Water Treatment Sludge: Dry Solids and Volume from Coagulation

Dry sludge mass from coagulant, turbidity, polymer and other additions and the wet sludge volume and share of plant flow at a given solids content.

Input parameters

Unit system: SI

Parameter	Value	Unit
Plant flow	0.50000	m³/s
Raw water turbidity, NTU	400.00	
TSS to turbidity ratio, mg/L per NTU (0.7–2.2)	1.6000	
Coagulant dose	60.000	mg/L
Dry sludge per unit coagulant (alum about 0.26, ferric chloride about 0.66)	0.26000	
Polymer dose	0.50000	mg/L
Other solids added (PAC, clay, lime solids)	0	mg/L
Sludge solids content	2.0000	%
Wet sludge specific gravity	1.0200	
Water density	999.10	kg/m³

Calculated results

Parameter	Value	Unit
Solids from the coagulant	673.92	kg/d
Solids from turbidity	27,648	kg/d
Solids from polymer and other additions	21.600	kg/d
Total dry solids	28,344	kg/d
Wet sludge volume	1,390.6	m³/d
Sludge volume as a share of plant flow	3.2191	%

Notes for this case

- Sludge from sedimentation is often 0.5–2 % solids, thickened 2–5 %.

Formula and method

$$\dot{m} = Q(f_c D_c + bT + D_p + D_x), \quad \dot{V} = \frac{\dot{m}}{P_s S_s \rho_w}$$

Variables

Q	Plant flow	m³/s
T	Raw water turbidity, NTU	-
b	TSS to turbidity ratio, mg/L per NTU (0.7–2.2)	-
D_c	Coagulant dose	kg/m³
f_c	Dry sludge per unit coagulant (alum about 0.26, ferric chloride about 0.66)	-
D_p	Polymer dose	kg/m³
D_x	Other solids added (PAC, clay, lime solids)	kg/m³

P_s	Sludge solids content	-
S_s	Wet sludge specific gravity	-
ρ_w	Water density	kg/m³
$\dot{m}_c$	Solids from the coagulant	kg/s
$\dot{m}_t$	Solids from turbidity	kg/s
$\dot{m}_p$	Solids from polymer and other additions	kg/s
$\dot{m}$	Total dry solids	kg/s
$\dot{V}$	Wet sludge volume	m³/s
$\dot{V}/Q$	Sludge volume as a share of plant flow	-

Method and standards

Residuals mass balance for coagulation plants.

Assumptions and limits

- Average conditions; the coagulant factor depends on the precipitate formed.

Report details

Report reference	FCC-NKFR-K2SQ (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/environmental/drinking-water/water-treatment-sludge-production

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.