Cane Knife Set Power per Tonne Fibre

Installed and absorbed power of a cane knife set from the fibre rate and an installed kW per tonne fibre per hour (Hugot ch. 3), with the turbine-drive allowance.

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

Input parameters

Unit system: SI

Parameter	Value	Unit
Crushing rate	250.00	t/h
Fibre % cane	14.500	%
Installed power per tonne of fibre per hour (kW/(t fibre/h), not per t cane) Hugot (South African practice): levellers 7, levellers running in reverse 10, knives working as a shredder 20 (first and second sets), third set 12 kW/(t fibre/h).	20.000	kWh/t
Mean absorbed power / installed power	60.000	%
Drive	Electric motor	

Calculated results

Parameter	Value	Unit
Fibre rate	36.250	t/h
Installed power (electric motor rating)	725.00	kW
Mean absorbed power	435.00	kW
Drive rating (motor: P_i; turbine: 1.33 P_i)	725.00	kW
Installed power per tonne cane per hour	2.9000	kWh/t

Notes for this case

- Hugot (after Farrell) rates a turbine drive about one-third above the motor, because a turbine cannot take the motor's short overloads.

Formula and method

$$P_i = e\,Af, \quad P_a = \varphi P_i, \quad P_d = P_i \ \text{(motor)},\ 1.33\,P_i \ \text{(turbine)}, \quad \frac{P_i}{A}$$

Variables

A	Crushing rate	kg/s
f	Fibre % cane	-
e	Installed power per tonne of fibre per hour (kW/(t fibre/h), not per t cane)	J/kg
φ	Mean absorbed power / installed power	-
drive	Drive	-
Af	Fibre rate	kg/s
P_i	Installed power (electric motor rating)	W
P_a	Mean absorbed power	W
P_d	Drive rating (motor: P_i; turbine: 1.33 P_i)	W
P_i/A	Installed power per tonne cane per hour	J/kg

Method and standards

Specific power on the fibre rate, as tabulated by Hugot.

Assumptions and limits

- Specific power from practice; adjust for cane variety and harvesting. It is per tonne of fibre per hour, shown in kWh/t (= kW per t/h); a figure per tonne of cane is about 7 times smaller.

References

- Hugot
- Handbook of Cane Sugar Engineering
- 3rd ed. (Elsevier, 1986)
- ch. 3
- Tables 3.1–3.2 and pp. 43–45

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/cane-preparation/cane-knife-power

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.