

IWA Webinar “Monitoring and mitigating methane: Danish lessons for global action”
Post Webinar Report – 27/06/2023

Webinar available at: <https://iwa-network.org/learn/monitoring-and-mitigating-methane-danish-lessons-for-global-action/>

Questions received from participants during registration:

#	Questions	Speaker	Answer
1	Are there are standard methods for measuring emission rates?	Anders Fredenslund	Not at the moment. Some methods have been tested regarding measurement accuracy. Regarding the method I described, please see https://www.sciencedirect.com/science/article/abs/pii/S0956053X18306470
4	How to realistically estimate biogas leakage? Mitigation pathways for hard-to-abate parts of the network like rising sewer mains?	Anders Fredenslund	For the treatment facilities, I would recommend the tracer gas dispersion method. However, other good measurement methods exist.
5	How do you see your efforts translating to for example Southeast Asia and the local policy, management, culture, knowledge?	Anders Fredenslund	I believe step 1 is to focus on the problem of direct greenhouse gas emissions by performing measurements at various facilities. It is in the further steps, where local policy, culture etc. becomes more relevant with regards to how to mitigate emissions.
6	How to upscale methane emissions and account them in National greenhouse gas inventory.	Anders Fredenslund	My recommendation is to perform a relatively large number of measurements, at facilities representing the variety in the country in question (size, plant age, technology etc.). Be aware that emissions may vary over time from each facility. Increasing the number of observations reduces statistical uncertainty due to emission dynamics.
7	What are the priorities for making the greatest impacts in the shortest	Anders Fredenslund	Our recommendation to the Danish water sector was to focus on often observed emission sources such as PRVs, and to

	timescale on GHG mitigation in the water sector?		focus on sludge storage w.o. gas collection, where from avoidable, significant methane emission occurs.
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Questions received from participants via the Q&A:

#	Questions	Speaker	Answer
1	Will be great if you could share "How did you calculate the emission factor?"		The EF for the national reporting is the sum of all measured methane emissions divided by the sum of productions at the plants. You can read more in this paper: Fredenslund, A. M., Gudmundsson, E., Falk, J. M., & Scheutz, C. 2023. The Danish national effort to minimise methane emissions from biogas plants. Waste Management, 157, 321-329. https://www.sciencedirect.com/science/article/pii/S0956053X22006304
2	Thank you for the presentation! concerning CH4 emission in WWTP the higher results with respect to agricultural plant could it be caused partially as well by CH4 emissions from other units in the WWTP?		It is true that there can be methane emissions from the water treatment line, but these normally only make up 10% of the total methane emission from the plant.
3	How do we solve the leakage that occurs through digester relief valves?	Charlotte	AK: See questions answered for Anders Fredenslund's presentation
4	Wat about methane loss in landfill sites		Methane emissions from landfills can be measured using the tracer dispersion method - this is what the method was developed for. We did a study at 22 Danish landfills with gas collection and found that on average 50% of the generated gas was collected.
5	Do you distinguish between leaks and emissions? The residual biogas from the		Yes, I agree that emissions from a an open biosolid storge/digestate tank is not considered a leak. And yes, open storage tanks at WWTPs are often an

	digested biosolids is likely to be greater than 1%.		important methane emission source. Covering a storage tank and recovering the methane gas is costly.
6	Please do you have any experience in monitoring methane emissions from natural water bodies?		I would love to have such a project, because I have seen methane emissions from small streams (when there is a fall in the water flow), from harbour areas and from lakes (which have for decades been loaded with nutrients). Currently there is no focus on these sources in DK. But sure, these can be measured with the tracer gas dispersion method if the area is defined and there are driveable roads downwind.
7	Given that methane slippage in biogas upgrading plants is higher than 1%, how will you achieve the target?		You are right, that methane slip from water scrubbers is often higher than 1%. However, from amine scrubbers and membrane technologies emissions can be reduced to much less than 1%. We also measured emissions from gas engines and biomethane upgrading. Check tables in the report and numbers given in the scientific paper. Also check the paper by Kvist and Aryal (2019). They investigated CH ₄ emissions from commercially operating biogas upgrading plants, where CH ₄ losses from water scrubbers were up to 1.97 % of influx, while from amine scrubbers they stood at 0.04 %.
8	I want to better understand the requirements - are they required to identify leaks but not necessarily required to quantify the emissions?		Yes, you got it right. The plants are required to have an independent company to do a leak search and fix leaks. They are not required to quantify the emissions.
9	how can the emissions be quantified for onsite systems and also how the emissions can be estimated that are released through the sewer chambers and through the sewer network		Methane emissions from the sewer system were not included in the total emission measured from the biogas facility. We are currently trying to measure methane emissions from the sewer system, a rather complex task

