Slurry Stream: Percent Solids, Solids Rate and Conditioner Volume

Percent solids, dry solids and water rates, solids by volume and dilution ratio of a slurry stream from flow and pulp density, and conditioner volume.

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

Input parameters

Unit system: SI

Parameter	Value	Unit
Slurry volume flow	0.51429	m³/h
Pulp density	1,400.0	kg/m³
Density of the dry solids	2,650.0	kg/m³
Density of the water	1,000.0	kg/m³
Retention time in a conditioning tank	5.0000	min

Calculated results

Parameter	Value	Unit
Solids by mass	45.887	%
Dry solids rate	0.33039	t/h
Water rate	0.38961	t/h
Solids by volume	24.242	%
Dilution ratio (water : solids)	1.1792	
Conditioning tank volume	0.042857	m³

Notes for this case

• The tank volume is the slurry volume for the nominal retention time; add freeboard and allow for air in aerated or agitated tanks. Measure pulp density on a sample free of air bubbles.

Formula and method

$$x = \frac{\rho_s (D - \rho_w)}{D(\rho_s - \rho_w)}, \quad M = FDx, \quad x_v = \frac{xD}{\rho_s}, \quad DR = \frac{1 - x}{x}, \quad V = Ft_r$$

Variables

F	Slurry volume flow	m³/s
D	Pulp density	kg/m³
ρ_s	Density of the dry solids	kg/m³
ρ_w	Density of the water	kg/m³
t_r	Retention time in a conditioning tank	s
x	Solids by mass	-
M	Dry solids rate	kg/s
M_w	Water rate	kg/s
x_v	Solids by volume	-
DR	Dilution ratio (water : solids)	-
V	Conditioning tank volume	m³

Method and standards

Pulp density relations.

Assumptions and limits

- Water and solids incompressible; no air.

References

- Wills and Finch
- Wills' Mineral Processing Technology
- 8th ed. (Butterworth-Heinemann, 2016)
- ch. 3
- eqs. 3.12-3.17
- Examples 3.4 and 3.6

Report details

Report reference	FCC-G8CJ-99EF (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/mining-minerals/slurry-stream-solids-flow

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.