Biogas from Spent Wash by Biomethanation (COD Basis)

Methane and biogas from the COD removed in an anaerobic digester (0.35 Nm³ CH_4 per kg COD at 0 °C), and the energy in the methane.

Method: COD equivalence of methane $CH_4 + 2\ O_2 \rightarrow CO_2 + 2\ H_2O$: 0.350 Nm³ CH_4 per kg COD at 0 °C; 1 atm (IPCC 2006 Vol. 5 uses 0.25 kg CH_4/kg COD)

Input parameters

Unit system: SI

Parameter	Value	Unit
COD load to the digester	110.00	t/d
COD removed (converted to methane)	65.000	%
Methane in biogas (by volume)	58.000	%
Methane net heating value	35.800	MJ/Nm³

Calculated results

Parameter	Value	Unit
Methane per kg COD removed	0.35024	m³/kg
Methane	25,042	Nm³/d
Biogas	43,176	Nm³/d
Energy in the methane	10.376	MW

Notes for this case

- COD used for sludge growth or reduced by sulphate makes no methane: use the COD actually converted.

Formula and method

$$Y = \frac{V_m}{2M_{O_2}} \approx 0.35\ \mathrm{Nm^3/kg}, \quad \dot{V}_{CH_4} = L_{COD}\eta_{COD}Y, \quad \dot{V}_b = \frac{\dot{V}_{CH_4}}{y_{CH_4}}$$

Variables

L_{COD}	COD load to the digester	kg/s
η_{COD}	COD removed (converted to methane)	-
y_{CH_4}	Methane in biogas (by volume)	-
LHV	Methane net heating value	J/m³
Y	Methane per kg COD removed	m³/kg
$\dot{V}_{CH_4}$	Methane	Nm³/s
$\dot{V}_b$	Biogas	Nm³/s
$\dot{E}$	Energy in the methane	W

Method and standards

COD stoichiometry.

Assumptions and limits

- Ideal gas at 0 °C, 1 atm; dry gas. Digester gas is saturated with water vapour (about 5–6 % by volume at 35 °C), so the wet gas volume is larger.

References

- COD equivalence of methane $CH_4 + 2\ O_2 \rightarrow CO_2 + 2\ H_2O$: 0.350 Nm³ CH_4 per kg COD at 0 °C
- 1 atm (IPCC 2006 Vol. 5 uses 0.25 kg CH_4/kg COD)

Report details

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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/spent-wash-zld/biomethanation-biogas

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.