Molasses as Boiler Fuel: Calorific Value

Net calorific value of molasses from its brix (Hugot eqn 41.52), its equivalent in fuel oil and coal of given calorific values, and the steam it can raise.

Method: Hugot; Handbook of Cane Sugar Engineering; ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Molasses brix	85.000	%
Molasses burnt	2.0000	t/h
Fuel oil net calorific value	9,800.0	kcal/kg
Coal net calorific value	6,000.0	kcal/kg
Boiler efficiency on NCV	75.000	%
Heat per kg of steam	2,800.0	kJ/kg

Calculated results

Parameter	Value	Unit
Net calorific value 37B − 500	11,074	kJ/kg
Fuel oil equivalent per tonne	269.90	kg/t
Coal equivalent per tonne	440.83	kg/t
Steam raised	5.9325	t/h

Notes for this case

- Molasses burns with much ash (potash) that fouls boilers; it is usually worth more as distillery feedstock.
- The oil and coal equivalents compare heating values only, as if both fuels burnt at the same boiler efficiency; molasses ash lowers the efficiency, so the real equivalent is smaller.

Formula and method

$$N = 37B - 500 \ [\text{kcal/kg};\ B\ \%], \quad m_o = \frac{N}{N_o}, \quad \dot{m}_s = \frac{\dot{m} N \eta}{\Delta h}$$

Variables

B	Molasses brix	-
$\dot{m}$	Molasses burnt	kg/s
N_o	Fuel oil net calorific value	J/kg
N_c	Coal net calorific value	J/kg
η	Boiler efficiency on NCV	-
Δh	Heat per kg of steam	J/kg
N	Net calorific value 37B − 500	J/kg
m_o	Fuel oil equivalent per tonne	kg/kg
m_c	Coal equivalent per tonne	kg/kg
$\dot{m}_s$	Steam raised	kg/s

Method and standards

Hugot's formula.

Assumptions and limits

- Hugot's correlation for cane molasses.

- The oil and coal equivalents compare net calorific values only, at equal boiler efficiency; molasses ash (potash) lowers the efficiency, so the real equivalent is smaller.
- The brix basis (refractometric or dry substance) is not stated with the formula; the two differ by several units for final molasses, and each unit of brix changes N by 37 kcal/kg.

References

- Hugot
- Handbook of Cane Sugar Engineering
- 3rd ed. (Elsevier, 1986)
- ch. 41
- other fuels
- eqn 41.52
- p. 943

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/sugar-ethanol/steam-power/molasses-fuel-value

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Reopens the calculator with the inputs of this report.