Sugar–Distillery Complex: Bagasse and Steam per Tonne of Cane

Per tonne of cane: bagasse for the sugar house, ethanol from its molasses, steam and bagasse for the distillery, and the surplus bagasse left.

Method: Mass and steam balance per tonne of cane

Input parameters

Unit system: SI

Parameter	Value	Unit
Bagasse % cane	29.000	%
Sugar-house boiler steam % cane	45.000	%
Steam-to-bagasse ratio	2.2000	kg/kg
Molasses % cane	4.5000	%
Ethanol per tonne of molasses	230.00	L/t
Distillery steam per litre (incl. MEE)	5.0000	kg/L

Calculated results

Parameter	Value	Unit
Bagasse for the sugar house % cane	20.455	%
Ethanol per tonne of cane	10.350	L/t
Distillery steam % cane	5.1750	%
Bagasse for the distillery % cane	2.3523	%
Surplus bagasse % cane (negative = deficit)	6.1932	%

Notes for this case

- The distillery runs on stored molasses beyond the season: its steam per tonne of cane is spread over the year.

Formula and method

$$B_s = \frac{s_b}{r}, \quad y_c = FM\, y_M, \quad s_{d,c} = y_c s_d, \quad B_d = \frac{s_{d,c}}{r}, \quad B_x = B - B_s - B_d$$

Variables

B	Bagasse % cane	-
s_b	Sugar-house boiler steam % cane	-
r	Steam-to-bagasse ratio	kg/kg
FM	Molasses % cane	-
y_M	Ethanol per tonne of molasses	m³/kg
s_d	Distillery steam per litre (incl. MEE)	kg/m³
B_s	Bagasse for the sugar house % cane	-
y_c	Ethanol per tonne of cane	m³/kg
$s_{d,c}$	Distillery steam % cane	-
B_d	Bagasse for the distillery % cane	-
B_x	Surplus bagasse % cane (negative = deficit)	-

Method and standards

Mass and steam balance per tonne of cane: the bagasse each plant burns is its steam divided by the steam-to-bagasse ratio, and the surplus is what is left of the bagasse made. The defaults (29 % bagasse, 45 % steam, ratio 2.2, 230 L/t of molasses, 5 kg of steam per

litre) are FireCAD illustrative values for an Indian complex, not sourced design data: enter your plant's figures.

Assumptions and limits

- Per tonne of cane.
- One steam-to-bagasse ratio for both boilers: they are assumed alike in steam conditions, efficiency and bagasse moisture. Use a weighted ratio if they differ.
- A negative surplus is a deficit to be made up with other fuel; a warning is shown.

References

- Mass and steam balance per tonne of cane

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/boilers-power-plant/plant-performance/integrated-complex-steam-balance

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.