Fermentation Sugar Balance and Yield on Sugar Consumed

Sugar consumed and sugar utilisation from sugar fed and residual unfermented sugar, and the alcohol yield on consumed sugar against Gay-Lussac theory.

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

Input parameters

Unit system: SI

Parameter	Value	Unit
Fermentable sugar fed (as invert)	192.00	t
Residual unfermented sugar	4.0000	t
Alcohol in wash (absolute)	112,000	L
Ethanol density at 20 °C	789.24	kg/m³

Calculated results

Parameter	Value	Unit
Sugar consumed	188.00	t
Sugar utilisation	97.917	%
Yield on consumed sugar vs theory	91.935	%

Notes for this case

- Low utilisation means slow or stuck fermentation; low yield on consumed sugar means contamination or by-products.

Formula and method

$$m_c = m_f - m_r, \quad U = \frac{m_c}{m_f}, \quad \eta_c = \frac{V_w}{m_c \dfrac{2M_{EtOH}}{M_{C_6H_{12}O_6}} / \rho_e}$$

Variables

m_f	Fermentable sugar fed (as invert)	kg
m_r	Residual unfermented sugar	kg
V_w	Alcohol in wash (absolute)	m³
ρ_e	Ethanol density at 20 °C	kg/m³
m_c	Sugar consumed	kg
U	Sugar utilisation	-
η_c	Yield on consumed sugar vs theory	-

Method and standards

Balance.

Assumptions and limits

- Fermentable sugars as invert.
- A yield above 100 % of theory is a data error; a note flags it.

References

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

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/fermentation-sugar-balance

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.