Pressure Feeder Swept Volume and Speed

Volume a pressure feeder must sweep for the fibre it feeds (Crawford, after Hugot eqn 8.14), and the roller speed that gives it for a diameter, length and opening.

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	%
Pressure feeder roller diameter	0.80000	m
Roller length	2.0000	m
Opening between the feeder rollers	120.00	mm
Mill roller speed (0 if not checked) Optional: the speed of the mill the feeder serves, to compare with Hugot's 1.3–1.7 times.	0	rpm

Calculated results

Parameter	Value	Unit
Swept volume needed (3.8 A f m³/h)	137.75	m³/h
Fibre index of the feed (fixed by Crawford's rule, 1/3.8 t/m³)	263.16	kg/m³
Feeder roller speed for that volume	3.8062	rpm
Feeder roller peripheral speed	9.5660	m/min

Notes for this case

- Hugot: pressure feeder rollers run about 1.5 times the mill speed (1.3–1.7).

Formula and method

$$\dot{V} = 3.8\,A f\ [\mathrm{m^3/h}], \quad v_p = \frac{\dot{V}}{L\,e_p}, \quad n_p = \frac{v_p}{\pi D_p}, \quad \varphi = \frac{A f}{\dot{V}} = \frac{1}{3.8}\ \mathrm{t/m^3}$$

Variables

A	Crushing rate	kg/s
f	Fibre % cane	-
D_p	Pressure feeder roller diameter	m
L	Roller length	m
e_p	Opening between the feeder rollers	m
n_m	Mill roller speed (0 if not checked)	1/s
$\dot{V}$	Swept volume needed (3.8 A f m³/h)	m³/s
φ	Fibre index of the feed (fixed by Crawford's rule, 1/3.8 t/m³)	kg/m³
n_p	Feeder roller speed for that volume	1/s
v_p	Feeder roller peripheral speed	m/s

Method and standards

Crawford's swept-volume rule as given by Hugot, with continuity through the feeder opening.

Assumptions and limits

- Steady feed; opening under load.

- In 3.8 A f, A is in t/h and f is a fraction (A f is fibre in t/h), giving m³/h. The fibre index is then fixed at 1/3.8 t/m³ (about 263 kg/m³) whatever the inputs.
- The mill speed is optional; when given, the feeder speed is compared with Hugot's 1.3–1.7 times.

References

- Hugot
- Handbook of Cane Sugar Engineering
- 3rd ed. (Elsevier, 1986)
- ch. 8
- pressure feeders and Crawford's eqn 8.14
- pp. 94–97

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/pressure-feeder-volume

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.