Vacuum Pan: Water Evaporated and Steam per Strike

Feed syrup, water evaporated and steam per strike of a vacuum pan from the massecuite made, the brix of feed and massecuite and the pan and steam pressures.

Method: Solids balance and energy balance with IAPWS-IF97 latent heats

Input parameters

Unit system: SI

Parameter	Value	Unit
Massecuite per strike	60.000	t
Feed (syrup or molasses) brix	65.000	%
Massecuite brix	92.000	%
Pan pressure (absolute)	16.000	kPa
Heating steam or vapour pressure (absolute)	1.8000	bar
Heat losses and sensible heat allowance	5.0000	%

Calculated results

Parameter	Value	Unit
Feed per strike	84.923	t
Water evaporated per strike	24.923	t
Steam or vapour per strike	28.044	t

Notes for this case

- Feed is taken at its boiling point in the pan; the allowance covers losses and any heating of the feed.

Formula and method

$$M_f = M_m \frac{Bx_m}{Bx_f}, \quad E = M_f - M_m, \quad M_s = \frac{E\,h_{fg}(p_p)(1+k_l)}{h_{fg}(p_s)}$$

Variables

M_m	Massecuite per strike	kg
Bx_f	Feed (syrup or molasses) brix	-
Bx_m	Massecuite brix	-
p_p	Pan pressure (absolute)	Pa
p_s	Heating steam or vapour pressure (absolute)	Pa
k_l	Heat losses and sensible heat allowance	-
M_f	Feed per strike	kg
E	Water evaporated per strike	kg
M_s	Steam or vapour per strike	kg

Method and standards

Solids and energy balance.

Assumptions and limits

- Feed at boiling point.
- The whole strike is built from feed (no footing share; see the pan boiling time calculator for that).
- The steam must be at a higher pressure than the pan, but the useful temperature difference after the massecuite's boiling-point rise and head is not checked.

References

- Solids balance and energy balance with IAPWS-IF97 latent heats

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/vacuum-pan-evaporation

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.