Sugar and Massecuite Screw Conveyor (Hugot)

Capacity, speed and power of a screw conveyor for sugar or massecuite from diameter, pitch, speed and fill (Hugot eqns 35.57–35.61).

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

Input parameters

Unit system: SI

Parameter	Value	Unit
Material	Sugar	
Screw diameter	0.50000	m
Pitch Hugot: about 0.7 D.	0.35000	m
Speed Hugot: sugar 15–25 rpm or 10/D; massecuite 15/D (Tromp 7–8).	20.000	rpm
Fill and slip coefficient Hugot: sugar 0.10–0.12 ribbon, 0.15–0.20 full; massecuite 0.15–0.20 ribbon, 0.25–0.30 full.	15.000	%
Bulk density About 850 kg/m³ for sugar; massecuite is much denser (about 1 450–1 500 kg/m³). Change it when you choose massecuite.	850.00	kg/m³
Screw length	20.000	m

Calculated results

Parameter	Value	Unit
Volume conveyed	12.370	m³/h
Mass conveyed	10.515	t/h
Hugot's speed (10/D sugar, 15/D massecuite)	20.000	rpm
Power (0.8 D²L sugar, 1.15 D²L massecuite)	4.0000	kW

Notes for this case

- The power is Hugot's rule in D²L only: it does not change with speed or throughput.
- Hugot: leave 6 mm between screw and trough so as not to crush crystals; support the shaft every 3 m. Add the drive efficiency to the power.

Formula and method

$$\dot{V} = \frac{\pi D^2}{4} p\, n\, k, \quad \dot{m} = d\dot{V}, \quad P = 0.8 D^2 L \text{ (sugar)},\ 1.15 D^2 L \text{ (massecuite)} \text{ [kW]}$$

Variables

$\mathrm{material}$	Material	-
D	Screw diameter	m
p	Pitch	m
n	Speed	1/s
k	Fill and slip coefficient	-
d	Bulk density	kg/m³
L	Screw length	m
$\dot{V}$	Volume conveyed	m³/s
$\dot{m}$	Mass conveyed	kg/s
n_H	Hugot's speed (10/D sugar, 15/D massecuite)	1/s

P	Power (0.8 D^2L sugar, 1.15 D^2L massecuite)	W

Method and standards

Hugot's screw conveyor rules.

Assumptions and limits

- Horizontal screws.
- Hugot's power rule depends on size only, not on speed or throughput; a speed well above his n_H is flagged.
- The bulk density is not changed with the material: enter about 1 450–1 500 kg/m³ for massecuite.

References

• Hugot
• Handbook of Cane Sugar Engineering
• 3rd ed. (Elsevier, 1986)
• ch. 35
• screw conveyors for massecuite and sugar
• eqns 35.57–35.61
• pp. 812–814

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/centrifugals-sugar-house/sugar-screw-conveyor

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.