Rotary Pump for Massecuite and Molasses (Hugot)

Output of a rotary (Rota-type) pump for massecuite or molasses from its body, rotor, width and speed (Hugot eqn 44.2) and the motor power (44.3).

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

Input parameters

Unit system: SI

Parameter	Value	Unit
Body diameter	0.40000	m
Rotor section	0.060000	m²
Barrel width	0.30000	m
Rotor speed Hugot: molasses 120–150 rpm; massecuite 30–60 rpm.	40.000	rpm
Volumetric efficiency Hugot: molasses 0.70–0.85; massecuite 0.60–0.75.	65.000	%
Density of the product	1,480.0	kg/m³
Total head with losses	20.000	m
Pump efficiency	65.000	%
Reducer and transmission efficiency	92.000	%
Motor efficiency	85.000	%

Calculated results

Parameter	Value	Unit
Output	30.731	m³/h
Motor input power	4.8748	kW

Notes for this case

- Enter the friction head of the viscous product in H + h: it is often the larger part of the head for massecuite.
- Hugot writes the power with 100 in place of 102 (g × 1000/100 rounding). These pumps lift 2–3 m and deliver to 20–30 m.

Formula and method

$$Q = \left(\frac{\pi D^2}{4} - s\right) L\, n\, \rho_v, \quad P = \frac{Q\, d\, g (H + h)}{\rho_m \rho_r \rho_M}$$

Variables

D	Body diameter	m
S	Rotor section	m²
L	Barrel width	m
n	Rotor speed	1/s
ρ_v	Volumetric efficiency	-
d	Density of the product	kg/m³
$H + h$	Total head with losses	m
ρ_m	Pump efficiency	-
ρ_r	Reducer and transmission efficiency	-
ρ_M	Motor efficiency	-
Q	Output	m³/s
P	Motor input power	W

Method and standards

Hugot's displacement and power.

Assumptions and limits

- Positive-displacement pump; head includes pipe losses, which the user must find for the viscous product.
- The rotor speed is compared with Hugot's overall ranges (30–150 rpm); check it against the range for the product.

References

• Hugot
• Handbook of Cane Sugar Engineering
• 3rd ed. (Elsevier, 1986)
• ch. 44
• rotary pumps
• eqns 44.2–44.3
• pp. 1108–1112

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/rotary-pump-massecuite

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.