Biomethane from biogenic waste materials

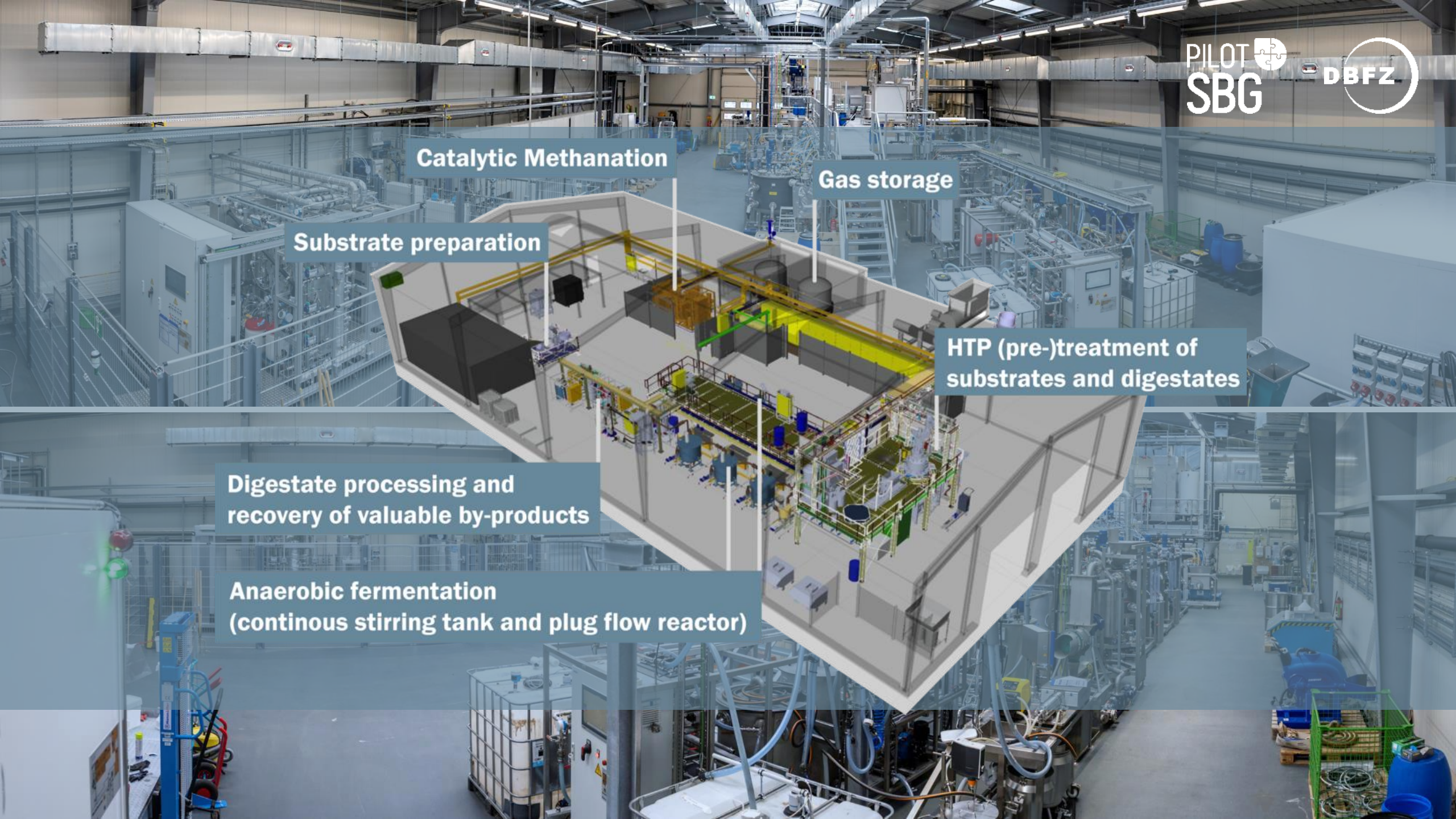
Optimisation of catalysts and process conditions for biomethane production from biogenic waste materials on a pilot scale

