Break-Even Price of a New Fuel (Fuel Switching)

Highest new-fuel price at which switching still pays, from the old fuel's price, both CVs and efficiencies, the annual heat and the conversion cost.

Method: Equal annual cost: $m_1 p_1 = m_2 p_2 + C_0 \cdot CRF$; with $m = Q/(\eta\, CV)$

Input parameters

Unit system: SI

Parameter	Value	Unit
Old fuel price per kg	70.000	
Old fuel calorific value (same GCV or NCV basis as η_1)	41.000	MJ/kg
Efficiency on the old fuel	86.000	%
New fuel calorific value (same basis as CV_1 and η_2)	15.500	MJ/kg
Efficiency on the new fuel	78.000	%
Useful heat per year	60,000	GJ
Conversion cost	3.0000e+07	
Interest rate	10.000	%
Recovery period (years)	7.0000	

Calculated results

Parameter	Value	Unit
Old fuel per year	1,701.6	t
New fuel per year	4,962.8	t
Capital recovery factor	20.541	%
Break-even new fuel price per kg	22.760	

Notes for this case

- Below the break-even price the new fuel saves money after paying for the conversion; add handling and ash costs for solid fuels.

Formula and method

$$p_{2,be} = \frac{m_1 p_1 - C_0\, CRF}{m_2}, \quad m_i = \frac{Q}{\eta_i CV_i}, \quad CRF = \frac{i(1+i)^n}{(1+i)^n - 1}$$

Variables

p_1	Old fuel price per kg	-
CV_1	Old fuel calorific value (same GCV or NCV basis as η_1)	J/kg
η_1	Efficiency on the old fuel	-
CV_2	New fuel calorific value (same basis as CV_1 and η_2)	J/kg
η_2	Efficiency on the new fuel	-
Q	Useful heat per year	J
C_0	Conversion cost	-
i	Interest rate	-
n	Recovery period (years)	-
m_1	Old fuel per year	kg
m_2	New fuel per year	kg
CRF	Capital recovery factor	-
$p_{2,be}$	Break-even new fuel price per kg	-

Method and standards

Annual cost balance.

Assumptions and limits

- Constant prices.
- Both calorific values and both efficiencies on one basis (all GCV or all NCV).
- A negative break-even price (conversion cost above the old fuel bill) is flagged.

References

- Equal annual cost: $m_1 p_1 = m_2 p_2 + C_0 \cdot CRF$
- with $m = Q/(\eta\ CV)$

Report details

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Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/general/economics/break-even-fuel-price

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.