Flotation Bubble Surface Area Flux and Rate Constant

Superficial gas velocity, bubble surface area flux Sb from the Sauter bubble size, and the pulp and overall flotation rate constants k = P Sb Rf.

Method: Wills and Finch; Wills' Mineral Processing Technology; ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Air flow to the cell	15.000	m³/min
Cell cross-sectional area	10.000	m²
Sauter mean bubble diameter	1.5000	mm
Floatability (calibrated)	5.0000e-04	
Froth zone recovery	50.000	%

Calculated results

Parameter	Value	Unit
Superficial gas velocity	2.5000	cm/s
Bubble surface area flux	100.00	1/s
Pulp-zone rate constant	3.0000	1/min
Overall rate constant	1.5000	1/min

Notes for this case

- P is a floatability factor fitted from plant or pilot data; the k–Sb relation is largely empirical. Frother reduces D32 to about 1 mm, raising Sb several-fold.

Formula and method

$$J_g = \frac{Q_g}{A}, \quad S_b = \frac{6 J_g}{D_{32}}, \quad k = P S_b R_f$$

Variables

Q_g	Air flow to the cell	m³/s
A	Cell cross-sectional area	m²
D_{32}	Sauter mean bubble diameter	m
P	Floatability (calibrated)	-
R_f	Froth zone recovery	-
J_g	Superficial gas velocity	m/s
S_b	Bubble surface area flux	1/s
k_p	Pulp-zone rate constant	1/s
k	Overall rate constant	1/s

Method and standards

Gas dispersion and flotation kinetics.

Assumptions and limits

- Empirical P; uniform aeration.

References

- Wills and Finch
- Wills' Mineral Processing Technology

- 8th ed. (Butterworth-Heinemann, 2016)
- ch. 12
- eqs. 12.7
- 12.29 and 12.32-12.33

Report details

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Release checks	3 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/civil/mining-minerals/bubble-surface-area-flux

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.