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Maximising climate protection through minimising gas leakage – the Danish biogas measurement programme

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The Danish voluntary methane monitoring programme for agricultural biogas producing facilities was launched by the Danish Biogas Association in autumn, 2016. The Danish Biogas Association had set a san overall goal of reducing the total methane loss from Danish biogas and upgrading plants on a national level to less than 1% of production by 2020.

The Danish Government has allocated approximately 1.3 million € to monitor and reduce methane emissions from the biogas sector in the period 2019-2020, based on previous experiences. The funds are used to administer this new programme, method testing, validation of measurement service providers and to provide partial funding for the participation of biogas plants. Also, the project includes recommendations to the Danish Energy Agency regarding use of measurements in regulation based on the results of the programme. The programme includes agricultural biogas plants (both farm-scale and centralized plants), industrial biogas plants and biogas plants treating sludge from wastewater treatment. The biogas plants provide partial funding. Three levels of own-funding are used depending on the magnitude of gas production. Large biogas plants pay a larger fraction of expenses than smaller plants. This was chosen to ensure participation of smaller facilities.

At each biogas plant, two or more of the following actions are performed:

1. Initial agreement on services and expectations
2. Development of self-monitoring programme
3. Leakage search and mitigation recommendations
4. Quantification of methane loss using remote sensing
5. Draft project of emission reduction initiatives

Actions 1 and 4 are mandatory for the participating biogas plants. The leakage search (Action 3) is performed using Optical Gas Imaging (OGI). Here, a measurement technician uses OGI to identify leakages both outdoors on tanks, pipes etc., and indoors. The report lists and illustrates leakages (through video documentation) and provides advise on mitigation actions were applicable. Even though OGI is not used quantitatively, the leaks are categorized as low, medium and high emission

rates based on the operator's assessment from the OGI videos.

Quantification of the biogas plants total methane emission (Action 4) is done using a tracer gas dispersion method. This remote sensing method includes the controlled, continuous release of a tracer gas (C_2H_2 in this case) combined with downwind, cross-plume measurements of methane and tracer gas. This method is described in Scheutz and Fredenslund (2019). It has been used to quantify emissions from biogas plants in the previous voluntary programme as well as to measure fugitive emissions from other area sources such as landfills, composting facilities and wastewater treatment plants.

About 60 plants have signed up and measurement and consultation activities are currently ongoing. The plants include about 35 manure-based biogas plants, 2 industrial biogas plants and 22 wastewater treatment plants. All activities are to be completed by the end of February, 2021.

This presentation will include a short introduction to the programme, observed emission rates and emission factors, typical sources of methane emission, mitigation options, recommendations regarding regulation and economic factors such as expenses for the monitoring activities.

Reference

Scheutz, C., Fredenslund, A.M. 2019. Total methane emission rates and losses from 23 biogas plants. *Waste Management*, 97, 38-46.