Combining energy positive wastewater treatment with nutrient recovery

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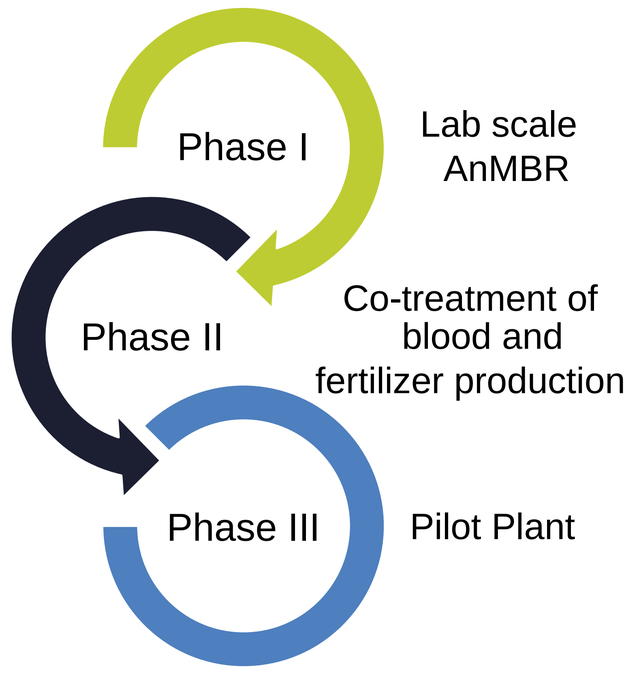
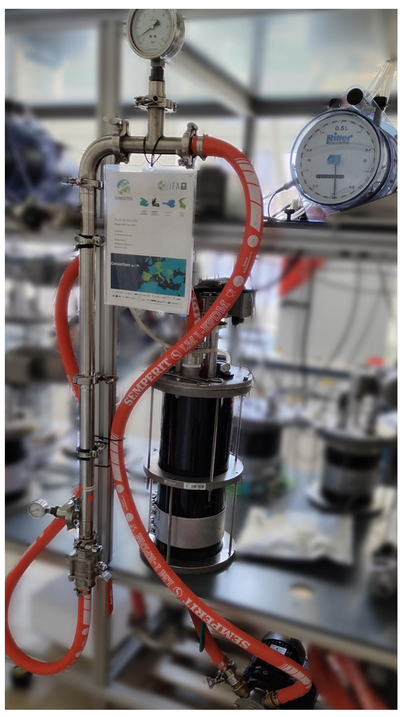
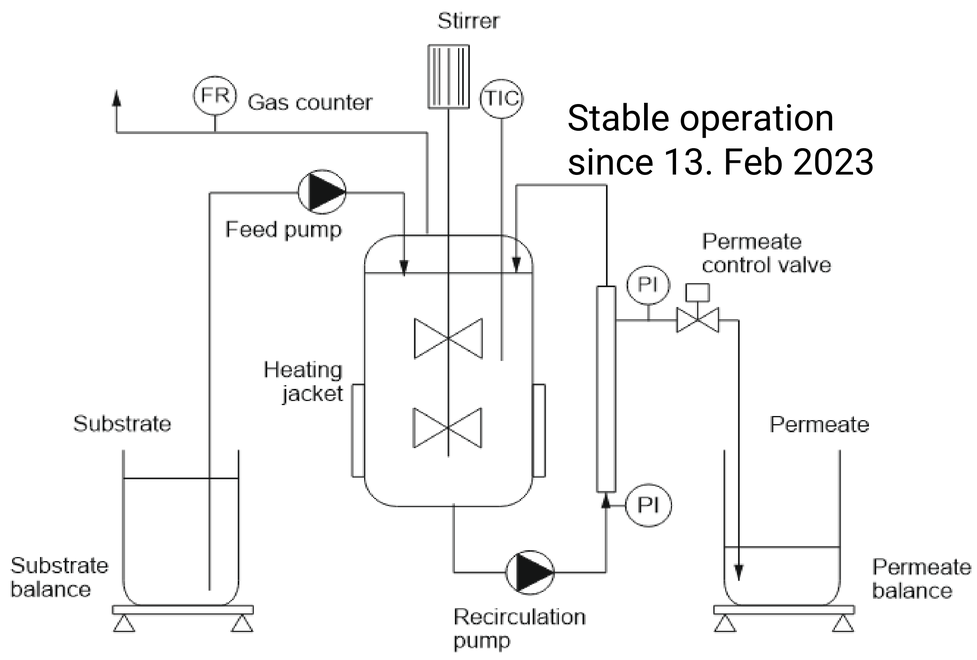
Introduction

In the HORIZON Europe project **"SYMSITES"** 30 international partners work together to establish four "EcoSites" in different European regions. At these sites **Industrial-Urban symbiosis** will be implemented to demonstrate its power in action. The EcoSites comprise wastewater treatment plants, industries or agriculture companies forming a hub collecting wastewater, biowastes, and non-recyclable waste generated by both the urban and industrial environments.
The **Austrian EcoSite** is established in the Tullnerfeld in cooperation with Fleischwaren Berger GesmbH, Gemeindeabwasserverband südöstliches Tullnerfeld, Spitzer GesmbH and AAT Abwasser und Abfalltechnik GmbH. The aim is to develop an **anaerobic membrane bioreactor (AnMBR)** for wastewater treatment and the additional usage of slaughterhouse residues to produce biogas, purified process water and fertilizer for regional farmers.



