Thickener Area by the Talmage–Fitch Method

Thickener unit area and diameter from a batch settling test by the simplified Talmage–Fitch construction, with the underflow line height and a safety factor.

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

Input parameters

Unit system: SI

Parameter	Value	Unit
Dry solids feed rate	400.00	t/h
Feed solids concentration in the test	300.00	g/L
Initial slurry height in the test	40.000	cm
Time to reach the underflow concentration (from the tangent)	35.000	min
Target underflow concentration	1,200.0	g/L
Scale-up safety factor (1.2–1.5)	1.3000	

Calculated results

Parameter	Value	Unit
Thickener area (test)	1,944.4	m²
Design area with safety factor	2,527.8	m²
Thickener diameter	56.732	m
Unit area (m² per t/d)	0.26331	
Height of the underflow line on the settling curve	10.000	cm

Notes for this case

• Draw H_u = C₀H₀/C_u on the settling curve; t_u is where the tangent at the compression point crosses it (or where the curve crosses it if compression starts below C_u). Use a flocculated test if the plant will flocculate.

Formula and method

$$A = \frac{W t_u}{C_0 H_0}, \quad H_u = \frac{C_0 H_0}{C_u}, \quad D = \sqrt{\frac{4 f_s A}{\pi}}$$

Variables

W	Dry solids feed rate	kg/s
C_0	Feed solids concentration in the test	kg/m³
H_0	Initial slurry height in the test	m
t_u	Time to reach the underflow concentration (from the tangent)	s
C_u	Target underflow concentration	kg/m³
f_s	Scale-up safety factor (1.2–1.5)	-
A	Thickener area (test)	m²
A_d	Design area with safety factor	m²
D	Thickener diameter	m
A_d/W	Unit area (m² per t/d)	-
H_u	Height of the underflow line on the settling curve	m

Method and standards

Simplified Talmage–Fitch construction.

Assumptions and limits

- Kynch theory; batch test representative of the plant.

References

- Wills and Finch
- Wills' Mineral Processing Technology
- 8th ed. (Butterworth-Heinemann, 2016)
- ch. 15
- eqs. 15.4-15.6 (Talmage and Fitch, 1955)

Report details

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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/thickener-area-talmage-fitch

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.