Multijet or Barometric Condenser Injection Water

Injection water for a multijet or barometric condenser from the vapour flow, condenser pressure and water inlet and outlet temperatures (IF97).

Method: Energy balance with IAPWS-IF97 enthalpies (saturated vapour, liquid water at 1 atm)

Input parameters

Unit system: SI

Parameter	Value	Unit
Vapour to the condenser	20.000	t/h
Condenser pressure (absolute)	16.000	kPa
Injection water in	32.000	°C
Tail water out	47.000	°C

Calculated results

Parameter	Value	Unit
Saturation temperature at condenser pressure	55.314	°C
Injection water	766.98	t/h
Water per kg of vapour	38.349	

Notes for this case

- Keep the tail water a few degrees below the vapour temperature; the approach sets the vacuum.

Formula and method

$$\frac{\dot{m}_w}{\dot{m}_v} = \frac{h_g(p_c) - h(T_{out})}{h(T_{out}) - h(T_{in})}$$

Variables

$\dot{m}_v$	Vapour to the condenser	kg/s
p_c	Condenser pressure (absolute)	Pa
T_{in}	Injection water in	K
T_{out}	Tail water out	K
T_s	Saturation temperature at condenser pressure	K
$\dot{m}_w$	Injection water	kg/s
$\dot{m}_w/\dot{m}_v$	Water per kg of vapour	-

Method and standards

Energy balance.

Assumptions and limits

- Saturated vapour; no air load.
- The tail water must stay below the vapour saturation temperature; an approach under about 2 K is flagged as unrealistic.

References

- Energy balance with IAPWS-IF97 enthalpies (saturated vapour, liquid water at 1 atm)

Report details

Report reference	FCC-ZCWA-Q59P (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/sugar-ethanol/vacuum-water/multijet-condenser-water

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.