Philipp Wilker, DBFZ Deutsches Biomasseforschungszentrum gGmbH

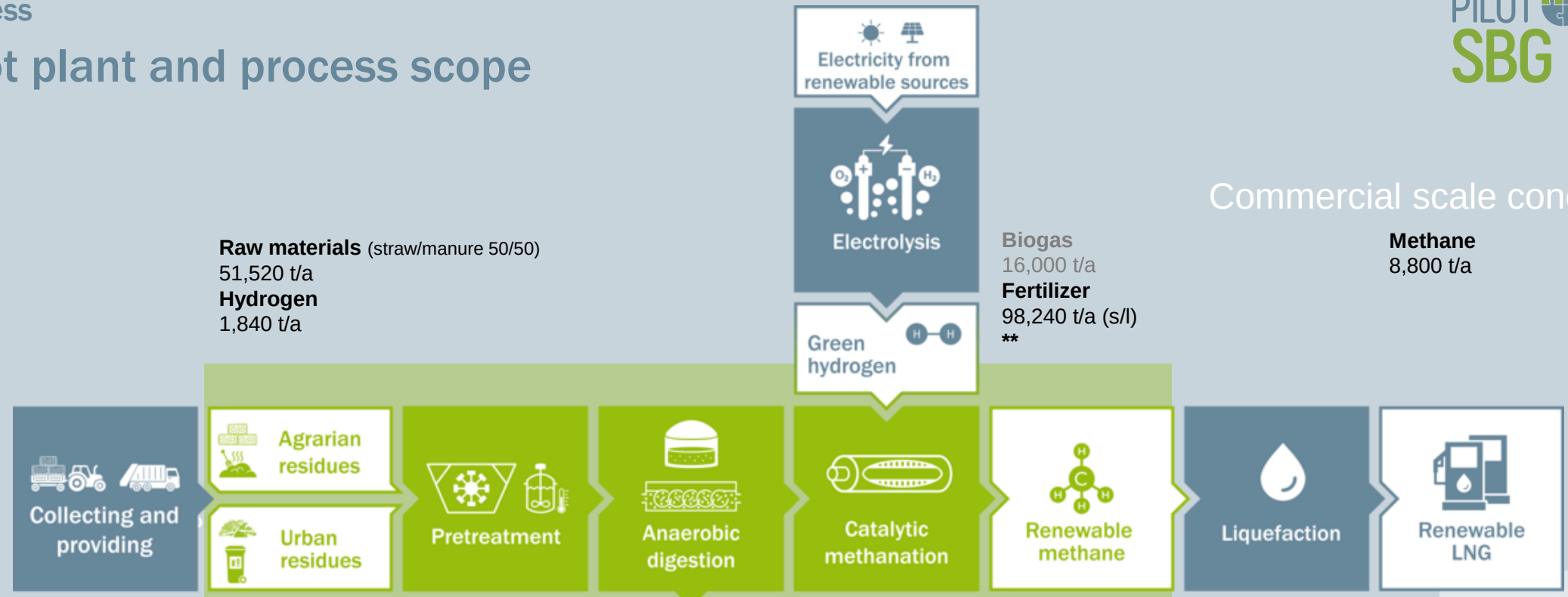
7th Nuremberg Workshop on “Methanation and 2nd Generation Fuels”, 12-13 June 2025

On behalf of:
Federal Ministry of Transport

This publication was carried out on behalf of the Federal Ministry for Digital and Transport under file number 3552.1. The sole responsibility for the content lies with the author.


PILOT SBG
DBFZ
Catalytic Methanation
Gas storage
Substrate preparation
HTP (pre-)treatment of substrates and digestates
Digestate processing and recovery of valuable by-products
Anaerobic fermentation (continous stirring tank and plug flow reactor)

Pilot plant and process scope



Raw materials (straw/manure 50/50)
51,520 t/a
Hydrogen
1,840 t/a

Biogas
16,000 t/a
Fertilizer
98,240 t/a (s/l)
**

Commercial scale concepts

Methane
8,800 t/a

input
Raw materials
7-8 t/a
Hydrogen
0.18-0.26 t/a
(2000-2900 m³/a)

output
Biogas
≈ 1 t/a
(≈ 770 m³/a)
Methane
0.59-0.67 t/a
(819-930 m³/a)
Fertilizer
5-7 t/a (s/l)
Hydrochar
≈2 t/a
*

Pilot plant

More research on upscaling, economics, educt potentials etc.

Est. potential[1]

450 PJ/a
straw & cattle manure

75 PJ/a
green and bio waste

36%
Total diesel consumption in Germany

m³ - standard cubic metre; * Rough approximation from the mass balance. Biogas, fertiliser and hydrochar amount and composition depend on the raw material origin and quality; **for the first commercial size plant concept results from lab scale preliminary tests were used since the pilot plant was still in commissioning.

Source: [1]Naumann, K. et al. (2024): Fokusheft Standortanalyse und Ressourcenverteilung für erneuerbares LNG im Verkehr (in preparation)

