Cost of Steam with Three Fuels

Fuel cost per tonne of steam for up to three fuels from the steam and feedwater enthalpies (IF97), each fuel's price, calorific value and boiler efficiency.

Method: Fuel per tonne of steam = Δh/(GCV η); Δh from IAPWS-IF97

Input parameters

Unit system: SI

Parameter	Value	Unit
Steam pressure (absolute)	11.000	bar
Steam condition	Superheated at the temperature below	
Steam temperature (superheated only)	185.00	°C
Feedwater temperature	80.000	°C
Fuel 1 price per tonne	1,800.0	
Fuel 1 GCV	9,600.0	kJ/kg
Efficiency on fuel 1	70.000	%
Fuel 2 price per tonne	9,000.0	
Fuel 2 GCV	23,000	kJ/kg
Efficiency on fuel 2	82.000	%
Fuel 3 price per tonne	4,500.0	
Fuel 3 GCV	13,500	kJ/kg
Efficiency on fuel 3	75.000	%

Calculated results

Parameter	Value	Unit
Heat per kg of steam	2,447.4	kJ/kg
Fuel cost per tonne of steam, fuel 1	655.57	
Fuel cost per tonne of steam, fuel 2	1,167.9	
Fuel cost per tonne of steam, fuel 3	1,087.8	

Notes for this case

- Fuel only: add power, water, chemicals, labour and maintenance for the full cost of steam.

Formula and method

$$C_i = \frac{h_s - h_{fw}}{GCV_i \eta_i} c_i$$

Variables

p	Steam pressure (absolute)	Pa
T	Steam temperature (superheated only)	K
state	Steam condition: dry saturated or superheated	-
T_{fw}	Feedwater temperature	K
c_1	Fuel 1 price per tonne	-
GCV_1	Fuel 1 GCV	J/kg
η_1	Efficiency on fuel 1	-

c_2	Fuel 2 price per tonne	-
GCV_2	Fuel 2 GCV	J/kg
η_2	Efficiency on fuel 2	-
c_3	Fuel 3 price per tonne	-
GCV_3	Fuel 3 GCV	J/kg
η_3	Efficiency on fuel 3	-
Δh	Heat per kg of steam	J/kg
C_1	Fuel cost per tonne of steam, fuel 1	-
C_2	Fuel cost per tonne of steam, fuel 2	-
C_3	Fuel cost per tonne of steam, fuel 3	-

Method and standards

Energy balance: fuel per tonne of steam is the heat added from feedwater to steam (IAPWS-IF97) over each fuel's GCV and efficiency, times its price.

Assumptions and limits

- Fuel cost only.
- Steam dry saturated or superheated as chosen.
- Feedwater must be liquid at the steam pressure.

References

- Fuel per tonne of steam = Δh/(GCV η); Δh from IAPWS-IF97

Report details

Report reference	FCC-BKW1-E3RX (the same inputs always give the same reference)
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Calculator	Cost of Steam with Three Fuels
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Software release	FireCAD Calc, release of 17 November 2026
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/boilers-power-plant/plant-performance/steam-cost-fuel-comparison

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.