CO_2 from Fermentation: Liquid CO_2 per Litre of Ethanol

CO_2 produced with ethanol (one mole per mole), recoverable liquid CO_2 mass and storage volume per day for an ethanol output and recovery fraction.

Method: Gay-Lussac stoichiometry $C_6H_{12}O_6 \rightarrow 2\ C_2H_5OH + 2\ CO_2$ (molar masses from IUPAC); OIML R 22: ethanol density 789.24 kg/m³ at 20 °C

Input parameters

Unit system: SI

Parameter	Value	Unit
Absolute ethanol produced at 20 °C Pure (absolute) ethanol, not bulk rectified spirit: multiply a bulk volume by its % v/v. Enter in m³/day or L/day in the unit list.	4.1667	m³/h
CO_2 recovered	75.000	%
Liquid CO_2 density at storage About 1 030 kg/m³ near −20 °C and 20 bar.	1,030.0	kg/m³

Calculated results

Parameter	Value	Unit
CO_2 per kg of ethanol	0.95528	kg/kg
CO_2 per litre of ethanol	753.95	g/L
CO_2 produced	3.1414	t/h
Liquid CO_2 recovered	2.3561	t/h
Liquid CO_2 volume	2.2875	m³/h

Formula and method

$$\frac{m_{CO_2}}{m_e} = \frac{M_{CO_2}}{M_e}, \quad \dot{m}_{CO_2} = \dot{V}_e \rho_e \frac{M_{CO_2}}{M_e}$$

Variables

$\dot{V}_e$	Absolute ethanol produced at 20 °C	m³/s
η	CO_2 recovered	-
ρ_l	Liquid CO_2 density at storage	kg/m³
m_{CO_2}/m_e	CO_2 per kg of ethanol	kg/kg
m_{CO_2}/V_e	CO_2 per litre of ethanol	kg/m³
$\dot{m}_{CO_2}$	CO_2 produced	kg/s
$\dot{m}_l$	Liquid CO_2 recovered	kg/s
$\dot{V}_l$	Liquid CO_2 volume	m³/s

Method and standards

Fermentation stoichiometry.

Assumptions and limits

- Fermentation CO_2 only, one mole per mole of ethanol. CO_2 from yeast growth and side reactions is not counted, so the real gas flow is somewhat higher.
- Ethanol volume is absolute (pure) ethanol; a bulk rectified-spirit volume would overstate the CO_2.

References

- Gay-Lussac stoichiometry $C_6H_{12}O_6 \rightarrow 2\ C_2H_5OH + 2\ CO_2$ (molar masses from IUPAC)
- OIML R 22: ethanol density 789.24 kg/m³ at 20 °C

Report details

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Calculator	CO_2 from Fermentation: Liquid CO_2 per Litre of Ethanol
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/co2-recovery-liquid-per-litre

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.