Dairy and Food Plant Energy and Water per Unit Product

Specific steam, fuel energy, electricity and water per 1000 L of milk processed (or per tonne of product) and the energy cost per unit, from monthly totals.

Method: Mass and energy balances (definitions): specific consumption definitions

Input parameters

Unit system: SI

Parameter	Value	Unit
Milk processed (or product)	3,000.0	m³
Steam used	600.00	t
Fuel energy per kg of steam (on the fuel price's CV basis)	3.2000	MJ/kg
Electricity used	150,000	kWh
Water used	4,500.0	m³
Fuel price per GJ (your currency)	800.00	
Electricity price per kWh (your currency)	8.0000	

Calculated results

Parameter	Value	Unit
Steam per m³	200.00	kg/m³
Electricity per m³	50.000	kWh/m³
Water per m³ of milk	1.5000	m³/m³
Energy cost per m³ (your currency)	912.00	

Formula and method

$$s = \frac{m_s}{V}, \quad e_e = \frac{E_e}{V}, \quad w = \frac{V_w}{V}, \quad c = \frac{m_s \Delta h_s c_f + E_e c_e}{V}$$

Variables

V	Milk processed (or product)	m³
m_s	Steam used	kg
Δh_s	Fuel energy per kg of steam	J/kg
E_e	Electricity used	J
V_w	Water used	m³
c_f	Fuel price per GJ	-
c_e	Electricity price per kWh	-
s	Steam per m³	kg/m³
e_e	Electricity per m³	J/m³
w	Water per m³ of milk	m³/m³
c	Energy cost per m³	-

Method and standards

KPI definitions.

Assumptions and limits

- Monthly totals.
- Fuel energy per kg of steam and the fuel price per GJ must be on the same calorific value basis (gross or net). Prices and the cost are in your own currency.

References

- Mass and energy balances (definitions): specific consumption definitions

Report details

Report reference	FCC-EJQ2-4MM8 (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/chemical/food-dairy/dairy-energy-water-kpi

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.