MICRO4 BIOGAS

Unit 2.6

Monitoring and performance evaluation for lab-scale and pilot scale bioreactors

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement **No 101006361**

VOS/TAC

- Determining volatile organic acids (VOS) and total inorganic carbon (TAC) is a simple way to monitor the fermentation process in a biogas plant.
- The VOS/TAC value is determined as a titration to two endpoints pH 5.0 and pH 4.4 with 0.05 mol/l sulfuric acid. As an alternative to sulfuric acid, 0.1 mol/l hydrochloric acid can also be used.
- This value describes the biochemical state in the fermenter and should be measured regularly in order to be able to recognize trends of change at an early stage and intervene if necessary.

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pH-value

- Typically, acetic acid and methane-forming organisms are inhibited in their growth in biogas plants below pH 6.8. Above pH 8.0, increased ammonia toxicity can occur
- Depending on the sampling location, pH values between 6.5 and 9 are found in practice
- the value itself is not suitable for a predictive assessment of the process, as it reacts very slowly due to the buffer properties of the fermentation mixture. However, determining it is still important, as recording the measured values can reveal tendencies and trends in the chronological sequence of the individual values and also allows conclusions to be drawn about other parameters (e.g. ammonium and ammonia).

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COD- chemical oxygen demand

- a measure for the sum of all organic compounds
- indicates the amount of oxygen that is consumed to oxidize all the organic substances contained in the water in mg/l or g/m3

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TS/oTS

- The dry matter content, or TS content for short, or dry mass content, refers to the percentage of solids in a mixture of substances. The higher the percentage, the drier the mixture.
- The oTS content is often also referred to as the so-called loss on ignition.
- The loss on ignition is determined by incinerating the dried sample at 550°C until the weight is constant and is related to the initial mass of the dried sample (% TS or kg oTS / kg TS).

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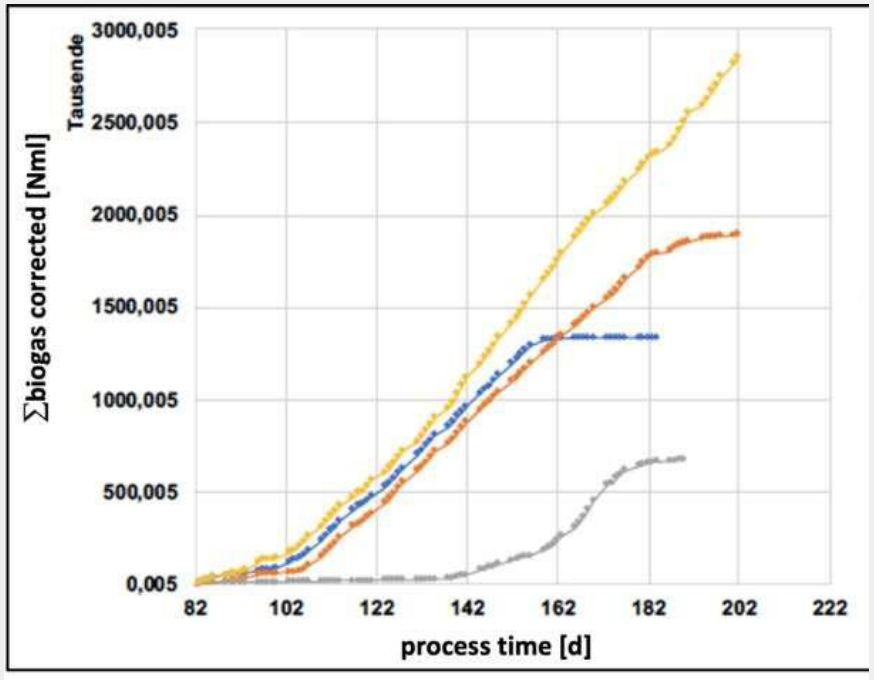
Gas Volume

- is measured using a gas meter
- as a product, it provides information on whether the processes are working and whether biogas is being produced evenly



Example: comparison of gas formation from different reactors over the test period

