Vacuum Pan Surface, Volume and Footing

Heating surface to volume ratio, Hugot's volume to diameter rule ($V/\Delta^2 = 1.9$), the diameter it suggests and the footing (graining) volume of a vacuum pan.

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

Input parameters

Unit system: SI

Parameter	Value	Unit
Working volume	30.000	m³
Heating surface	180.00	m²
Pan diameter	4.0000	m
Graining (footing) volume share Hugot: 24–40 % of working capacity, generally not above 30 %.	30.000	%

Calculated results

Parameter	Value	Unit
Surface / volume (m²/m³)	6.0000	
Volume / diameter² (Hugot 1.9)	1.8750	m
Diameter for 1.9 m³/m²	3.9736	m
Graining volume	9.0000	m³

Notes for this case

- S/V = 6.0 m²/m³ is in the range for calandria pans on exhaust.
- Hugot's S/V: coils on live steam 3.9–4.6; calandria on exhaust 4.9–6.6; on bled vapour 6.6–7.2 m²/m³; refined sugar pans up to about 10.

Formula and method

$$\frac{S}{V}, \quad \frac{V}{\Delta^2} \approx 1.9 \text{ m}, \quad \Delta_H = \sqrt{V/1.9}, \quad V_g = \phi_g V$$

Variables

V	Working volume	m³
S	Heating surface	m²
Δ	Pan diameter	m
ϕ_g	Graining (footing) volume share	-
S/V	Surface / volume (m²/m³)	1/m
V/Δ^2	Volume / diameter² (Hugot 1.9)	m
Δ_H	Diameter for 1.9 m³/m²	m
V_g	Graining volume	m³

Method and standards

Hugot's proportions.

Assumptions and limits

- Normal massecuite heights.
- S/V is in m²/m³ (shown as a plain number) and is compared with Hugot's ranges in the note.

References

- Hugot
- Handbook of Cane Sugar Engineering

- 3rd ed. (Elsevier, 1986)
- ch. 33
- eqns 33.15 and 33.30 and Table 33.10
- pp. 653 and 667–669

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/pan-boiling/pan-capacity-geometry

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.