Cane Carrier Power (Hugot)

Slat cane carrier power from the cane load, the chain and slat weight, friction and the lift, by Hugot eqns 2.9–2.13, with his rough and installed rules (2.14–2.15).

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

Input parameters

Unit system: SI

Parameter	Value	Unit
Crushing rate	250.00	t/h
Carrier speed	8.0000	m/min
Loaded length of the carrier	40.000	m
Total length of apron (both runs)	90.000	m
Height the cane is lifted	7.0000	m
Chain mass per metre, each of the two chains Hugot: 18–30 kg/m.	25.000	kg/m
Slat mass per metre of carrier length Per metre of carrier length, for the whole width: Hugot gives 32–40 kg per metre length per metre of width, so multiply by the carrier width (75 kg/m is about 2 m wide).	75.000	kg/m
Friction coefficient, loaded run 0.30 on rollers; 0.60 if the slats slide.	0.30000	
Friction coefficient, return run The empty return run on its rollers or rails; 0.15 is a FireCAD starting value, not a figure from Hugot. Use the carrier maker's value.	0.15000	
Gearing and drive factor Hugot: 1.4–1.5.	1.4500	

Calculated results

Parameter	Value	Unit
Cane on the loaded length	20.833	t
Weight of chains and slats on one run	5.6250	t
Friction power	16.649	kW
Lifting power	6.9123	kW
Carrier power	23.561	kW
Rough estimate (3Z_t + A)/20 hp	19.123	kW
Installed power, Hugot rule (3Z_t + A)/10 hp	38.246	kW

Notes for this case

- Hugot's rules use metric horsepower (75 kgf·m/s) with Z_t in metres and A in t/h.

Formula and method

$$Q = \frac{A\,Z_c}{u}, \quad K = \frac{Z_t}{2}(2p + p')$$

$$P_f = [(Q + K)f + Kf']\,g\,u\,\lambda, \quad P_e = A\,g\,H\,\lambda, \quad P = P_f + P_e$$

$$P_r = \frac{3Z_t + A}{20}, \quad P_i = \frac{3Z_t + A}{10}\ [\text{metric hp}]$$

Variables

A	Crushing rate	kg/s
$\mathcal{U}$	Carrier speed	m/s
Z_c	Loaded length of the carrier	m
Z_t	Total length of apron (both runs)	m
H	Height the cane is lifted	m
p	Chain mass per metre, each of the two chains	kg/m
p'	Slat mass per metre of carrier length	kg/m
f	Friction coefficient, loaded run	-
f'	Friction coefficient, return run	-
λ	Gearing and drive factor	-
Q	Cane on the loaded length	kg
K	Weight of chains and slats on one run	kg
P_f	Friction power	W
P_e	Lifting power	W
P	Carrier power	W
P_r	Rough estimate (3Z_t + A)/20 hp	W
P_i	Installed power, Hugot rule (3Z_t + A)/10 hp	W

Method and standards

Hugot's force balance on the loaded and return runs plus the work of lifting the cane, multiplied by a drive factor.

Assumptions and limits

- Steady load evenly spread on the loaded length.
- The slat mass is per metre of carrier length for the whole width (Hugot's figure per metre of width times the width). The return-run friction default is a FireCAD starting value.

References

• Hugot
• Handbook of Cane Sugar Engineering
• 3rd ed. (Elsevier, 1986)
• ch. 2
• eqns 2.9–2.15
• pp. 27–29

Report details

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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/cane-preparation/cane-carrier-power

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.