Molecular Sieve Bed Mass and Volume per Cycle

Adsorbent mass and bed volume for one bed from the water removed per hour, the cycle time and the working adsorption capacity of the sieve.

Method: Adsorption mass balance m_s = ṁ_w t_c / q

Input parameters

Unit system: SI

Parameter	Value	Unit
Water removed	0.25000	t/h
Adsorption time per bed	10.000	min
Working capacity (kg water per kg sieve)	0.080000	kg/kg
Sieve bulk density	700.00	kg/m³

Calculated results

Parameter	Value	Unit
Water per cycle	41.667	kg
Sieve per bed	0.52083	t
Bed volume	0.74405	m³

Notes for this case

- Working capacity is well below the equilibrium capacity of 3A sieve; use the supplier's design figure.

Formula and method

$$m_s = \frac{\dot{m}_w t_c}{q}, \quad V = \frac{m_s}{\rho_b}$$

Variables

$\dot{m}_w$	Water removed	kg/s
t_c	Adsorption time per bed	s
q	Working capacity (kg water per kg sieve)	kg/kg
ρ_b	Sieve bulk density	kg/m³
m_w	Water per cycle	kg
m_s	Sieve per bed	kg
V	Bed volume	m³

Method and standards

Mass balance.

Assumptions and limits

- Constant water load.

References

- Adsorption mass balance m_s = ṁ_w t_c / q

Report details

Report reference	FCC-WVP3-Z5XK (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/ethanol-distillation/molecular-sieve-bed-size

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.