Pumping Energy Cost and Wire-to-Water Efficiency

Hydraulic power, wire-to-water efficiency, electrical input, yearly energy and cost of pumping from flow, head, pump and motor efficiencies, hours and tariff.

Method: P = ρ g Q H / (η_p η_m)

Input parameters

Unit system: SI

Parameter	Value	Unit
Flow	150.00	m³/h
Total head	40.000	m
Liquid density	998.00	kg/m³
Pump efficiency	75.000	%
Motor (and drive) efficiency	93.000	%
Running hours in a year	6,000.0	h
Electricity price per kWh (your currency)	8.0000	

Calculated results

Parameter	Value	Unit
Hydraulic power ρ g Q H	16.312	kW
Electrical input	23.386	kW
Wire-to-water efficiency	69.750	%
Energy in a year	140,316	kWh
Cost in a year	1,122,528	
Energy per volume pumped	0.15591	kWh/m³

Formula and method

$$P_h = \rho g Q H, \quad P_e = \frac{P_h}{\eta_p \eta_m}, \quad E = P_e\, t$$

Variables

Q	Flow	m³/s
H	Total head	m
ρ	Liquid density	kg/m³
η_p	Pump efficiency	-
η_m	Motor (and drive) efficiency	-
t	Running hours in a year	s
C	Electricity price per kWh (your currency)	-
P_h	Hydraulic power ρ g Q H	W
P_e	Electrical input	W
η_{ww}	Wire-to-water efficiency	-
E	Energy in a year	J
C	Cost in a year	-
e_v	Energy per volume pumped	J/m³

Method and standards

Energy balance.

Assumptions and limits

- Steady duty.

References

- P = ρ g Q H / (η_p η_m)

Report details

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Release checks	3 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/mechanical/pumps/pump-energy-cost

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.