Steam from Biogas in a Boiler

Heat input and steam raised by burning biogas in a boiler from its flow, methane content, heating value and boiler efficiency, with IF97 enthalpies.

Method: Energy balance with IAPWS-IF97 enthalpies; methane LHV 35.8 MJ/Nm³ from 802.3 kJ/mol (NIST) by default

Input parameters

Unit system: SI

Parameter	Value	Unit
Biogas	1,500.0	Nm³/h
Methane in biogas	58.000	%
Methane net heating value	35.800	MJ/Nm³
Boiler efficiency (net basis)	88.000	%
Steam pressure (absolute)	11.000	bar
Feedwater temperature	105.00	°C

Calculated results

Parameter	Value	Unit
Heat input	8.6517	MW
Heat per kg of steam (dry saturated)	2,339.7	kJ/kg
Steam	11.714	t/h

Notes for this case

- H_2S in biogas forms SO_2 and acid dew point problems: scrub it before the boiler.

Formula and method

$$\dot{Q} = \dot{V}_b y_{CH_4} LHV, \quad \dot{m}_s = \frac{\eta_b \dot{Q}}{h_g(p) - h(p, T_{fw})}$$

Variables

$\dot{V}_b$	Biogas	Nm³/s
y_{CH_4}	Methane in biogas	-
LHV	Methane net heating value	J/m³
η_b	Boiler efficiency (net basis)	-
p	Steam pressure (absolute)	Pa
T_{fw}	Feedwater temperature	K
$\dot{Q}$	Heat input	W
Δh	Heat per kg of steam (dry saturated)	J/kg
$\dot{m}_s$	Steam	kg/s

Method and standards

Energy balance.

Assumptions and limits

- Dry saturated steam.

References

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Report details

Report reference	FCC-JJYP-NWGC (the same inputs always give the same reference)
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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/sugar-ethanol/spent-wash-zld/biogas-steam-equivalent

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.