Feed Tank Temperature from Condensate and Make-up

Temperature of boiler feedwater when returned condensate and cold make-up water mix in the feed tank, by an enthalpy balance (IAPWS-IF97).

Method: IAPWS R7-97(2012) IF97; first law of thermodynamics

Input parameters

Unit system: SI

Parameter	Value	Unit
Condensate return flow	6,000.0	kg/h
Condensate temperature	85.000	°C
Make-up water flow	4,000.0	kg/h
Make-up water temperature	30.000	°C
Feed tank pressure (absolute)	1.0132	bar

Calculated results

Parameter	Value	Unit
Feedwater temperature	63.036	°C
Condensate share of the feedwater	60.000	%
Feedwater flow	10,000	kg/h
Mixed enthalpy	263.92	kJ/kg

Formula and method

$$h_m = \frac{\dot{m}_c h(T_c) + \dot{m}_{mu} h(T_{mu})}{\dot{m}_c + \dot{m}_{mu}} \qquad T_m = T(p, h_m) \quad \text{(all enthalpies at the tank pressure } p\text{)} \qquad r_c = \frac{\dot{m}_c}{\dot{m}_c + \dot{m}_{mu}}$$

Variables

$\dot{m}_c$	condensate return flow	kg/s
T_c	condensate temperature	K
$\dot{m}_{mu}$	make-up water flow	kg/s
T_{mu}	make-up temperature	K
p	feed tank pressure, absolute	Pa
T_m	feedwater temperature	K
r_c	condensate share	–
$\dot{m}_{fw}$	feedwater flow, $\dot{m}_c + \dot{m}_{mu}$	kg/s
h_m	mixed enthalpy	J/kg
h	water enthalpy (IF97)	J/kg

Method and standards

Adiabatic mixing; enthalpies and the outlet temperature from FireCAD's IAPWS-IF97.

Assumptions and limits

- No heat loss or steam heating in the tank; condensate taken as liquid at tank pressure. Condensate arriving from a higher line pressure is entered at its temperature in the tank; any flash is lost through the vent.

References

- IAPWS R7-97(2012) IF97
- first law of thermodynamics

Report details

Report reference	FCC-P0Z1-RC6A (the same inputs always give the same reference)
Generated	17 November 2026, 19:36 UTC
Calculator	Feed Tank Temperature from Condensate and Make-up
Method last reviewed	11 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/boilers-power-plant/steam/feedwater-temperature-from-mixing

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.