Fermenter Volume and Number for a KLPD Plant

Wash volume per day, total fermenter volume and number of fermenters for a plant capacity, wash strength, fermentation cycle and working fill.

Method: Volume balance: wash = AA/(η_d s); volume = wash × cycle time / fill

Input parameters

Unit system: SI

Parameter	Value	Unit
Plant capacity (absolute alcohol)	100.00	kL/d
Wash strength	9.0000	%
Distillation efficiency	98.500	%
Cycle time (fill, ferment, empty, clean)	36.000	h
Working fill of the fermenter	85.000	%
One fermenter, gross	600.00	m³

Calculated results

Parameter	Value	Unit
Wash per day	1,128.0	m³/d
Total gross fermenter volume	1,990.6	m³
Fermenters	4.0000	

Notes for this case

- Add a fermenter for cleaning and maintenance standby.

Formula and method

$$\dot{V}_w = \frac{\dot{V}_e}{\eta_d s_v}, \quad V_g = \frac{\dot{V}_w t_c}{\phi}, \quad N = \lceil V_g / V_u \rceil$$

Variables

$\dot{V}_e$	Plant capacity (absolute alcohol)	m³/s
s_v	Wash strength	-
η_d	Distillation efficiency	-
t_c	Cycle time (fill, ferment, empty, clean)	s
ϕ	Working fill of the fermenter	-
V_u	One fermenter, gross	m³
$\dot{V}_w$	Wash per day	m³/s
V_g	Total gross fermenter volume	m³
N	Fermenters	-

Method and standards

Volume balance.

Assumptions and limits

- Steady output.

References

- Volume balance: wash = AA/(η_d s); volume = wash × cycle time / fill

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/sugar-ethanol/ethanol/fermenter-sizing

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.