Evaporation Rate by Dessin's Formula

Specific evaporation coefficient of an evaporator vessel by Dessin's formula (Hugot eqn 32.31), and its evaporation per m² and in total from surface and drop.

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

Input parameters

Unit system: SI

Parameter	Value	Unit
Mean brix in the vessel	16.000	%
Heating steam or vapour temperature	120.00	°C
True temperature drop (steam to boiling juice)	8.2000	K
Heating surface	700.00	m²
Dessin factor Hugot: 0.001 for clean vessels on known juice; 0.0008–0.0009 to allow for scale.	0.001000	

Calculated results

Parameter	Value	Unit
Specific evaporation coefficient, kg/(m²·h·°C)	5.5440	
Evaporation per m²	45.461	kg/(m²·h)
Evaporation	31,823	kg/h

Notes for this case

- Hugot's check: first vessel, mean brix 15, steam 120 °C, drop 8.2 °C gives c = 5.61 and 46 kg/(m²·h).

Formula and method

$$c = f(100 - b)(T - 54)\ [\mathrm{kg/(m^2\,h\,^\circ C);\ b\ \%;\ T\ ^\circ C}], \quad g = c\Delta, \quad E = gS$$

Variables

b	Mean brix in the vessel	-
T	Heating steam or vapour temperature	K
Δ	True temperature drop (steam to boiling juice)	K
S	Heating surface	m²
f	Dessin factor	-
C	Specific evaporation coefficient, kg/(m²·h·°C)	-
g	Evaporation per m²	kg/(m²·s)
E	Evaporation	kg/s

Method and standards

Dessin's formula as given by Hugot.

Assumptions and limits

- Robert (short-tube) vessels.
- The true drop is entered by you and is not checked against the boiling-point elevation and hydrostatic head; the note gives Hugot's check case only.
- c is in kg/(m²·h·°C) in every unit system (there is no unit list for it).

References

- Hugot
- Handbook of Cane Sugar Engineering
- 3rd ed. (Elsevier, 1986)
- ch. 32

- eqn 32.31 (Dessin) and Table 32.18
- pp. 576–580

Report details

Report reference	FCC-E4G6-CZT0 (the same inputs always give the same reference)
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Method last reviewed	13 November 2026
Software release	FireCAD Calc, release of 17 November 2026
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/evaporation/evaporation-coefficient-dessin

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.