Juice Flash Tank: Flash Vapour and Temperature

Flash vapour released when heated juice enters a flash tank, from juice temperature and flow, tank pressure, boiling-point elevation and IF97 latent heat.

Method: Energy balance with IAPWS-IF97 saturation and latent heat; boiling-point elevation as input

Input parameters

Unit system: SI

Parameter	Value	Unit
Juice flow	260.00	t/h
Juice temperature in	105.00	°C
Flash tank pressure (absolute)	1.0132	bar
Boiling-point elevation of the juice	0.20000	K
Juice specific heat	3.9000	kJ/(kg·K)

Calculated results

Parameter	Value	Unit
Juice boiling point in the tank	100.17	°C
Flash vapour	2.1685	t/h
Flash vapour share of juice	0.83403	%

Notes for this case

- Flashing removes air and dissolved gases so flocs settle in the clarifier.

Formula and method

$$T_b = T_{sat}(p) + BPE, \quad x = \frac{c_p (T_j - T_b)}{h_{fg}(p)}$$

Variables

$\dot{m}_j$	Juice flow	kg/s
T_j	Juice temperature in	K
p	Flash tank pressure (absolute)	Pa
BPE	Boiling-point elevation of the juice	K
c_p	Juice specific heat	J/(kg·K)
T_b	Juice boiling point in the tank	K
$\dot{m}_v$	Flash vapour	kg/s
x	Flash vapour share of juice	-

Method and standards

Energy balance.

Assumptions and limits

- Adiabatic flash.
- Juice specific heat and boiling-point elevation are separate inputs, not linked to brix: take both for your juice (c_p falls as brix rises). The result is proportional to c_p.
- The latent heat is taken at the water saturation temperature at p rather than at the juice boiling point; the difference is small for BPE below about 1 K.

References

- Energy balance with IAPWS-IF97 saturation and latent heat; boiling-point elevation as input

Report details

Report reference	FCC-6BX7-KQNN (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/clarification/juice-flash-tank

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.