Task 37

- Australia
- Austria
- Brazil
- Canada
- Denmark
- Estonia
- Finland
- France
- Germany
- Ireland (Lead)

- Norway
- Sweden
- Switzerland
- South Korea
- The Netherlands
- United Kingdom
Benefits of anaerobic digestion

- Agriculture
- Industry
- Reduction of organic residues
- Power to gas
- Utilisation of digestate
- Recovery of nutrients
- Utilisation of CO₂
Implementation of biogas plants in agriculture

- Digestion of
  - Manure
  - Crops
  - Residues
- Recovery of nutrients
- Worldwide successful projects available
Industries

- Slaughterhouse / meat processing industry
- Dairy
- Brewery
- Olive processing
- Sugar factory (sugar beet pulp)
- Distilleries (bioethanol, rum, schnapps)
- Potato processing
- Winery
- Juice factory
Brewery Gösser Göss/Austria

Feedstock
- Brewers spent grains 17kt/a
- Yeast
- Kieselghur

Gas production
- ~2,000,000 Nm³

Energy utilisation
- Electricity production
- Gas to brewery

Specification
- Preacidification
- Digestate utilisation
Dairy Berglandmilch/Austria

Feedstock
- 360 t/d
- Whey
- Waste water

Gas production
- 5,500 m³/d

Energy utilisation
- 7,900 kWh/d electricity
- 9,900 kWh/d heat

Specification
- liquid treatment
Biomethanation

- Methanogenic archaea convert CO₂ and H₂ to methane
- Ambient temperature and pressure
- Tolerant to impurities like H₂S
- Formation of H₂ from “surplus” energy

\[
\text{CO}_2 + 4 \text{H}_2 \rightarrow \text{CH}_4 + 2 \text{H}_2\text{O}
\]
Power-to-Gas concept

Source: Own elaboration based on data from Sterner, 2009 & Specht et al., 2010
International examples

Switzerland
- Natural gas user get automatically 10-20% of biomethane
- Requires activity to get 100% natural gas
- Increased demand of biomethane

France
- Depending on amount of organic residues AD treatment required
- Biomethane feed-in tariff
- Bonus for manure
NiMEM
Development of a process for the combined energy and nutrient recycling by using membranes in a biogas process

- Integrated removal of nitrogen and sulfur
- Mono-digestion of nitrogen rich feedstock (chicken manure, slaughterhouse waste)
- Reduction of inhibiting effect
- Sulfur recovery by microbiological oxidation of $\text{H}_2\text{S}$ to sulfuric acid
- Sulfuric acid is used as absorption liquid during nitrogen removal
- Production of marketable fertilizer – ammonium sulfate
- Innovative membrane technique
Outlook

- Huge variety of applications
- Many examples for implementation of AD in industry
- Power to gas technology
- Utilisation of digestate

- Support required!
Questions?

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