Dissolved Air Flotation: Air-to-Solids Ratio

Air-to-solids ratio of a dissolved air flotation unit with pressurised recycle from air solubility, pressure, recycle and feed solids, and recycle needed.

Method: Air-to-solids relation for pressurised recycle (Metcalf & Eddy, Wastewater Engineering, 5th ed. (McGraw-Hill, 2014), ch. 5 and 14)

Input parameters

Unit system: SI

Parameter	Value	Unit
Air solubility at the temperature (mL/L)	18.700	
Fraction of saturation achieved	50.000	%
Saturator pressure (absolute)	4.5000	bar
Pressurised recycle flow	30.000	m³/h
Feed flow	100.00	m³/h
Feed suspended solids (mg/L)	3,000.0	
Target air-to-solids ratio	0.020000	

Calculated results

Parameter	Value	Unit
Air-to-solids ratio (mL/mg × 1.3)	0.002967	
Recycle for the target A/S	202.21	m³/h

Notes for this case

- A/S = 0.0030 is outside the typical design range 0.005–0.06: check the recycle, pressure and solids.
- A/S = 1.3s_a(fP − 1)R/(QS_a), P in atmospheres, 1.3 mg of air per mL. Typical design A/S is 0.005–0.06; air solubility is 29.2, 22.8, 18.7 and 15.7 mL/L at 0, 10, 20 and 30 °C.

Formula and method

$$\frac{A}{S} = \frac{1.3 s_a (fP - 1) R}{Q S_a}$$

Variables

s_a	Air solubility at the temperature (mL/L)	-
f	Fraction of saturation achieved	-
P	Saturator pressure (absolute)	Pa
R	Pressurised recycle flow	m³/s
Q	Feed flow	m³/s
S_a	Feed suspended solids (mg/L)	-
$(A/S)_t$	Target air-to-solids ratio	-
A/S	Air-to-solids ratio (mL/mg × 1.3)	-
R_t	Recycle for the target A/S	m³/s

Method and standards

Air-to-solids ratio.

Assumptions and limits

- Pressurised recycle system.
- An A/S outside the typical 0.005–0.06 is flagged.

References

• Air-to-solids relation for pressurised recycle (Metcalf & Eddy, Wastewater Engineering, 5th ed. (McGraw-Hill, 2014), ch. 5 and 14)

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/environmental/wastewater/daf-air-solids-ratio

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.