Power for Sale from a Sugar Factory (Hugot)

Power per tonne cane from drive turbines, pass-out, back-pressure and condensing turbo-alternator steam, own use and export (Hugot pp. 1018–1022).

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

Input parameters

Unit system: SI

Parameter	Value	Unit
Crushing rate	250.00	t/h
Steam available per tonne cane	708.00	kg/t
Steam to drive turbines per tonne cane	26.000	kg/t
Their steam rate	5.5000	kg/kWh
Pass-out (medium pressure) steam per tonne cane	40.000	kg/t
Steam rate to the pass-out	11.000	kg/kWh
Back-pressure (process) steam per tonne cane	319.00	kg/t
Steam rate to back pressure	9.0000	kg/kWh
Steam rate of the condensing part	5.0000	kg/kWh
Own power use per t cane/h Include the power of the turbine-driven mills and pumps, because their drive-turbine power is counted in the total.	37.000	kWh/t

Calculated results

Parameter	Value	Unit
Steam condensed per tonne cane	323.00	kg/t
Power from drive turbines per t cane/h	4.7273	kWh/t
Power from the pass-out steam	3.6364	kWh/t
Power from the back-pressure steam	35.444	kWh/t
Power from the condensing steam	64.600	kWh/t
Total per t cane/h	108.41	kWh/t
Total generated (alternators plus drive turbines)	27,102	kW
Power for sale	17,852	kW

Notes for this case

- Hugot's example (250 t/h, 708 kg/t at 55 atm 440 °C): 4.7 + 3.6 + 35.4 + 64.6 = 108 kW per t/h, 27 MW generated, about 17.8 MW for sale.

Formula and method

$$S_c = S - S_d - S_m - S_p, \quad p = \frac{S_d}{r_d} + \frac{S_m}{r_m} + \frac{S_p}{r_p} + \frac{S_c}{r_c}, \quad P_x = (p - P_o)A$$

Variables

A	Crushing rate	kg/s
S	Steam available per tonne cane	kg/kg
S_d	Steam to drive turbines per tonne cane	kg/kg
r_d	Their steam rate	kg/J

S_m	Pass-out (medium pressure) steam per tonne cane	kg/kg
r_m	Steam rate to the pass-out	kg/J
S_p	Back-pressure (process) steam per tonne cane	kg/kg
r_p	Steam rate to back pressure	kg/J
r_c	Steam rate of the condensing part	kg/J
P_o	Own power use per t cane/h	J/kg
S_c	Steam condensed per tonne cane	kg/kg
p_d	Power from drive turbines per t cane/h	J/kg
p_m	Power from the pass-out steam	J/kg
p_p	Power from the back-pressure steam	J/kg
p_c	Power from the condensing steam	J/kg
p	Total per t cane/h	J/kg
P_g	Total generated (alternators plus drive turbines)	W
P_x	Power for sale	W

Method and standards

Hugot's power balance by steam path.

Assumptions and limits

- All steam available is used.
- The total includes the mechanical power of the drive turbines, so the own use must include the mills and pumps they drive; otherwise the power for sale is overstated.
- A negative power for sale means the factory imports; a note says so.

References

• Hugot
• Handbook of Cane Sugar Engineering
• 3rd ed. (Elsevier, 1986)
• ch. 41
• steam balance for maximum economy and power for sale
• pp. 1016–1022

Report details

Report reference	FCC-JRG9-V2CW (the same inputs always give the same reference)
Generated	17 November 2026, 19:49 UTC
Calculator	Power for Sale from a Sugar Factory (Hugot)
Method last reviewed	13 November 2026
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/sugar-ethanol/steam-power/cogeneration-power-export-hugot

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.