Country updates:

Germany

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Institute of Technology and Biosystem Engineering
Number of biogas plants in Germany
Installed electrical capacity

Mean electrical capacity [kW]

- Vor 2000: 50
- 2000: 75
- 2001: 190
- 2002: 330
- 2003: 350
- 2004: 380
- 2005: 450
- 2006: ?
Massenanteil Wirtschaftsdünger am Substratinput (Start up: 2004-2006)
Application of energy crops
(Start up: 2004 – 2006)

Type of energy crops

- Maize silage
- Grain
- Grain silage
- Grass silage
- Grass
- CCM
- Corn
- Sunflower silage

Frequency of application [%]
Application of wet- and dry-fermentation

Biogas plants 2004-2006

Digestion technology:
- wet fermentation
  - with manure
  - without manure
- dry fermentation
  - with manure
  - without manure
Direct-feeding systems for solids

Feed screw

Solid substrate

Biogasreactor

Feed piston

Solid substrate

Biogasreactor

Flushing system

Solid substrate

Biogasreactor
Solid substrate dosing device
Reaktor systems

Biogas plants 2004-2006

Relative frequency [%]

vertical  
horizontal  
combined  
n.d.
Application of different stirrer types

Biogas plants 2004-2006

Relative frequency [%]

- submerged mixer
- central mixer
- side mixer
- pneumatic mixer
- n.d.
Number of process units

The bar chart shows the number of process units in one stage and two stage systems from 1999 to 2006.

- **One stage**: The relative frequency is approximately 50% for both periods.
- **Two stage**: The relative frequency is significantly higher, around 75% from 1999 to 2006.

The chart indicates a trend towards more two-stage systems over the observed period.
Process temperature

Biogas plants 2004-2006

Relative frequency [%]

mesophilic | thermophilic | mesophilic/thermophilic | n.d.

process temperature
ODM-Loading rate

Loading rate [kg ODM/(m³ d)]

- < 1
- 1-2
- 2-3
- 3-4
- 4-5
- > 5

Relative frequency [%]

50
40
30
20
10
0
Residual methane formation from the storage tank

N = 11

Methane losses from storage tank [%] (at 20 °C)
Storage tanks for digester residues

**Biogas plants 2004-2006**

- **open**: 50%
- **covered**: 10%
- **gas-tight covered**: 30%
- **n.d.**: 0%

Relative frequency [%]
## Renewable Energy Sources Act (2005)

<table>
<thead>
<tr>
<th>Electrical capacity [kW]</th>
<th>Compensation [Cent/kWh(_{el})]</th>
<th>Energy crops bonus [Cent/kWh(_{el})]</th>
</tr>
</thead>
<tbody>
<tr>
<td>150</td>
<td>11.33</td>
<td>6.0</td>
</tr>
<tr>
<td>150 – 500</td>
<td>9.75</td>
<td>6.0</td>
</tr>
<tr>
<td>500–5.000</td>
<td>8.77</td>
<td>4.0</td>
</tr>
</tbody>
</table>

KWK-Bonus: 2 Cent/kWh\(_{el}\) for external heat utilization

Technology bonus: 2 Cent/kWh\(_{el}\) (e.g. dry fermentation)
Discontinuously operated dry fermentation with percolation
Continuously operated dry fermentation with plug-flow fermenter
Many thanks for your attention!