Aeration Tank HRT, F/M Ratio and Sludge Age (SRT)

Hydraulic retention time, food-to-microorganism (F/M) ratio and sludge age of an activated sludge aeration tank from the flow, BOD, volume, MLSS and sludge wasting.

Method: Metcalf & Eddy; Wastewater Engineering (activated sludge definitions)

Input parameters

Unit system: SI

Parameter	Value	Unit
Influent flow	1,000.0	m³/d
Influent BOD	250.00	mg/L
Aeration tank volume	300.00	m³
MLSS (or MLVSS) in the tank	3,000.0	mg/L
Waste sludge flow	10.000	m³/d
Solids in the waste sludge	8,000.0	mg/L
Solids in the treated effluent	20.000	mg/L

Calculated results

Parameter	Value	Unit
Hydraulic retention time V / Q	7.2000	h
Food to microorganism ratio Q S_0 / (V X)	0.27778	1/d
Sludge age V X / (Q_w X_w + (Q − Q_w) X_e)	9.0180	d
BOD loading on the tank volume	0.83333	kg/(m³·d)
Solids under aeration	900.00	kg

Notes for this case

- Steady-state mass balance on the aeration tank (Metcalf & Eddy definitions); clarifier inventory is not included in the sludge age.

Formula and method

$$\theta = \frac{V}{Q}, \quad F/M = \frac{Q\,S_0}{V\,X}$$

$$\theta_c = \frac{V X}{Q_w X_w + (Q - Q_w) X_e}$$

Variables

Q	Influent flow	m³/s
S_0	Influent BOD	kg/m³
V	Aeration tank volume	m³
X	MLSS (or MLVSS) in the tank	kg/m³
Q_w	Waste sludge flow	m³/s
X_w	Solids in the waste sludge	kg/m³
X_e	Solids in the treated effluent	kg/m³
θ	Hydraulic retention time V / Q	s
F/M	Food to microorganism ratio Q S_0 / (V X)	1/s
θ_c	Sludge age V X / (Q_w X_w + (Q − Q_w) X_e)	s
OLR	BOD loading on the tank volume	kg/(m³·s)

M_X	Solids under aeration	kg

Method and standards

Steady-state mass balances on the aeration tank.

Assumptions and limits

- Steady state; clarifier inventory ignored.
- Waste solids below the MLSS, or effluent solids above it, are flagged as implausible.

References

- Metcalf & Eddy
- Wastewater Engineering (activated sludge definitions)

Report details

Report reference	FCC-FCYD-NT9V (the same inputs always give the same reference)
Generated	17 November 2026, 19:36 UTC
Calculator	Aeration Tank HRT, F/M Ratio and Sludge Age (SRT)
Method last reviewed	12 November 2026
Software release	FireCAD Calc, release of 17 November 2026
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/wastewater/aeration-tank-hrt-fm

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.