Extraction with Simple and Compound Imbibition (Hugot)

Total extraction of a tandem with simple and with compound imbibition from fibre, dry-crushing bagasse fibre, wet mills, imbibition and efficiency β (Hugot ch. 19).

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

Input parameters

Unit system: SI

Parameter	Value	Unit
Fibre per unit cane	15.000	%
Fibre in bagasse after dry crushing Hugot assumes about 0.5 for the wet-crushing theory.	50.000	%
Sugar/juice extraction ratio in dry crushing Hugot: 1.05–1.10.	1.0700	
Number of wet-crushing mills	4.0000	
Imbibition water per unit cane	30.000	%
Imbibition efficiency Hugot: water under pressure 0.60–0.80, returned juice 0.50–0.70; 0.60–0.65 in practice.	65.000	%

Calculated results

Parameter	Value	Unit
Imbibition per unit fibre w/f	2.0000	
Extraction by dry crushing	88.118	%
Total extraction, simple imbibition	95.526	%
Total extraction, compound imbibition	96.214	%

Notes for this case

- The theory assumes every wet mill leaves bagasse at the fibre m; take the results as trends, not guarantees.

Formula and method

$$\lambda = \frac{w}{f}, \quad e_d = \min\left[1, \frac{\alpha(m-f)}{m(1-f)}\right], \quad r_s = \frac{\lambda m}{n(1-m)+\lambda m}, \quad E_s = e_d + (1-e_d)[1-(1-\beta r_s)^n]$$

One further formula is shown on the calculator page: https://calc.firecad.com/sugar-ethanol/milling/imbibition-extraction-theory

Variables

f	Fibre per unit cane	-
m	Fibre in bagasse after dry crushing	-
α	Sugar/juice extraction ratio in dry crushing	-
n	Number of wet-crushing mills	-
w	Imbibition water per unit cane	-
β	Imbibition efficiency	-
λ	Imbibition per unit fibre w/f	-
e_d	Extraction by dry crushing	-
E_s	Total extraction, simple imbibition	-
E_c	Total extraction, compound imbibition	-

Method and standards

Hugot's mathematical study of imbibition, Handbook of Cane Sugar Engineering, 3rd ed., ch. 19, eqns 19.5–19.16, pp. 284–293. The simple-imbibition forms are Hugot's own general-m forms (19.5, 19.7, 19.9); the same m for the dry-crushing and wet mills is Hugot's hypothesis (p. 285). Hugot derives compound imbibition for m = 0.5 (p. 293); the calculator generalises it by taking λ as r/(1 − r), the

ratio Hugot uses on p. 294.

Assumptions and limits

- Constant bagasse fibre after each wet mill.

References

• Hugot
• Handbook of Cane Sugar Engineering
• 3rd ed. (Elsevier, 1986)
• ch. 19
• eqns 19.3–19.16
• pp. 281–293

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/milling/imbibition-extraction-theory

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.