Enzyme Dose and Cost for Grain Liquefaction and Saccharification

Enzyme consumption per day and cost per kilolitre of ethanol from grain throughput, the doses per tonne of grain and the enzyme prices.

Method: Definitions (dose × throughput; cost per kL = cost per t ÷ kL per t)

Input parameters

Unit system: SI

Parameter	Value	Unit
Grain	250.00	t/d
Alpha-amylase dose	0.30000	kg/t
Glucoamylase dose	0.60000	kg/t
Alpha-amylase price per kg	900.00	
Glucoamylase price per kg	600.00	
Ethanol yield	450.00	L/t

Calculated results

Parameter	Value	Unit
Alpha-amylase per day	75.000	kg/d
Glucoamylase per day	150.00	kg/d
Enzyme cost per kL of ethanol (currency)	1,400.0	

Notes for this case

- Enzyme activity differs between products: compare on activity units, not kg.

Formula and method

$$\dot{m}_{AA} = \dot{m}_g d_a, \quad \dot{m}_{GA} = \dot{m}_g d_g, \quad C_{kL} = \frac{d_a c_a + d_g c_g}{y}$$

Variables

$\dot{m}_g$	Grain	kg/s
d_a	Alpha-amylase dose	kg/kg
d_g	Glucoamylase dose	kg/kg
c_a	Alpha-amylase price per kg	-
c_g	Glucoamylase price per kg	-
y	Ethanol yield	m³/kg
$\dot{m}_{AA}$	Alpha-amylase per day	kg/s
$\dot{m}_{GA}$	Glucoamylase per day	kg/s
C_{kL}	Enzyme cost per kL of ethanol (currency)	-

Method and standards

Definitions.

Assumptions and limits

- Steady throughput.

References

- Definitions (dose × throughput; cost per kL = cost per t ÷ kL per t)

Report details

Report reference	FCC-G2AA-Y88Y (the same inputs always give the same reference)
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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/enzyme-dose-cost

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.