Mixer–Settler: Mixer Volume and Settler Area

Mixer volume from residence time and settler area from the specific settler flow for a liquid–liquid extraction mixer–settler, with settler residence time.

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

Input parameters

Unit system: SI

Parameter	Value	Unit
Aqueous flow	20.000	m³/h
Organic flow	20.000	m³/h
Mixer residence time	3.0000	min
Specific settler flow	4.0000	m/h
Settler liquid depth	0.80000	m

Calculated results

Parameter	Value	Unit
Mixer volume	2.0000	m³
Settler area	10.000	m²
Settler volume	8.0000	m³
Settler residence time	12.000	min

Notes for this case

- Specific settler flow comes from batch settling tests or pilot data; 3–6 m³/(m²·h) of total flow is common in metal extraction.

Formula and method

$$V_m = (Q_a + Q_o)t_m, \quad A_s = \frac{Q_a + Q_o}{q_s}, \quad t_s = \frac{A_s H}{Q_a + Q_o}$$

Variables

Q_a	Aqueous flow	m³/s
Q_o	Organic flow	m³/s
t_m	Mixer residence time	s
q_s	Specific settler flow	m/s
H	Settler liquid depth	m
V_m	Mixer volume	m³
A_s	Settler area	m²
V_s	Settler volume	m³
t_s	Settler residence time	s

Method and standards

Residence time and specific flow.

Assumptions and limits

- Specific settler flow from tests.

References

- Perry's Chemical Engineers' Handbook
- 9th ed. (McGraw-Hill, 2019)
- sec. 15 (mixer–settlers: specific settler flow)

Report details

Report reference	FCC-KG99-85FG (the same inputs always give the same reference)
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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/mixer-settler-sizing

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.