Feedwater Heater: TTD, DCA and Temperature Rise

Terminal temperature difference, drain cooler approach and temperature rise of a feedwater heater from shell pressure and water and drain temperatures.

Method: TTD = T_sat(p_shell) − T_fw; out; DCA = T_drain − T_fw; ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Shell (extraction steam) pressure (absolute)	12.000	bar
Feedwater in	140.00	°C
Feedwater out	185.00	°C
Drain leaving	148.00	°C

Calculated results

Parameter	Value	Unit
Saturation temperature at shell pressure	187.96	°C
Terminal temperature difference T_sat − T_fw,out	2.9646	K
Drain cooler approach T_d − T_fw,in	8.0000	K
Feedwater temperature rise	45.000	K

Notes for this case

- A rising TTD or DCA over time points to fouling, air blanketing or a high drain level.

Formula and method

$$TTD = T_{sat}(p_s) - T_{fw,out}, \quad DCA = T_d - T_{fw,in}$$

Variables

p_s	Shell (extraction steam) pressure (absolute)	Pa
$T_{fw,in}$	Feedwater in	K
$T_{fw,out}$	Feedwater out	K
T_d	Drain leaving	K
T_{sat}	Saturation temperature at shell pressure	K
TTD	Terminal temperature difference T_sat − T_fw,out	K
DCA	Drain cooler approach T_d − T_fw,in	K
ΔT	Feedwater temperature rise	K

Method and standards

Definitions.

Assumptions and limits

- Steady operation.
- A negative TTD is possible with a desuperheating zone. A negative DCA, or a drain hotter than saturation, is not physical; notes flag both.

References

- TTD = T_sat(p_shell) − T_fw
- out; DCA = T_drain − T_fw
- in (definitions as in the HEI Standards for Closed Feedwater Heaters and ASME PTC 12.1, Closed Feedwater Heaters); T_sat from IAPWS-IF97

Report details

Report reference	FCC-Z1ND-83SJ (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/boilers-power-plant/turbines-cycles/feedwater-heater-ttd

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.