The contribution of AD in delivering renewable energy and the rôle of IEA Bioenergy Task 37

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Co-digestion for an optimized production of biogas and fertilizer, Ludlow 17 April 2008
Task 37 is part of the Bioenergy Agreement of the IEA
20 countries plus the European Commission participate in IEA Bioenergy
The following countries are member of Task 37 on Energy from Biogas and Landfill gas

• Switzerland: Arthur Wellinger, Task Leader
• Austria: Rudolf Braun
• Canada: Jody Anne Barclay
• EC (JRC): David Baxter
• Denmark: Jens Bo Holm-Nielsen
• Finland: Jukka Rintala
• France: Olivier Théobald
• Germany: Peter Weiland
• Sweden: Anneli Petersson
• The Netherlands: Mathieu Dumont
• U.K.: Clare Lukehurst
Focus

The anaerobic treatment of agricultural waste including energy crops, the organic fraction of municipal solid waste and organic rich industrial waste water to produce biogas and a digestate of a high quality.

Aim

Exchange and disseminate information on biogas production, upgrading and utilisation

Promote deployment of AD plants

www.iea-biogas.net

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Task 37 – Key Activities and Achievements

- Stimulate R&D on gas upgrading
- Continuous education and information for decision makers
- Demonstration of new developments and lessons learned (Success Stories)
- Workshops and meetings with operators, industry and decision makers
- Promote biogas as a vehicle fuel and/or injection into gas grid

www.iea-biogas.net
The history of biogas
U.K. used to play an important rôle

- 1776  Description of biogas in Italy by A. Volta (Aria inflammmabile nativa delle Paludi)
- 1804  Dalton gave correct formula of methane
- 1859  Biogas plant on lepper station in Bombay
- 1896  Installation delivering gas light in Exeter
Today Anaerobic Digestion (AD) is widely applied in industry, agriculture and infrastructure to

- upgrade waste water from household or industry
- stabilize sewage sludge
- treat the organic fraction of municipal solid waste
- improve fertilizer quality of animal waste
- digest energy crop to biogas (energy from biomass)
Upgrade of waste water from household and industry

There are more than 5000 digesters on WWTP in Europe

More than 2000 high-rate digesters are operated world wide for WWT from industry

Basically 4 different systems are applied
Continuously stirred tank reactor

- Input
- Biogas
- Output
Upgrade of waste water from industry

Contact system

Bacterial rich sludge is recycled to the digester

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Anaerobic filter on a brewery

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UASB cover 2/3 of all industrial WWTP

Rendering plant Bazenheid

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Example of a EGSB System

Bacteria form pellets (granules) of 2 to 3 mm

Emmi Milk Ltd

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AD for the treatment of source separated waste

In total there are about 210 plants with more than 2‘500 tpy of source separated waste:

thereof 140 plants with biowaste
(78 dry and 62 liquid digestion)
70 plants digesting manure together with organic industrial wastes or biowaste

Together, they treat 8m tons per year of organic waste

⇒ www.iea-biogas.net

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Dry fermentation systems

A. Dranco

B. Kompogas

C. Valorga

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Dry fermentation

Dranco

Kompogas

Valorga
Wet fermentation

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Typical process flow of a Mechanical Biological Treatment (MBT)

The same AD systems are applied as for Source separated waste

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Treatment of full or gray MSW

Countries with the highest share of MBT

Total installed capacity > 20m tons

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MBT with percolation

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UR-3R Sydney (as built in Leicestershire)

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Agricultural biogas production

a) With co-substrates
b) With energy crop

Source: Weiland
Rubber top digester

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Large scale digester

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Co-digestion

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Improved fertilizer quality of animal wastes

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Improved fertilizer quality of animal wastes

• better nutrient availability
• improved homogeneity
• less plant burning
• reduced C/N ratio
• odour reduction
• elimination of plant pathogens and weed seeds
Energy remains the major driving force of biogas production

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Electricity production
Biomethane as fuel

6.4 million methane powered vehicles:
127,000 buses, 113,000 trucks, and 6,200,000 cars running on natural gas or biomethane
How does biogas compare to other bio-fuels?

Energy yield (Output/Input):

- EtOH from sugar cane (Brasil) 8.6-10.0
- EtOH from Maiz (USA) 1.34
- RME (Germany) 2.2-3.7
- Biogas from Gras (D) ca. 6
- Biogas from Maiz (D) ca. 8
Comparison of different bio-fuels
How far can a car run with different biofuels produced on 1ha of land

Source FNR

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Thank you!