Ice Making: Production from Refrigeration Capacity

Ice production per day from the refrigeration capacity, water and ice temperatures, specific heats and latent heat of fusion, with heat losses allowed.

Method: Sensible and latent heat of water and ice

Input parameters

Unit system: SI

Parameter	Value	Unit
Refrigeration capacity	50.000	TR
Losses (share of capacity)	15.000	%
Make-up water temperature	30.000	°C
Ice temperature leaving	-5.0000	°C
Specific heat of water	4.1860	kJ/(kg·K)
Latent heat of fusion of ice About 333.5 kJ/kg at 0 °C.	333.50	kJ/kg
Specific heat of ice	2.1000	kJ/(kg·K)

Calculated results

Parameter	Value	Unit
Heat removed per kg of ice	469.58	kJ/kg
Ice production	27.501	t/d

Formula and method

$$q = c_w(T_w - 0\,°C) + L + c_i(0\,°C - T_i), \quad \dot{m} = \frac{\dot{Q}_e(1 - k_l)}{q}$$

Variables

$\dot{Q}_e$	Refrigeration capacity	W
k_l	Losses (share of capacity)	-
T_w	Make-up water temperature	K
T_i	Ice temperature leaving	K
c_w	Specific heat of water	J/(kg·K)
L	Latent heat of fusion of ice	J/kg
c_i	Specific heat of ice	J/(kg·K)
q	Heat removed per kg of ice	J/kg
$\dot{m}$	Ice production	kg/s

Method and standards

Energy balance.

Assumptions and limits

- Steady production.
- Latent heat default 333.5 kJ/kg (the defrost calculator uses 333.55 kJ/kg, a 0.015 % difference).

References

- Sensible and latent heat of water and ice

Report details

Report reference	FCC-H640-J24T (the same inputs always give the same reference)
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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/hvac/refrigeration/ice-making-capacity

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.