Thickener Area by Coe–Clevenger (Batch Settling Tests)

Unit area and thickener area for a solids feed from settling velocities measured at several concentrations, taking the largest area (Coe–Clevenger).

Method: Perry's Chemical Engineers' Handbook; 9th ed. (McGraw-Hill, 2019); ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Solids feed rate	20.000	t/h
Underflow concentration	600.00	g/L
Test 1 concentration	100.00	g/L
Test 1 settling velocity	1.2000e-04	m/s
Test 2 concentration	200.00	g/L
Test 2 settling velocity	4.0000e-05	m/s
Test 3 concentration	300.00	g/L
Test 3 settling velocity	1.5000e-05	m/s
Safety factor on area	1.3000	

Calculated results

Parameter	Value	Unit
Largest unit area, m² per kg/s of solids	111.11	
Limiting concentration	300.00	g/L
Thickener area (with safety factor)	802.47	m²
Diameter	31.965	m

Notes for this case

- Unit area A_u is in m² per (kg/s) of solids, here 111.11; that is 1.286 m² per t/d (divide by 86.4). The test that gives the largest unit area limits the design.

Formula and method

$$A_u = \frac{1/C - 1/C_u}{u}, \quad A = f_s \, F_s \max_i A_{u,i}$$

Variables

F_s	Solids feed rate	kg/s
C_u	Underflow concentration	kg/m³
C_1	Test 1 concentration	kg/m³
u_1	Test 1 settling velocity	m/s
C_2	Test 2 concentration	kg/m³
u_2	Test 2 settling velocity	m/s
C_3	Test 3 concentration	kg/m³
u_3	Test 3 settling velocity	m/s
f_s	Safety factor on area	-
A_u	Largest unit area, m² per kg/s of solids	-
C_{lim}	Limiting concentration	kg/m³
A	Thickener area (with safety factor)	m²

D	Diameter	m

Method and standards

Coe–Clevenger flux method.

Assumptions and limits

- Settling velocities from batch tests at the same flocculant dose.
- The unit area is a plain number in m² per kg/s of solids; divide by 86.4 for m² per t/d (the note gives both).

References

• Perry's Chemical Engineers' Handbook
• 9th ed. (McGraw-Hill, 2019)
• sec. 18 (thickening): Coe–Clevenger unit-area method from batch settling tests

Report details

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Release checks	2 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/chemical/unit-operations/thickener-area-coe-clevenger

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.