HanzeResearch
University of Applied Sciences
Energy

Power to Methane

WP2/3: A promising new method for hydrogen delivery to methanogens results in more methane from biomass

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Excess of renewable electricity from wind turbines or solar panels is used for electrolysis of water. To store this renewable energy as methane, the hydrogen is fed to an anaerobic digester to stimulate biological methanation by hydrogenotrophic methanogens. This workpackage focusses on the best ways for hydrogen delivery and the community changes in a biomethanation reactor as a result of hydrogen supply.

Biological Power to Methane is based on the ability of microorganisms to make methane from (renewable) hydrogen and carbon dioxide (Figure 1).

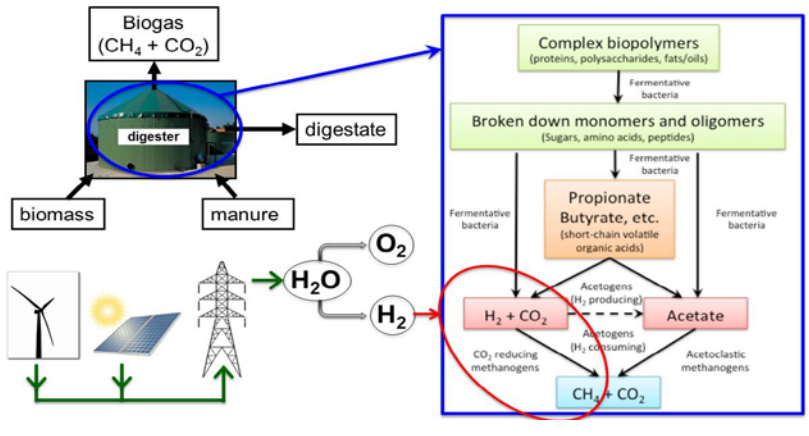

Figure 1. Biological Power to Methane

The effect of hydrogen of methane formation was studied at mesophilic conditions (42°C) at atmospheric pressure in two 10 L bioreactors (Infors) in both an *in situ* and an *ex situ* setup (Figure 2), with different ways of hydrogen supply and appropriate controls.

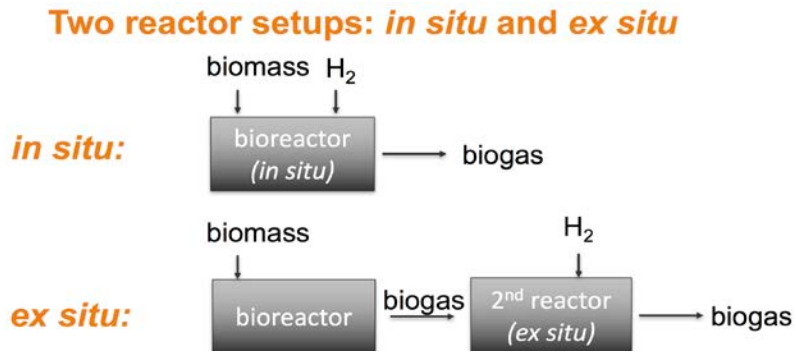

Figure 2. Reactor set-ups used

Results

The addition of hydrogen biogas resulted in both set-ups in more methane per unit biomass (Figure 3 *in situ*).

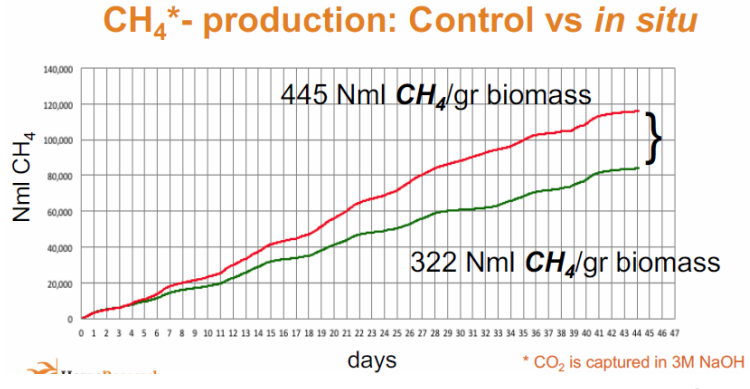

Figure 3. Methane per amount of biomass (*in situ*)

In both reactor setups the innovative use of high permeable silicone tubing resulted in sufficient diffusion and hydrogen solubilisation to convert it with carbon dioxide in methane. Adding hydrogen to an experimental reactor (in situ) is therefore attractive.

Future activities

- Taqman assay to study the effects of hydrogen supply on the microbial community
- Scaling up (WP5)
- Further comparison *in situ* and *ex situ*

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