Cane Diffuser Width and Residence Time (Hugot)

Width of a moving-bed cane or bagasse diffuser from fibre rate, bed depth, apron speed and compaction (Hugot p. 394), its residence time and the 25 mm per t/h rule.

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	%
Apron (bed) speed Hugot: de Smet 0.24–0.90 m/min, generally 0.65; BMA about 1 m/min.	0.65000	m/min
Bed depth Hugot: de Smet normally 1.8 m (2 m maximum); BMA 1.35 m.	1.8000	m
Compaction (fibre per m³ of bed) Hugot: 60–80 kg fibre/m³; above 80 the bed floods.	80.000	kg/m³
Share of the cross-section filled (scrapers, slope)	80.000	%
Length of the extraction zone	48.000	m

Calculated results

Parameter	Value	Unit
Diffuser width	8.0685	m
Bagasse residence time	73.846	min
Width by the 25 mm per t cane/h rule	6.2500	m

Notes for this case

- Hugot: de Smet residence 30–45 min for bagasse and 55–65 min for cane diffusers; juice passes in 20–35 min.
- Residence time 74 min is outside the 30–65 min Hugot quotes for de Smet bagasse and cane diffusers.

Formula and method

$$L = \frac{A f}{v H t \varphi}, \quad t_r = \frac{Z}{v}, \quad L_r = 0.025\,A \ \ [\mathrm{m};\ A\ \mathrm{t/h}]$$

Variables

A	Crushing rate	kg/s
f	Fibre % cane	-
v	Apron (bed) speed	m/s
H	Bed depth	m
t	Compaction (fibre per m³ of bed)	kg/m³
φ	Share of the cross-section filled (scrapers, slope)	-
Z	Length of the extraction zone	m
L	Diffuser width	m
t_r	Bagasse residence time	s
L_r	Width by the 25 mm per t cane/h rule	m

Method and standards

Continuity of fibre through the bed (Hugot after Van Hengel).

Assumptions and limits

- Uniform bed; constant compaction.

References

- Hugot
- Handbook of Cane Sugar Engineering
- 3rd ed. (Elsevier, 1986)
- ch. 23
- diffuser capacity (Van Hengel, p. 394) and de Smet and BMA data
- pp. 369–392

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/diffusion/cane-diffuser-sizing

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.