			at the moment. We are working on the upscaling, tricky.
10	I often see temporary leakage which corresponds to when a digester is fed, which means there is enough discrimination between the working pressure and the lifting pressure of the breather valve.		I would describe that as "functional" - meaning the valve is doing what it is supposed to
11	I would like, if possible, for you to repeat how you measure the flow of methane released		All measurements of total CH ₄ emissions were done using the tracer gas dispersion method (often shorten TDM), which applies a continuous release of a gaseous tracer (here acetylene, C ₂ H ₂) at the facility, combined with downwind measurements of atmospheric concentrations of CH ₄ and tracer gas. Read more in the paper: Fredenslund, A. M., Gudmundsson, E., Falk, J. M., & Scheutz, C. 2023. The Danish national effort to minimise methane emissions from biogas plants. Waste Management, 157, 321-329.
12	As well as losses through PRVs did you look at losses through other roofs - seals, etc.		No, in this project we did not quantify methane rates from leaks. There are a few scientific papers on this. We did measure the methane slip from the gas engine, and biogas upgrade at several facilities. Check the report (link on the last slide of the presentation), there are some tables compiling numbers. Also check the scientific paper. Fredenslund, A. M., Gudmundsson, E., Falk, J. M., & Scheutz, C. 2023. The Danish national effort to minimise methane emissions from biogas plants. Waste Management, 157, 321-329.
13	how can you release too high pressure without		It must be possible, but not practised in Denmark, at least.

	letting CH4 out in the atmosphere?		
14	<p>There are LiDAR cameras that claim to be able to quantify methane leaks in real time (usually g/s). E.g. qlmtec.com</p> <p>What are the international standards we need to look out for to validate different methane detection methods?</p>		<p>There is some measurement uncertainty - but useful to get an idea about emission rates (and potential savings)</p>
15	<p>What is the total contribution of relief valves to methane emissions?</p>		<p>Our study did not quantify this source's contribution to the total emission. The only study I know, which may provide some answer is the study by Reinelt & Liebetau, I referenced</p>
16	<p>Question for Per Henrik Nielsen. Thank you for the presentation. Regarding scope 2 is it possible to know the electricity factor that were consider?</p>		<p>Can not remember - but it is based on the official accounted data</p>
17	<p>Is there any specific guideline for scope-4 GHG emissions?</p>		<p>Not to the best of my knowledge</p>
18	<p>Covering the primary tanks and taking out the gases to further biological treatment are mainly for odor removal. How the emission of CH4 from primary tanks can be used since it is low in concentration?</p>		<p>Agree - it will most likely be a elimination of the gas</p>
19	<p>It is good to hear independent feedback that vacuum degassing has improved dewatered sludge dry solids, this can often form a part of the business case, can you give us an indication of the degree of</p>		<p>live answered</p>

	improvement you have seen? Many Thanks		
20	Are the tenders/procurements adequate addressing the demand of low CO2-e emission for non-public plants treating waste - as support to lacking or delayed legislation	Anders Fredenslund	Some waste management companies (and their owners – municipalities) in Denmark require measurements of direct methane emissions from biogas plants receiving their food waste for treatment and require the biogas plants CH4 emission to be below a set threshold.