Sugar Dryer: Water Removed and Air Flow

Water removed in a sugar dryer from the sugar flow and moisture in and out, and the dry-air flow from the humidity rise of the air.

Method: Solids and moisture balance; air humidity balance (psychrometrics)

Input parameters

Unit system: SI

Parameter	Value	Unit
Wet sugar to dryer	25.000	t/h
Moisture in (wet basis)	1.0000	%
Moisture out (wet basis)	0.050000	%
Air humidity in	8.0000	g/kg
Air humidity out	12.000	g/kg
Air temperature out (to check saturation) Used only to check that the exit humidity is below saturation at 1 atm.	40.000	°C

Calculated results

Parameter	Value	Unit
Water removed	237.62	kg/h
Dry air needed	59,405	kg/h

Formula and method

$$\dot{m}_w = \dot{m}(1-w_1)\left(\frac{w_1}{1-w_1} - \frac{w_2}{1-w_2}\right), \quad \dot{m}_a = \frac{\dot{m}_w}{Y_2 - Y_1}$$

Variables

$\dot{m}$	Wet sugar to dryer	kg/s
w_1	Moisture in (wet basis)	-
w_2	Moisture out (wet basis)	-
Y_1	Air humidity in	kg/kg
Y_2	Air humidity out	kg/kg
T_e	Air temperature out (to check saturation)	K
$\dot{m}_w$	Water removed	kg/s
$\dot{m}_a$	Dry air needed	kg/s

Method and standards

Mass balance.

Assumptions and limits

- Steady state.
- The exit humidity must be below saturation at the exit air temperature (checked at 1 atm).

References

- Solids and moisture balance; air humidity balance (psychrometrics)

Report details

Report reference	FCC-15ZJ-Z712 (the same inputs always give the same reference)
Generated	17 November 2026, 19:50 UTC
Calculator	Sugar Dryer: Water Removed and Air Flow
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/centrifugals-sugar-house/sugar-dryer-air

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.