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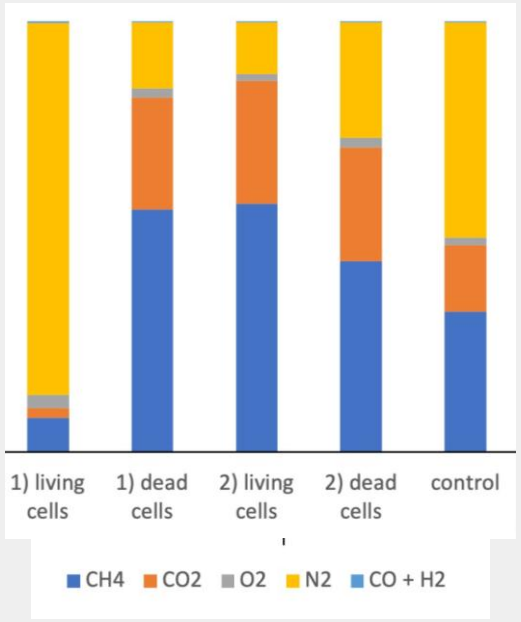
Gas Composition



example: comparison of different experiments

- Determination of the methane content, the carbon content and the oxygen content
- The oxygen content should be close to 0%, otherwise it indicates leaks in the reactor
- Methane and carbon content provide information about the quality of the biogas
- The aim is to achieve the highest possible methane content

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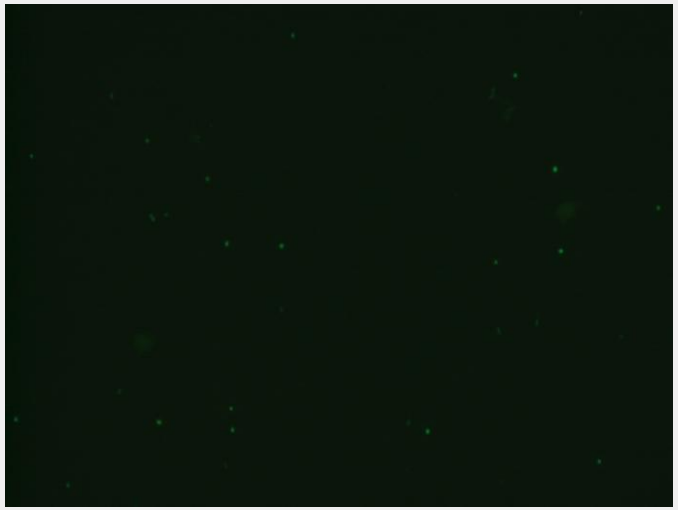
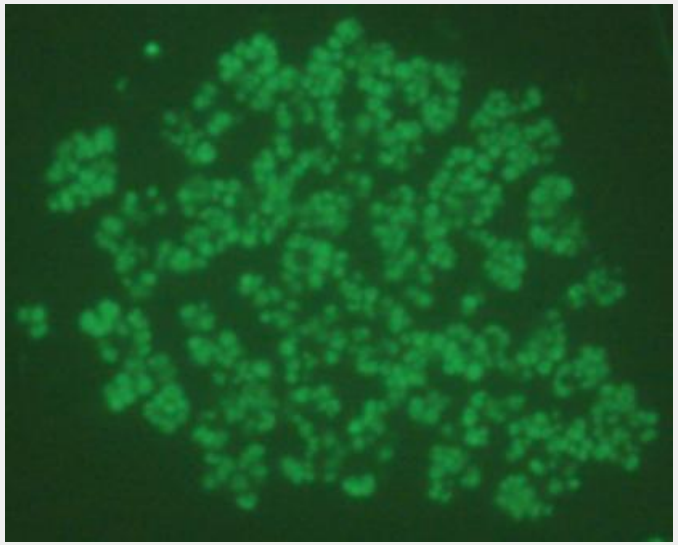
Microscopie

- In F240 microscopy, living archaea are stained
- The number and composition of the archaea provide information about the state of a reactor
- The number should increase and cluster formation should occur



individual archaea -> clusters



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