Bagasse Dryer Using Flue Gas: Water Removed and Gas Exit

Water removed from bagasse in a flue-gas dryer, the heat it takes (IF97), the gas exit temperature and the bagasse net calorific value before and after drying.

Method: Mass balance; energy balance with IAPWS-IF97 enthalpies; bagasse NCV by the sugar-industry equation

Input parameters

Unit system: SI

Parameter	Value	Unit
Wet bagasse	40.000	t/h
Moisture in	50.000	%
Moisture out	42.000	%
Ash % bagasse (wet)	2.5000	%
Brix % bagasse (wet)	2.0000	%
Flue gas through the dryer	160.00	t/h
Flue gas specific heat	1.1000	kJ/(kg·K)
Flue gas in	200.00	°C
Bagasse temperature in	35.000	°C

Calculated results

Parameter	Value	Unit
Water evaporated	5.5172	t/h
Heat taken from the gas	3,936.7	kW
Flue gas out	119.48	°C
Bagasse NCV before drying	7,375.0	kJ/kg
Bagasse NCV after drying	8,947.6	kJ/kg

Notes for this case

- Water leaves as vapour at the gas exit temperature; dryer heat losses are neglected. Keep the gas exit above its dew point.

Formula and method

$$\dot{m}_v = \dot{m}_b - \frac{\dot{m}_b(1-W_1)}{1-W_2}, \quad \dot{Q} = \dot{m}_v[h_v(T_{g,out}) - h_l(T_b)], \quad T_{g,out} = T_{g,in} - \frac{\dot{Q}}{\dot{m}_g c_{p,g}}$$

Variables

$\dot{m}_b$	Wet bagasse	kg/s
W_1	Moisture in	-
W_2	Moisture out	-
A	Ash % bagasse (wet)	-
B_x	Brix % bagasse (wet)	-
$\dot{m}_g$	Flue gas through the dryer	kg/s
$c_{p,g}$	Flue gas specific heat	J/(kg·K)
$T_{g,in}$	Flue gas in	K
T_b	Bagasse temperature in	K
$\dot{m}_v$	Water evaporated	kg/s
$\dot{Q}$	Heat taken from the gas	W

$T_{g,out}$	Flue gas out	K
NCV_1	Bagasse NCV before drying	J/kg
NCV_2	Bagasse NCV after drying	J/kg

Method and standards

Mass balance of the water removed and an energy balance on the gas: the heat taken is the water evaporated from liquid at the bagasse temperature to vapour at the gas exit temperature (IAPWS-IF97 at 1 atm), solved by a short fixed-point iteration. Bagasse NCV by the sugar-industry equation, with ash and brix concentrating as water leaves.

Assumptions and limits

- Adiabatic dryer.
- The sensible heat to warm the dry bagasse and the water left in it is not included, so the heat taken and the gas temperature drop are slightly understated.
- The gas dew point is not calculated; the page stops only if the gas would leave below about 60 °C. Check the exit against the dew point of your flue gas.

References

• Mass balance; energy balance with IAPWS-IF97 enthalpies; bagasse NCV by the sugar-industry equation

Report details

Report reference	FCC-P9R7-Z4TQ (the same inputs always give the same reference)
Generated	17 November 2026, 19:50 UTC
Calculator	Bagasse Dryer Using Flue Gas: Water Removed and Gas Exit
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/steam-power/bagasse-dryer-flue-gas

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.