Manure Digesters in Europe – Applications to the United States

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EBA-GmbH Triesdorf
Landmaschinenschule
EBA

• Comprehensive impartial consulting for investors and farmers
  → Biogas, renewable fuels and heating with wood
  → Solar heating and production of solar power

• Nonpartisan calculations needed for banks (financing)

• Verification of company quotes

• Schooling and education of biogas producers

• Supervising and optimization of biogas plants

• Consultation for building a biogas plant

Figure 2: Number of biogas plants with their total installed electrical capacity in Germany
(Source: Federal Ministry for Environment, 2008; German Biogas Association, 2008; precede FNR)

EEG tariff for the year 2009

- Share of capacity €cents/kWh
- Basic tariff
  - up to 150 kWp: 11.67
  - from 150 to 500 kWp: 9.18
  - from 500 kWp to 2 MWp: 6.23
  - from 2 MWp to 20 MWp: 5.79
- Cultivated biomass bonus
  - up to 150 kWp: 7.00
  - from 150 to 500 kWp: 7.00
  - from 500 kWp to 5 MWp: 6.00
  - from 5 MWp to 20 MWp: 4.00
- Manure bonus
  - up to 150 kWp: 4.00
  - from 150 to 500 kWp: 1.00

Example calculations:
- Fermenting manure
- Rest of silage
- Rest of feed

- Basic tariff
- Cultivated biomass bonus
- Manure bonus

- Up to 22.67 €-Cent/kWh
- Exchange rate: 1 € = 1.3 $
- Up to 29.5 US-Cent/kWh

Status quo in Germany

Status quo in USA

Premises for enabling the biogas technology

- Possible planning horizon of at least 15 years!
- Defined payment rates for every kilowatt hour!
- Preferential use of renewable energy!

- Establishment of the „Renewable Energy Source Act“ in the United States
Basic numbers

- Biogas yield [m³/Year - m³/Year]
- Methane content [%]

Fermenters

- Typical fermenters
  - Steel/Stainless steel
  - Concrete

- Steel/Stainless steel
  - Flexible cover
  - Concrete with wooden cover
  - Concrete with concrete ceiling

Horizontal fermenters

- Concrete
- Steel/Stainless steel

Technics of a biogas plant

- Gas tank...
  - In a separate building
  - As part of the plant (flexible cover)
  - Separate on the pit
  - In a separate shed (plastic tarp)

Heating:

- Circular wall heating
  - Important for constant gas yield
  - Material: plastic, steel or stainless steel

Technics of a biogas plant

- Temperature stability is essential for a well-running plant!

Agitation devices:

- No swim layers
- Output of gas bubbles
- Mix the bacteria with new substrate
- Constant heating of the system
Agitation devices

Conventional mixers
(6,500 – 12,000,- $ per unit)

Paddle mixers
(15,000 – 26,000,- $ per unit)

Feeding devices:
- constant feeding of the fermenter
- as many feeding intervals as possible
- low self-power requirement

Feeding devices
- Augers for feeding in high pits
- Electronic scale optional

Feeding devices
- hydraulic back wall
- push floor
- scraper floor

CHP (combined heat and power unit)
gas-powered

Advantages
- no need for pilot injection
- minimized service
- long lasting (3-6 years)

Disadvantages
- relatively low electrical efficiency in small units (< 150 kWel.)

Costs:
190 kWel. = 143,000,- $
**Advantages**
- high electrical efficiency (up to 250 kW)

**Disadvantages**
- need for pilot injection (fossil oil / vegetable oil)
- additional investment for storage of oil
- more service

Costs (including Oil storage)
180 kWel. = 180,000,- $
Current problems

Costs of invest and running the plant
- fixed costs now average about 7 to 10 US-cent / kWh
  - amortization
  - interest rate
  - service (CHP, technics and buildings)
  - labor time
  - insurance
  - additional costs

Introducing biogas technology needs start-up support!

Don't shy to contact us!
It is important to share knowledge!

Thanks for listening!
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