Steam Distillation of an Immiscible Liquid

Steam needed per kilogram of an immiscible organic liquid distilled with live steam, from total pressure, its vapour pressure and molar mass (Dalton's law).

Method: Dalton's law of partial pressures for immiscible liquids (each exerts its own vapour pressure); Perry's Chemical Engineers' Handbook; ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Total pressure	101.33	kPa
Vapour pressure of the organic at the still temperature	8.0000	kPa
Molar mass of the organic	154.00	kg/kmol
Vaporisation efficiency (saturation of steam)	80.000	%

Calculated results

Parameter	Value	Unit
Partial pressure of steam	93.325	kPa
Steam per kg of organic	1.7058	kg/kg

Notes for this case

- The still runs where p_A + p_w = P, below the boiling points of both liquids; find that temperature from both vapour pressure curves.

Formula and method

$$\frac{\dot{m}_s}{\dot{m}_A} = \frac{P - p_A^s}{E p_A^s} \cdot \frac{M_w}{M_A}$$

Variables

P	Total pressure	Pa
p_A^s	Vapour pressure of the organic at the still temperature	Pa
M_A	Molar mass of the organic	kg/kmol
E	Vaporisation efficiency (saturation of steam)	-
p_w	Partial pressure of steam	Pa
$\dot{m}_s/\dot{m}_A$	Steam per kg of organic	kg/kg
M_w	Molar mass of water 18.015	kg/kmol

Method and standards

Dalton's law with a vaporisation efficiency.

Assumptions and limits

- Immiscible liquids; ideal gas.

References

- Dalton's law of partial pressures for immiscible liquids (each exerts its own vapour pressure)
- Perry's Chemical Engineers' Handbook
- 9th ed. (McGraw-Hill, 2019)
- sec. 13 (distillation)
- vaporisation efficiency

Report details

Report reference	FCC-BW0M-87X6 (the same inputs always give the same reference)
Generated	17 November 2026, 19:46 UTC
Calculator	Steam Distillation of an Immiscible Liquid
Method last reviewed	13 November 2026
Software release	FireCAD Calc, release of 17 November 2026
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/chemical/separation/steam-distillation-immiscible

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.