

Experiences with anaerobic digestion in the Czech Republic

Miroslav Kajan, CZBA, R.A.B.
 Třeboň
 Pavel Štindl, JČU Č. Budějovice

Czech Republic

„The Future for AD of Organic Waste in Europe“, 16th – 17th of Jan.2008, Nuremberg, Germany

Anaerobic digestion & WWTP

- AD of sewage sludge – first half of last century
- Now about 100 WWTP with AD (almost each city with more than 30 000 inhab.)
- Number of plants with AD is stabilized



„The Future for AD of Organic Waste in Europe“, 16th – 17th of Jan.2008, Nuremberg, Germany

Agriculture & biogas plants

- Forced collectivisation of agriculture, small independent farms were changed in huge artificial units (state farms) with thousands of hectares and thousands of cows resp. tens of thousands pigs
- Local overproduction of wastes
- Consequent problems with contamination of soil and water.
- Reason for biogas plants construction = decrease of organic fraction in wastes with secondary treatment of digestate
- The main reason „environmental“

???

„The Future for AD of Organic Waste in Europe“, 16th – 17th of Jan.2008, Nuremberg, Germany

? Why idea of secondary treatment of digestate ?

- High manure (water) production per animal (15 – 20 l/pig/day)
- Low TS in manure (1,5 – 3 %)
- **Aerobic secondary treatment of digested material**
- High ammonium concentration (2000-3000mg/l)
- Adjustment of BOD (C) / N ratio is necessary
- *Distillation*
- *Stripping*
- *Mixing with other waste waters*

„The Future for AD of Organic Waste in Europe“, 16th – 17th of Jan.2008, Nuremberg, Germany

1974 first agricultural biogas plant in CR

1974- 1995 : 11 BP, 200 – 400 kW el.

1995 – 2005: 1 BP



„The Future for AD of Organic Waste in Europe“, 16th – 17th of Jan.2008, Nuremberg, Germany

Law No. 180/2005 on support of electricity production from renewable sources of energy was adopted

- The law introduces a preferential connection of RES into the distribution or transmission system
- The minimal purchasing prices for electricity from RES
- Maintenance of the purchasing prices support for the period of 15 (20) years

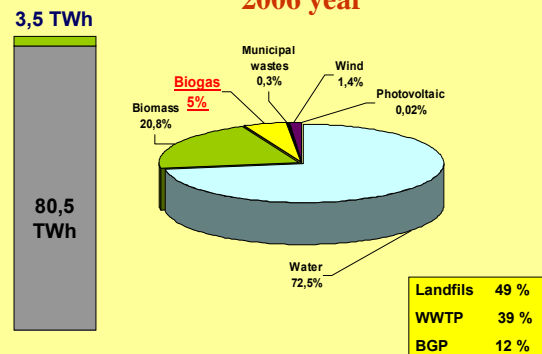
„The Future for AD of Organic Waste in Europe“, 16th – 17th of Jan.2008, Nuremberg, Germany

2005 - 2007

- Conditions for BP: 0,1 Euro/kWh + investment grants
- Municipalities investment grants (up to 85 %)
- Others up to 50 % (30 % avg.)
- **Cca 10 new BP – when main imperfections:**
- Defects in construction, wrong substrate calculation, inexperience with operation, short retention time, etc.
- **ODOUR**
- Aversion of resident population to BP
- Promotion in the media = aversion of large population = tighter specification = bureaucracy

„The Future for AD of Organic Waste in Europe“, 16th – 17th of Jan.2008, Nuremberg, Germany

Gross consumption of electricity 2006 year



„The Future for AD of Organic Waste in Europe“, 16th – 17th of Jan.2008, Nuremberg, Germany

