Truck Loading Passes, Cycle Time and Fleet Size

Passes to fill a haul truck by weight and volume, truck load, spot and load time, haul cycle, trucks to keep a loader busy and fleet production.

Input parameters

Unit system: SI

Parameter	Value	Unit
Truck payload	220.00	t
Truck heaped capacity (loose)	150.00	m^3
Loader bucket heaped capacity (loose)	40.000	m^3
Bucket fill factor	90.000	%
Swell factor (bank per loose)	0.67000	
Bank density	2,650.0	kg/m^3
Passes used (0 = round down automatically)	0	
Loader cycle time	0.50000	min
Truck spot time	0.50000	min
One-way haul distance	2.5000	km
Average loaded speed	18.000	km/h
Average empty speed	30.000	km/h
Dump time	1.0000	min
Wait and delay time per cycle	1.0000	min
Trucks in the fleet	7.0000	
Operating efficiency	83.000	%

Calculated results

Parameter	Value	Unit
Passes to fill by weight	3.4419	
Passes to fill by volume	4.1667	
Passes used	3.0000	
Truck load (bank)	72.360	m^3
Truck load by mass	191.75	t
Spot and load time	1.5000	min
Theoretical cycle time	15.833	min
Trucks to keep the loader busy	10.556	
Fleet production (bank)	1,498.5	m^3/h
Fleet production by mass	3,971.0	t/h

Notes for this case

- Three to six passes per truck is the usual match. The trucks needed is the cycle time over the load time; the fleet production uses the corrected cycle time with wait and delays.

Formula and method

$$N_p = \frac{C_{tw}}{C_b FF SF BD} \text{ or } \frac{C_{tv}}{C_b FF}, \quad L_h = N_P C_b FF SF$$

$$T_l = N_P T_{cl} \text{ or } T_s + (N_P - 1)T_{cl}, \quad N_h^* = \frac{T_{ch}}{T_l}, \quad P_h = \frac{60 N_h L_h E}{T_{ch} + T_w + T_d}$$

Variables

C_{tw}	Truck payload	kg
C_{tv}	Truck heaped capacity (loose)	m³
C_b	Loader bucket heaped capacity (loose)	m³
FF	Bucket fill factor	-
SF	Swell factor (bank per loose)	-
BD	Bank density	kg/m³
N_P	Passes used (0 = round down automatically)	-
T_{cl}	Loader cycle time	s
T_s	Truck spot time	s
D	One-way haul distance	m
V_l	Average loaded speed	m/s
V_e	Average empty speed	m/s
T_{dp}	Dump time	s
$T_w + T_d$	Wait and delay time per cycle	s
N_h	Trucks in the fleet	-
E	Operating efficiency	-
$N_{p,w}$	Passes to fill by weight	-
$N_{p,v}$	Passes to fill by volume	-
L_h	Truck load (bank)	m³
L_t	Truck load by mass	kg
T_l	Spot and load time	s
T_{ch}	Theoretical cycle time	s
N_h^*	Trucks to keep the loader busy	-
P_h	Fleet production (bank)	m³/s
P_t	Fleet production by mass	kg/s

Method and standards

Truck loading and haulage equations.

Assumptions and limits

- Average speeds; queueing ignored except through the wait time.

Report details

Report reference	FCC-1KJ9-3K8A (the same inputs always give the same reference)
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Calculator	Truck Loading Passes, Cycle Time and Fleet Size
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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/truck-shovel-match-fleet-size

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Reopens the calculator with the inputs of this report.