Konstrukcija i rad bioplinare – video

<https://www.youtube.com/watch?v=5RswjCWaR6I>

<https://www.youtube.com/watch?v=mCebM7a5XBQ>

Own numbers

Fist numbers biogas

The summary of important base numbers of biogas technology published for many years has been updated again. Latest publications by well-known academic basis.

The following figures can be used as a guide for General calculations of agricultural biogas plants.

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| 1 m³ of biogas | 5.0-7.5 kWh energy content |
| 1 m³ of biogas | 50-75% methane content |
| 1 m³ of biogas | approx. 0.6 litres of heating oil equivalent |
| 1 m³ methane | 9.97 kWh energy content |
| 1 m³ methane | Calorific value 36 MJ / m ³, or  50 MJ/kg |
| 1 m³ methane | Density 0.72 kg / m ³ |
| 1 m³ methane | approximately 1 l of heating oil equivalent |

**Biogas yield of**

|  |  |
| --- | --- |
| Dairy cow (17 m³ liquid manure / animal place and year) | 289 nm ³ methane ≙ 1.095 kWhel. / TP x a \*. |
| Porker (1.6 m ³ manure/animal place and year) | 19 nm ³ methane ≙ 73 kWhel. / TP x a \*. |
| Fattening cattle (2.8 tonnes of solid dung/animal place and year) | 185 nm ³ methane ≙ 562 kWhel. / TP x a \*. |
| Horse (11.1 t solid dung/animal place and year) | 388 nm ³ methane ≙ 1.472 kWhel. / TP x a \*. |
| Laying hens (2 m³ of rotting manure/100 animal places per year) | 164 nm ³ methane ≙ 621 kWhel. / 100 TP x a \*. |
| 1 hectare maize (40-60 t FM \*) | 3.956-5.934 nm ³ methane ≙ 14.985-22.477 kWhel. / ha \*. |
| 1 ha of sugar beet (55-75 t FM \*) | 3.523-4.803 nm ³ methane 13.343-18.195 ≙ kWhel. / ha \*. |
| 1 ha grain-GPS (30-50 t FM \*) | 2.884-4.807 nm ³ methane ≙ 10.926-18.210 kWhel. / ha \*. |
| 1 ha-mixed Perfoliatum (45-60 t FM \*) | 2.871 3,828 nm ³ methane ≙ 10.874-14.499 kWhel. / ha \*. |
| 1 ha of Sudan grass (35-55 t FM \*) | 2.392-3.759 nm ³ methane ≙ 9.061-14.238 kWhel. / ha \*. |
| 1 ha of green land (23-43 t FM \*) | 2,001th 3.808 nm ³ methane ≙ 7.579-14.424 kWhel. / ha \*. |
| 1 ha wheat grain rye (4.3-6.8 t FM \*) | 1,390 2.179 nm ³ methane ≙ 5.264-8.255 kWhel. / ha \*. |

**Process indicators**

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| Temperature | *mesophil* | 32-34 ° C |
|  | *thermophil* | 50-57 ° C |
| Ph | *Hydrolysis / Acidogenese* | 4.5-7 |
|  | *Acetogenese / Methanogenesis* | 6.8-8.2 |
| Lazy loads of space |  | Ø 3.2 kg oTM/(m³\*d); (from 1.1 9.3) |
| Average hydraulic residence time | *single stage* | 22-88 days (Ø 58) |
|  | *multi-level* | 37-210 days (Ø 101) |
| FOS/TAC ratio |  | < 0,6 |
| Bio gas storage gas permeability |  | 1-5 ‰ biogas/day |
| Power BGA |  | Ø 7.6% |
| BGA heat |  | Ø 28% |
| Work necessary BGA per year |  | 1.15-8.5 AKH /(kWel. ) \* a). |
| Malfunction BGA per year |  | 1.2 per 10 kWel. |

**Indicators of gas utilization**

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| --- | --- |
| CHP efficiencyel. | 28 - 47% |
| CHP efficiencyth. | 34 - 55% |
| CHP efficiencytotal | approx. 85 - 90% |
| CHP use scope | 60,000 hours of operation |
| Micro gas turbine efficiencyel. | 26 - 33% |
| Micro gas turbine efficiency ofth. | 50 - 55% |
| Fuel cell efficiencyel. | 40 - 60% |
| ORC system efficiencyel. | 6-16% |

**Economic indicators**

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| --- | --- |
| Specific investment costs BGA 75 kWel. | approximately 9,000 €/ kWel. |
| *only CHP (incl. control, gas torch)* | *approx. 1.700 €/ kWel.* |
| Specific investment costs BGA 150 kWel. | approximately 6,500 €/ kWel. |
| *only CHP (incl. control, gas torch)* | *approx. 1.800 €/ kWel.* |
| Specific investment costs BGA 250 kWel. | approx. 6,000 €/ kWel. |
| *only CHP (incl. control, gas torch)* | *approx. 1.300 €/ kWel.* |
| BGA 500 kWel. | approximately 4,600 euro/kWel. |
| *only CHP (incl. control, gas torch)* | *approx. 1.000 €/ kWel.* |
| Specific investment costs BGA 750 kWel. | approx. 4,000 €/ kWel. |
| *only CHP (incl. control, gas torch)* | *900 €/ kWel.* |
| BGA 1,000 kWel. | about 3,500 €/ kWel. |
| *only CHP (incl. control, gas torch)* | *about 800 €/kWel.* |
| Specific investment costs BGA with processing 400 nm ³/h | about €9,600 / nm ³ \* h |
| *Biogas production only 400 nm ³/h* | *about €3,600 / nm ³ \* h* |
| Specific investment costs BGA with processing 700 nm ³/h | about €9,100 / nm ³ \* h |
| *Biogas production only 700 nm ³/h* | *about €2,400 / nm ³ \* h* |
| Specific investment costs ORC annex 13 - 375 kWel. | approximately 5,000 - 7,700 €/ kWel. |
|  |  |
| Electricity production costs BGA 75 kWel. | approx. 30 ct / kWh |
| Electricity production costs BGA 500 kWel. | approx. 17 euro cents / kWh |
| Electricity production costs BGA 1,000 kWel. | approx. 15 ct / kWh |
| Organic production cost methane 400 nm ³/h | 7-9 ct / kWh |
| Bio methane production costs 700 nm ³/h | 6-8 ct / kWh |

**Sample annual need for substrate biogas plant 75 kWel.**

3.300 t cow manure (165 dairy cows, at Ø 8,000 l milk production/a)

790 t corn silage (18 ha; in Ø 50 t FM/ha yield \*)

**Sample annual need for substrate biogas plant 500 kWel.**

2,200 t cow manure (110 dairy cows, at Ø 8,000 l milk production/a)

6,500 t of corn silage (148 ha; in Ø 50 t FM/ha yield \*)

1,100 t cereal-GPS (31 ha; for Ø 40 t FM/ha yield \*)

1,100 T silage from the permanent grassland (42 ha; at Ø 30 FM / ha yield \*)

*CHP efficiency 38%el.*

*\* 12% forage losses included sugar beet 15% (lagoon), cereal grain rye 1.4%*

*Sources: Biomass Regulation (2012), Faust numbers biogas (KTBL, 2013), Guide (FNR, 2013), guide biogas production biogas and both (FNR, 2014), electricity generation from biomass (DBFZ, 2014) and own calculations*