Packed Absorber: Transfer Units (Colburn) and Height

Number of overall gas-phase transfer units of a packed absorber by the Colburn equation for a straight equilibrium line, and the packed height from HOG.

Method: Colburn (1939) N_OG for straight equilibrium and operating lines; Z = H_OG × N_OG

Input parameters

Unit system: SI

Parameter	Value	Unit
Solute in the gas entering	2.0000	%
Solute in the gas leaving	0.10000	%
Solute in the liquid entering	0	%
Equilibrium slope y = mx	1.2000	
Liquid-to-gas molar ratio	1.8000	
Height of a transfer unit From the packing maker or a correlation.	0.60000	m

Calculated results

Parameter	Value	Unit
Stripping factor mG/L	0.66667	
Transfer units	5.9773	
Packed height	3.5864	m

Formula and method

$$N_{OG} = \frac{1}{1-\lambda} \ln\left[(1-\lambda)\frac{y_1 - m x_2}{y_2 - m x_2} + \lambda\right], \quad \lambda = \frac{mG}{L}$$

Variables

y_1	Solute in the gas entering	-
y_2	Solute in the gas leaving	-
x_2	Solute in the liquid entering	-
m	Equilibrium slope y = mx	-
L/G	Liquid-to-gas molar ratio	-
H_{OG}	Height of a transfer unit	m
λ	Stripping factor mG/L	-
N_{OG}	Transfer units	-
Z	Packed height	m

Method and standards

Colburn.

Assumptions and limits

- Dilute, isothermal, straight lines.

References

• Colburn (1939) N_OG for straight equilibrium and operating lines; Z = H_OG × N_OG

Report details

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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/chemical/separation/absorber-ntu-colburn

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.