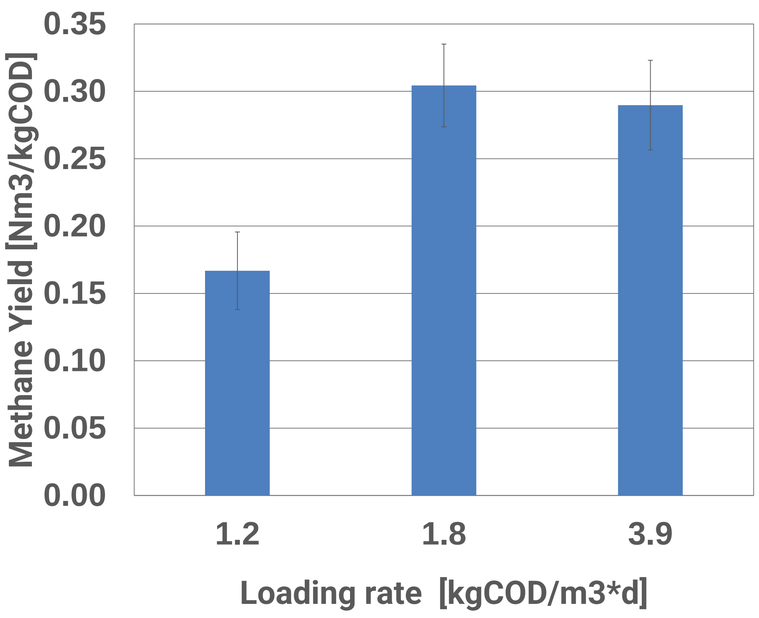




Stable operation since 13. Feb 2023

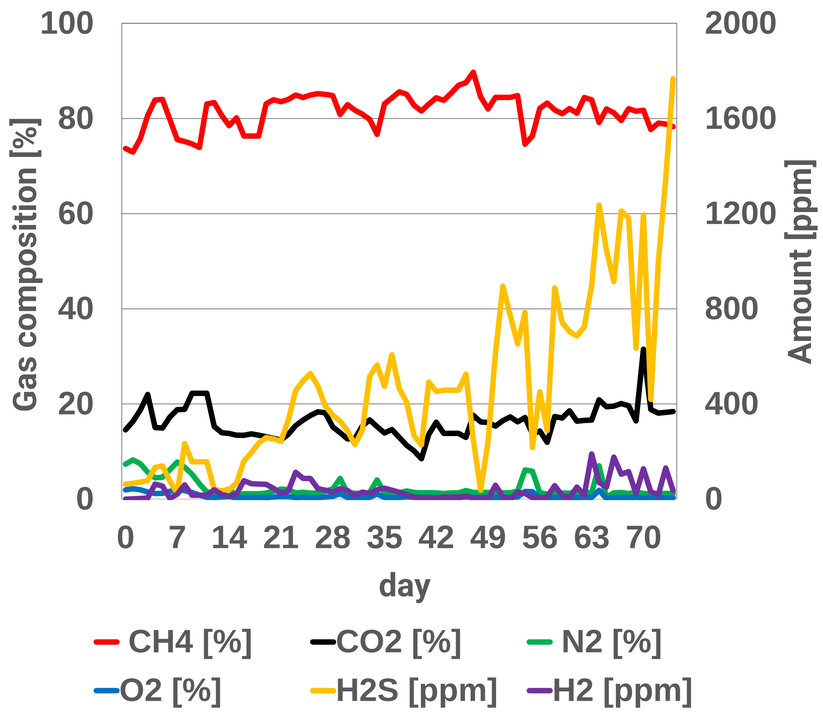
Material and methods

A lab scale anaerobic membrane bioreactor (AnMBR) was set up with a total volume of **18.6 L** and continuous operation at **37 °C** and various feeding rates. The feed and permeate flow were automated by monitoring the corresponding balances and controlling the feed pump and permeate valve. The reactor content run with a cross flow velocity of **2.5 m/s** through a tubular ultrafiltration column with a pore size of **0.2 µm**.
Gas amount and quality was continuously measured as well as analytical parameters to monitor in- and outflow such as the **chemical oxygen demand (COD)**.



Results

- **3.71±0.74 gCOD/kg Wastewater**
- **COD removal 91.7±1.7 %**
- **Methane yield max.~300 Nm^3/tCOD**
- **Increase in H_2S with loading rate**
- **Improved methane concentrations due to dissolved methane in the permeate**



Discussion

More than **800kg** of wastewater was treated in **phase I** and a total of **1m^3** methane was produced theoretically corresponding to **~10 kWh/m^3**. In **phase II** the loading rate will be increased by the addition of blood. This will increase biogas yield but also result in elevated H_2S and NH_4 levels. These side products will be utilized for fertilizer production by oxidation of H_2S in a **desulphurization column** resulting in H_2SO_4, in terms used in **a hollow fibre membrane** module to precipitate NH_4 from the permeate resulting in the **fertilizer** ammonium sulphate ($(NH_4)_2SO_4$).

Partners involved :

Find out more: SCAN ME

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