Sugar Diversion to Ethanol: Litres and Revenue

Ethanol from sucrose diverted from sugar to the distillery and the revenue from ethanol against the sugar forgone, by stoichiometry and the two prices.

Method: Sucrose → 4 C_2H_5OH (via inversion and Gay-Lussac stoichiometry $C_6H_{12}O_6$ → 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
Sugar (sucrose) diverted	1,000.0	t
Fermentation × distillation efficiency	88.500	%
Sugar price per tonne	38,000	
Ethanol price per litre	65.000	
Ethanol density at 20 °C	789.24	kg/m³

Calculated results

Parameter	Value	Unit
Ethanol per tonne of sucrose	603.67	L/t
Ethanol made	603,670	L
Ethanol revenue	3.9239e+07	
Sugar revenue forgone	3.8000e+07	
Gain (+) or loss (−) from diverting	1,238,575	

Notes for this case

- Diverted juice or B-heavy molasses also saves sugar-house steam and bagging; include those in a full study.

Formula and method

$$y = \frac{4M_{EtOH}}{M_{C_{12}H_{22}O_{11}}}\frac{\eta}{\rho_e}, \quad \Delta R = m_S y c_e - m_S c_S$$

Variables

m_S	Sugar (sucrose) diverted	kg
η	Fermentation × distillation efficiency	-
c_S	Sugar price per tonne	-
c_e	Ethanol price per litre	-
ρ_e	Ethanol density at 20 °C	kg/m³
y	Ethanol per tonne of sucrose	m³/kg
V_e	Ethanol made	m³
R_e	Ethanol revenue	-
R_S	Sugar revenue forgone	-
ΔR	Gain (+) or loss (−) from diverting	-

Method and standards

Stoichiometry.

Assumptions and limits

- Pure sucrose.

References

• Sucrose → 4 C_2H_5OH (via inversion and Gay-Lussac stoichiometry $C_6H_{12}O_6$ → 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/sugar-diversion-ethanol

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.