Heater Coefficient Fall with Scale and Cleaning Interval

Fall of a juice heater or evaporator coefficient with time on line by Hugot's law k = $k_0\sqrt{(A/(A + J))}$ (eqn 30.18), and the days until it reaches a cleaning limit.

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

Input parameters

Unit system: SI

Parameter	Value	Unit
Coefficient when clean	1,163.0	W/(m²·K)
Juice scaling factor, in days (Hugot's A, not the crushing rate) Hugot: 6 favourable, 4 average, 3 unfavourable.	6.0000	
Days on line	6.0000	d
Coefficient at which to clean	581.50	W/(m²·K)

Calculated results

Parameter	Value	Unit
Coefficient after J days	822.37	W/(m²·K)
Fraction of the clean coefficient	70.711	%
Days to the cleaning limit	18.000	d

Notes for this case

- Hugot's example: k_0 = 1000, A = 6, after 6 days k = 707 kcal/(m²·h·°C).

Formula and method

$$k = k_0\sqrt{\frac{A}{A+J}}, \quad J_c = A\left[\left(\frac{k_0}{k_l}\right)^2 - 1\right]$$

Variables

k_0	Coefficient when clean	W/(m²·K)
A	Juice scaling factor (Hugot's A, not the crushing rate)	days
J	Days on line (entered in any time unit, converted to days in the law)	s
k_l	Coefficient at which to clean	W/(m²·K)
k	Coefficient after J days	W/(m²·K)
k/k_0	Fraction of the clean coefficient	-
J_c	Days to the cleaning limit	s

Method and standards

Hugot's scaling law.

Assumptions and limits

- Steady scaling rate.
- In Hugot's law A and J are both in days: A is entered as a number of days and J is converted to days. Here A is Hugot's scaling factor, not the crushing rate A used elsewhere on the site.

References

- Hugot
- Handbook of Cane Sugar Engineering
- 3rd ed. (Elsevier, 1986)
- ch. 30
- eqns 30.15–30.18

- pp. 453–454

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/clarification/heater-scaling-coefficient

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.