

Method and standards

Scraper production method.

Assumptions and limits

- Average speeds and times; grades enter through the speeds.

Report details

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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/scraper-pusher-production

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Reopens the calculator with the inputs of this report.