Molasses Storage Tank and Storage Loss

Tank volume for final molasses from production, storage days, density and entrained air (Hugot ch. 38), and the fermentable sugar lost in storage at a temperature.

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

Input parameters

Unit system: SI

Parameter	Value	Unit
Molasses made	100.00	t/d
Days of storage	120.00	d
True density of molasses	1,450.0	kg/m³
Entrained air by volume Hugot: 10 % for light, 15 % for heavy molasses.	10.000	%
Free board and dead volume	10.000	%
Storage temperature	35.000	°C
Fermentable loss per year at 30–35 °C Hugot (Meade): 2–3 % per year.	2.5000	%

Calculated results

Parameter	Value	Unit
Molasses stored	12,000	t
Bulk density with air	1,305.0	kg/m³
Tank volume	10,217	m³
Fermentable loss per year at that temperature	3.5355	%
Loss over the storage period	1.1624	%

Notes for this case

- Hugot: the loss roughly quadruples for each 10 °C above 30–35 °C. The rule is a rough guide near that range; far from it the loss is an extrapolation.

Formula and method

$$M = \dot{m}t, \quad \rho_a = \rho(1-a), \quad V = \frac{M}{\rho_a(1-\ell)}, \quad L = L_0\, 4^{(T-32.5)/10}, \quad L_s = L\frac{t}{365\ \mathrm{d}}$$

Variables

$\dot{m}$	Molasses made	kg/s
t	Days of storage	s
ρ	True density of molasses	kg/m³
a	Entrained air by volume	-
ℓ	Free board and dead volume	-
T	Storage temperature	K
L_0	Fermentable loss per year at 30–35 °C	-
M	Molasses stored	kg
ρ_a	Bulk density with air	kg/m³
V	Tank volume	m³
L	Fermentable loss per year at that temperature	-
L_s	Loss over the storage period	-

Method and standards

Mass balance and Hugot's storage-loss rule.

Assumptions and limits

- Loss rule centred on 32.5 °C; Hugot gives no range for it, so far from 30–35 °C it is an extrapolation. Losses above 100 % are capped and flagged.
- The storage loss assumes all the molasses is held for the whole period, and the tank holds the full production of the period at once with no deduction for the loss.

References

- Hugot
- Handbook of Cane Sugar Engineering
- 3rd ed. (Elsevier, 1986)
- ch. 38
- density and storage of molasses
- pp. 836–837

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/centrifugals-sugar-house/molasses-storage-tank

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.