



World Biogas Expo 2022 Anders Fredenslund

Targeted effort to reduce methane loss from biogas plants

Denmark's production of biogas is growing



- Extrapolating this curve leads to 100% biogas in the gas grid in 12 years
- This has been found to be technically possible
- Tendency: large, "centralised" biogas plants
- Will reduce greenhouse gas emission from Danish agriculture (less CH₄ from manure)
- Increased focus on ensuring low, direct greenhouse gas emissions

Targeted effort to reduce methane loss from biogas plants

- Project overall defined in Danish Parliaments Finance Act for 2019 to reduce GHG emissions from agriculture (10 million DKK for the project + 30 million DKK for expected increased subsidies due to higher biogas production)
- 60 participating biogas plants
- One ore more actions at each plant (financed partly by the plants):
 - Determination of total methane emission (mandatory)
 - Leak search
 - Establishing self monitoring program
 - Preliminary project to reduce GHG



Leak search using gas camera



Figur 1: Lækage #1, fra vandlås på rådnetank. Lækagen kan ses ved den mørke sky, som er markeret på billedet til højre. Udklip fra MOV_0937.

Lessons learned – sources of emission

- Very often seen leak: pressure relief valves
- Likely most significant emitter: biomass/digestate storage w.o. gas collection
- Atypical emission patterns (examples: leaking gas storage, overloaded gas upgrade unit)



DTU



Determination of total methane emission





Observations of methane loss

- Total methane emission rates from 69 plants were measured
- Plants varied in size and technologies
- Large variation in methane loss
- Emission, all plants divided by production = 2.5% (best estimate on emission factor for Danish biogas production)





Effect – measurement before and after GHG mitigation actions



- At six plants, methane emission was measured both before and after GHG mitigation actions
- Loss before: 3.7%, loss after: 2.1%
- Avoided GHG: 29,400 t CO₂ eq./yr (or about 5.300 Danes)
- Avoided loss of CH₄: 1.5 mio. Nm³/yr (≥ production increase)



Main learnings

- Varying methane loss (0.3% to more than 40% between individual plants)
- It is possible to produce biogas with <1% loss (target set by association of Danish biogas producers)
- Focus on pressure relief valves and gas collection from digestate storage
- Identifying sources of emission and quantifying emission can reduce emissions
- Mitigation actions can, in some cases, be fully financed through increase in gas sales