Crystalliser Yield (Anhydrous Crystals)

Mass of anhydrous crystals from a cooling or evaporative crystalliser from the feed, its solute content, the final solubility and the water evaporated.

Method: Solute and water mass balance with the final solubility

Input parameters

Unit system: SI

Parameter	Value	Unit
Feed solution	1,000.0	kg
Solute mass fraction in the feed	30.000	%
Solubility at the final temperature (kg solute per kg water) From a solubility table.	0.20000	
Share of the feed water evaporated	10.000	%

Calculated results

Parameter	Value	Unit
Crystals formed	174.00	kg
Mother liquor	756.00	kg
Yield (share of solute crystallised)	58.000	%

Notes for this case

- Equilibrium yield; hydrated crystals carry water and need the hydrate form of the balance.

Formula and method

$$C = F w_F - S F (1 - w_F)(1 - E)$$

Variables

F	Feed solution	kg
w_F	Solute mass fraction in the feed	-
S	Solubility at the final temperature (kg solute per kg water)	-
E	Share of the feed water evaporated	-
C	Crystals formed	kg
M_L	Mother liquor	kg
Y	Yield (share of solute crystallised)	-

Method and standards

Mass balance.

Assumptions and limits

- Anhydrous crystals at equilibrium. Hydrated crystals are not handled: their water of crystallisation must be added to the balance.
- No mother liquor adheres to the crystals; washing and drying losses are not counted.

References

- Solute and water mass balance with the final solubility

Report details

Report reference	FCC-T8SR-P0K6 (the same inputs always give the same reference)
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Calculator	Crystalliser Yield (Anhydrous Crystals)
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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/chemical/separation/crystalliser-yield

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.