Year 2008

- Investment grants (EU, Min. of industry, agri., environment) 50 %
- Purchases prices or green premiums

| | Purchase prices (EUR/kWh) | Green premiums (EUR/kWh) |
|---|------------------------------|-----------------------------|
| For BP commissioned after 1/1/2008 and processing manure, energy plants | 3,90 (0,15) | 2,62 (0,10) |
| For BP commissioned after 1/1/2008 and processing wastes | 3,30 (0,13) | 2,02 (0,78) |

„The Future for AD of Organic Waste in Europe“, 16th – 17th of Jan.2008, Nuremberg, Germany

Construction of biogas plants during 2008 - 2013

- 300 – 400 new biogas plants are supposed to be built
- In 2008/2009 construction of approximately 100 biogas plants is expected
- sample of 50 planned biogas plants was treated
 - two-step fermentation
 - reinforced concrete fermentors (vertical, horizontal)
 - use of heat mainly for self-operation
 - cogeneration units (36 – 41 % el. ef., 8000 Mh)

„The Future for AD of Organic Waste in Europe“, 16th – 17th of Jan.2008, Nuremberg, Germany

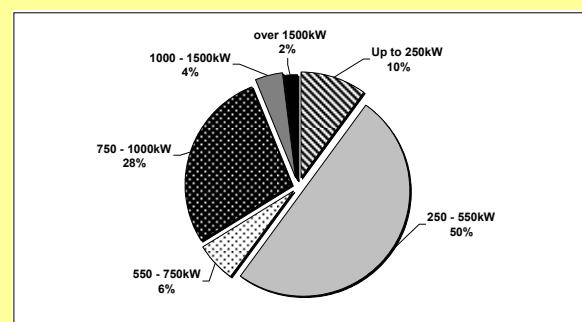
„Average“ biogas plants – power supply

| Installed power (MWel.) | Biogas (mil. m3/year) | Biogas energy (GWh/year) | Electricity production (GWh/year) |
|-------------------------|-----------------------|--------------------------|-----------------------------------|
| 0,69 | 2,53 | 13,9 | 5,55 |

| Koef. of year utilization of installed power | Water | FV | Wind | Biogas „new „ (8000Mh) | Nuclear energy |
|--|-------|------|------|------------------------|----------------|
| Ky | 0,28 | 0,11 | 0,13 | 0,92 | 0,82 |
| Day/year | 102 | 40 | 47 | 332 | 299 |

„The Future for AD of Organic Waste in Europe“, 16th – 17th of Jan.2008, Nuremberg, Germany

Division of biogas plants (planned) according to installed el. power



„The Future for AD of Organic Waste in Europe“, 16th – 17th of Jan.2008, Nuremberg, Germany

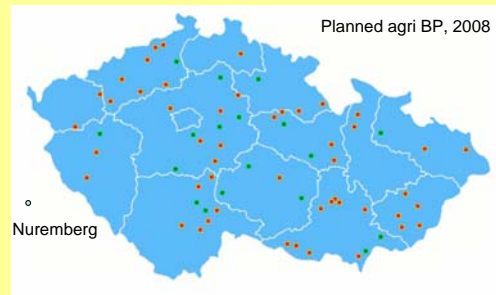
**„Average“ 690 kW el. biogas plant -
 substrates**

| Substrate (thousands of tons/year) | Maize silage (MS) | Grass silage (GS) | Cattle dung+ma nure (CM) | Pig's manure (PM) | others | In total |
|--|--------------------------------|--------------------------------|--|--------------------------------|--------|----------|
| average | 7,6 | 1,6 | 4,9 | 4,2 | 3,7 | 22,0 |
| 100 BP | 760 | 160 | 490 | 420 | 370 | 2 200 |

MS = cca 10 % area
GS = 2 % of set asside area
CM + PM = 4 %

„The Future for AD of Organic Waste in Europe“, 16th – 17th of Jan.2008, Nuremberg, Germany

Thank you for your attention



Mira Kajan & Pavel Štindl

„The Future for AD of Organic Waste in Europe“, 16th – 17th of Jan.2008, Nuremberg, Germany