Murphree Tray Efficiency to Overall Column Efficiency

Overall column efficiency from the Murphree vapour efficiency and the stripping factor λ = mV/L (Lewis's relation, straight equilibrium and operating lines).

Method: Perry's Chemical Engineers' Handbook; 9th ed. (McGraw-Hill, 2019); ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Murphree vapour efficiency	70.000	%
Equilibrium line slope	1.2000	
Vapour-to-liquid molar ratio	1.0000	
Theoretical stages	15.000	

Calculated results

Parameter	Value	Unit
Stripping factor mV/L	1.2000	
Overall efficiency	71.867	%
Actual trays	21.000	

Notes for this case

- Lewis's relation assumes vapour and liquid fully mixed between trays and straight lines over the section; apply it per section.

Formula and method

$$E_o = \frac{\ln[1 + E_{MV}(\lambda - 1)]}{\ln \lambda}, \quad \lambda = \frac{mV}{L}$$

Variables

E_{MV}	Murphree vapour efficiency	-
m	Equilibrium line slope	-
V/L	Vapour-to-liquid molar ratio	-
N_t	Theoretical stages	-
λ	Stripping factor mV/L	-
E_o	Overall efficiency	-
N_a	Actual trays	-

Method and standards

Lewis relation.

Assumptions and limits

- Straight lines; mixed vapour and liquid.

References

- Perry's Chemical Engineers' Handbook
- 9th ed. (McGraw-Hill, 2019)
- sec. 14 (E_o = ln[1 + E_MV(λ − 1)]/ln λ)

Report details

Report reference	FCC-WQBY-SN7H (the same inputs always give the same reference)
Generated	17 November 2026, 19:44 UTC
Calculator	Murphree Tray Efficiency to Overall Column Efficiency
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/murphree-overall-efficiency

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.