Optimum Separator Temperature of a Single-Flash Plant

Separator temperature that maximises the output per kg of geofluid in a single-flash plant, compared with the equal-temperature-split rule of thumb.

Method: Optimisation of the single-flash separator temperature

Input parameters

Unit system: SI

Parameter	Value	Unit
Reservoir temperature (saturated liquid)	240.00	°C
Condenser temperature	52.000	°C
Dry turbine efficiency	85.000	%
Total geofluid flow	540,000	kg/h

Calculated results

Parameter	Value	Unit
Optimum separator temperature	140.51	°C
Turbine work per kg of geofluid at the optimum	83.936	kJ/kg
Steam fraction at the optimum	20.820	%
Equal-temperature-split estimate	146.00	°C
Work per kg at the estimate	83.670	kJ/kg
Turbine power at the optimum	12.590	MW

Notes for this case

• Golden-section search of the turbine work per kg of geofluid (single flash, Baumann rule). The optimum is broad: a few degrees either way costs well under 1 %. Water and steam properties from IAPWS-IF97.

Formula and method

$$w(T_{sep}) = x_2(T_{sep})\left[h_g(T_{sep}) - h_5(T_{sep})\right], \quad T_{ETS} = \frac{T_{res} + T_{cond}}{2}$$

Variables

T_{res}	Reservoir temperature (saturated liquid)	K
T_{cond}	Condenser temperature	K
η_{td}	Dry turbine efficiency	-
$\dot{m}$	Total geofluid flow	kg/s
$T_{sep,opt}$	Optimum separator temperature	K
w_{max}	Turbine work per kg of geofluid at the optimum	J/kg
x_2	Steam fraction at the optimum	-
T_{ETS}	Equal-temperature-split estimate	K
w_{ETS}	Work per kg at the estimate	J/kg
$\dot{W}_t$	Turbine power at the optimum	W

Method and standards

Separator temperature optimisation.

Assumptions and limits

- Saturated-liquid reservoir; turbine work only (no parasitic loads).

References

Optimisation of the single-flash separator temperature

Report details

Report reference	FCC-5YAE-69TS (the same inputs always give the same reference)
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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/geothermal-ocean/geothermal-optimum-flash-temperature

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.