Sucrose Solubility and Supersaturation

Solubility of sucrose by Wise and Nicholson, Charles and Verhaar (Hugot eqns 37.1–37.5) and the supersaturation of a liquor from brix, purity and temperature.

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

Input parameters

Unit system: SI

Parameter	Value	Unit
Temperature	60.000	°C
Brix of the liquor	80.000	%
Purity of the liquor (sucrose on dry solids)	75.000	%
Solubility coefficient (impure / pure) 1 for pure solutions; impurities change the solubility of sucrose (Hugot ch. 33). Enter a measured or published value for your liquor: the page has no correlation for it.	1.0000	

Calculated results

Parameter	Value	Unit
Saturated sucrose % solution, Wise and Nicholson	74.244	%
Charles	74.204	%
Verhaar	74.189	%
Saturated sucrose per water (Wise and Nicholson)	2.8827	
Sucrose per water in the liquor	3.0000	
Supersaturation	1.0407	

Notes for this case

• Hugot: graining at 1.25–1.40; building the strike at 1.08–1.20; about 1.2 in crystallisers. Above about 1.44 the liquor is labile and false grain forms.

Formula and method

$$s_{WN} = 62.77 + 0.1706t + 0.000344t^2, \quad s_{Ch} = 64.4 + 0.0725t + 0.002057t^2 - 0.000009035t^3, \quad s_V = \frac{10\,000}{100 + 0.355(158 - t)}$$

$$q_s = \sigma \frac{s}{100 - s}, \quad q = \frac{BP}{1 - B}, \quad S = \frac{q}{q_s}$$

Variables

t	Temperature	K
B	Brix of the liquor	-
P	Purity of the liquor (sucrose on dry solids)	-
σ	Solubility coefficient (impure / pure)	-
s_{WN}	Saturated sucrose % solution, Wise and Nicholson	-
s_{Ch}	Charles	-
s_V	Verhaar	-
q_s	Saturated sucrose per water (Wise and Nicholson)	-
q	Sucrose per water in the liquor	-
S	Supersaturation	-

Method and standards

Solubility fits cited by Hugot.

Assumptions and limits

- Fits for 0–100 °C.
- Purity is sucrose on dry solids (apparent purity, pol on brix, is the usual factory approximation).
- The solubility coefficient for impure liquors is the user's value; the page has no correlation for it.
- Supersaturation above about 1.44 (labile) or below 1 is flagged.

References

• Hugot
• Handbook of Cane Sugar Engineering
• 3rd ed. (Elsevier, 1986)
• ch. 33 (supersaturation, eqns 33.3–33.5, 33.44) and ch. 37 (solubility, eqns 37.1–37.5, Table 37.1)

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/sucrose-solubility-supersaturation

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.