Ethanol Storage Tanks: Days, Volume at 20 °C

Storage volume for a production rate and days of storage with ullage, tank count, and the volume a stock at a temperature occupies at 20 °C.

Method: V = Q t/(1 − u); V_{20} = V_T [1 − β (T − 20 °C)] (linear expansion)

Input parameters

Unit system: SI

Parameter	Value	Unit
Production	100.00	kL/d
Days of storage	30.000	d
Ullage (empty share at full)	5.0000	%
One tank, nominal	1,000.0	m³
Stock temperature	35.000	°C
Cubic expansion coefficient	1,100.0	µm/(m·K)

Calculated results

Parameter	Value	Unit
Stock to hold	3,000.0	m³
Nominal tankage	3,157.9	m³
Tanks	4.0000	
Volume at 20 °C per unit volume at stock temperature	0.98350	

Notes for this case

- A linear expansion coefficient is adequate for a few tens of degrees; use the official tables for excise.

Formula and method

$$V_n = \frac{\dot{V} t}{1 - u}, \quad N = \lceil V_n / V_{tank} \rceil, \quad \frac{V_{20}}{V_T} = 1 - \beta (T - 20\,°C)$$

Variables

$\dot{V}$	Production	m³/s
t	Days of storage	s
u	Ullage (empty share at full)	-
V_{tank}	One tank, nominal	m³
T	Stock temperature	K
β	Cubic expansion coefficient	1/K
V_s	Stock to hold	m³
V_n	Nominal tankage	m³
N	Tanks	-
V_{20}/V_T	Volume at 20 °C per unit volume at stock temperature	-

Method and standards

Definitions.

Assumptions and limits

- Linear expansion with the β you enter; the default 1.1 × 10^{-3} /K is a round figure for high-strength ethanol near room temperature, not an official value. The OIML R 22 density formula (used in the steel tank and spirit stock calculators) is more exact; use the official tables for excise.

References

- V = Q t/(1 − u); V_{20} = V_T [1 − β (T − 20 °C)] (linear expansion)

Report details

Report reference	FCC-7BA0-JJ71 (the same inputs always give the same reference)
Generated	17 November 2026, 19:49 UTC
Calculator	Ethanol Storage Tanks: Days, Volume at 20 °C
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/sugar-ethanol/ethanol/ethanol-storage-tank

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.