

Biomethane Process Monitoring Executive Summary



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Task 5.3 New Quality Management Demonstrators



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Scope of the Task

Due to the complexity of a biomethane plant many factors have to be considered if one wants to improve the efficiency of the system (increased gas yield, increased energy production or increased income, ...). Thus improvements can be made at many points of the system. E.g. already the quality of the used substrates (feedstock) can be improved. Using energy crops, the time of harvest and the storage of the crops highly influence the gas yield. Stability of the biological digestion process and or a properly functioning plant technology are other important factors of a successful plant operation.

Over time biomethane plant operators can develop a certain degree of blindness regarding potential improvements. The support of an external advisor can be a solution.

The Biomethane Regions project picked „process monitoring“ – being one important factor in improving the efficiency of biomethane plants – and set the aim of a 10% increase in biomethane production. 3 biomethane plants – one in Styria, Austria and 2 in Wales, UK – were scientifically monitored and supported over a period of 2 years. Various data were gathered and analysed. The recommendations of the “Monitoring Guide for Optimisation of AD and biomethane plants” - another outcome of the Biomethane Regions Project – were tested and proved. The improvements were implemented jointly with the biomethane plant operators.

Many insights and experiences could be gained and are summarized below:

Why biomethane process monitoring?

Biomethane production is a complex biological process. Its different phases involve various populations of microbes. An inhibition of the microbes significantly reduces the productivity of the plant and sometimes leads to a complete stagnancy of the process.

Process monitoring helps the biomethane plant operator to better understand what is actually happening in the biomethane plant. The monitoring provides assistance for achieving a long-term stable biomethane production process.

The parameters of monitoring the process' stability can be grouped into 2 sets: The one set of indicators can be determined easily at the plant and allows for taking corrective measures instantly. The other set of indicators is responsible for a long-term stable process.

Of course biomethane process monitoring results in costs. In general these costs are significantly lower than the loss of income due to instable operation of the plant.

Lessons learned

The monitoring – i.e. the design of the sampling, the lab analyses, the interpretation of the results and the communication with the plant operator - requires the involvement of an experienced external advisor (Lab, University, Expert).

The most essential parameters for monitoring the fermenter's stability are

- Ratio of free organic acids / total alkaline capacity []
- volatile fatty acids [mg/L]
- ph-value [-]
- $\text{NH}_4\text{-N}$ [g/kg]
- DM [%]
- Organic load [$\text{kg oD/m}^3 \cdot \text{d}^{-1}$]

For other parameters and important information please refer to the “Monitoring Guide for Optimisation of AD and biomethane plants” of the Biomethane Regions Project

The plant operator needs to make a good record of at least the quantity and quality of the substrates (feedstock), the gas yield and the electric/thermal energy produced or gas feed into the gas-grid. The constant reporting of this record to the external advisor is essential for the success of the monitoring.

Continuity in the sampling and recording is another success factor of the monitoring which avoids misinterpretation of the parameters.

Biomethane process monitoring results in costs for the plant operator – especially in the introduction phase. In general these costs are significantly lower than the loss of income due to instable operation of the plant. Due to the improved performance and thus income these costs are compensated at a later time. Once the process reaches a state of stability, the sampling intervals thus the running costs of the monitoring are reduced.

The most crucial factor although is the operator and his willingness and ability to cooperate and communicate with the external advisor.

Regular and constant biomethane process monitoring detects potential problems in the operation of the biomethane plant in time and allows for setting corrective measures. The efficiency of the plants can be improved by up to 10% - sometimes even more.