Ethanol Lost to Lactic and Acetic Acid Bacteria

Ethanol lost to the lactic and acetic acid made by contaminating bacteria (stoichiometry, Alcohol Textbook ch. 20) and the loss as a share of ethanol made.

Method: Jacques; Lyons and Kelsall (eds.); ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Beer volume	500.00	m³
Lactic acid formed	4.0000	g/L
Acetic acid formed	0.50000	g/L
Ethanol in the beer By volume.	12.000	%
Ethanol density at 20 °C	789.24	kg/m³

Calculated results

Parameter	Value	Unit
Glucose diverted to lactic acid (homolactic)	2,000.0	kg
Ethanol lost through lactic acid	1,022.9	kg
Ethanol lost through acetic acid (oxidation)	191.79	kg
Ethanol lost	1,539.0	L
Loss as a share of the ethanol made	2.5009	%

Notes for this case

- Per gram of lactic acid one loses the same 0.51 g of ethanol whether the bacteria are homo- or heterofermentative. Acetic acid is taken as ethanol oxidised by Acetobacter.

Formula and method

$$m_{E,L} = c_L V \frac{2M_E}{2M_L}, \quad m_{E,A} = c_A V \frac{M_E}{M_A}, \quad \Delta V_E = \frac{m_{E,L} + m_{E,A}}{\rho_e}$$

Variables

V	Beer volume	m³
c_L	Lactic acid formed	kg/m³
c_A	Acetic acid formed	kg/m³
P	Ethanol in the beer	-
ρ_e	Ethanol density at 20 °C	kg/m³
m_G	Glucose diverted to lactic acid (homolactic)	kg
$m_{E,L}$	Ethanol lost through lactic acid	kg
$m_{E,A}$	Ethanol lost through acetic acid (oxidation)	kg
ΔV_E	Ethanol lost	m³
$\Delta V_E / V_E$	Loss as a share of the ethanol made	-

Method and standards

Stoichiometry of the bacterial pathways.

Assumptions and limits

- Acids measured as formed during the fermentation.

References

- Jacques
- Lyons and Kelsall (eds.)
- The Alcohol Textbook
- 4th ed. (Nottingham University Press, 2003)
- ch. 20 (Narendranath)
- lactic and acetic acid bacteria and their pathways
- Stoichiometry with IUPAC atomic masses: $C_6H_{12}O_6 \rightarrow 2\ C_3H_6O_3$; $C_2H_5OH + O_2 \rightarrow CH_3COOH + H_2O$

Report details

Report reference	FCC-B5M1-B4BR (the same inputs always give the same reference)
Generated	17 November 2026, 19:46 UTC
Calculator	Ethanol Lost to Lactic and Acetic Acid Bacteria
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/lactic-acetic-ethanol-loss

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.