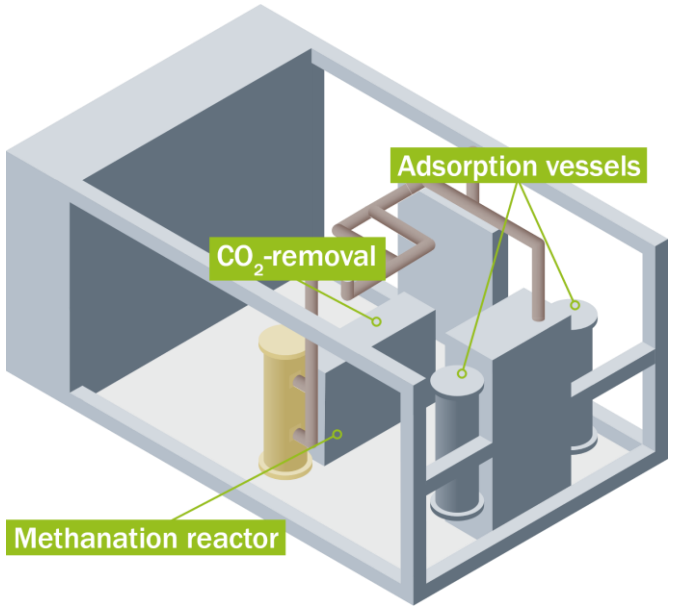
Catalytic methanation

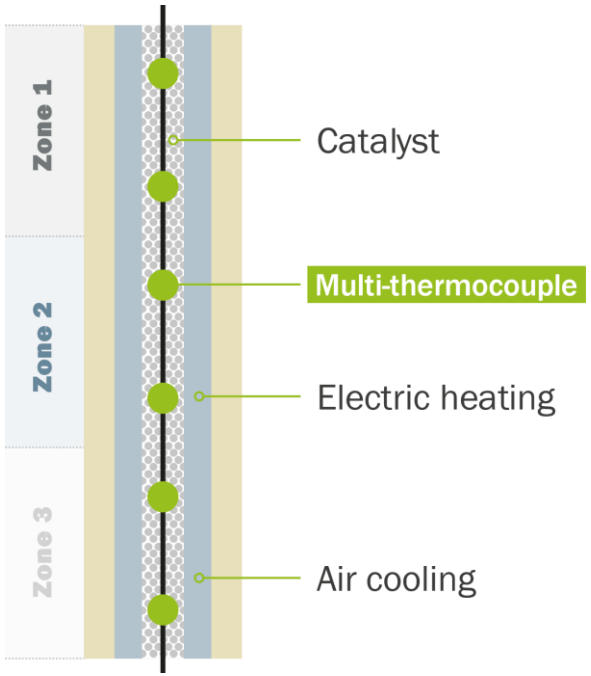
Layout & design

Input

Biogas

Hydrogen





Output

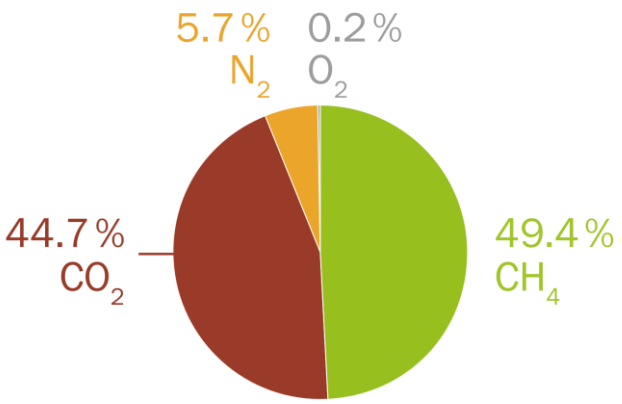
Renewable methane

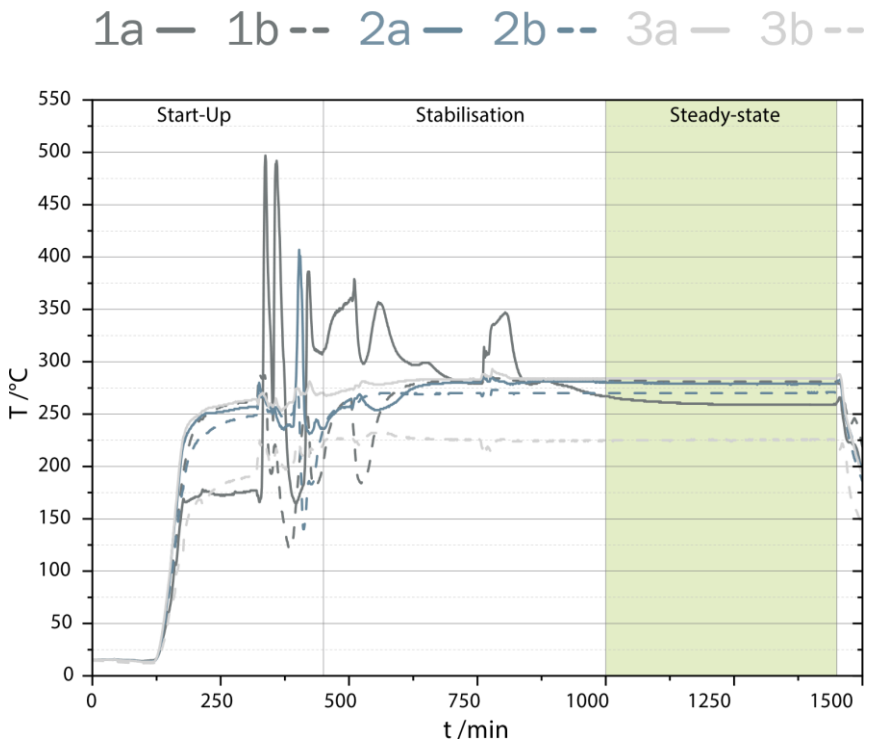
Structure of the module and the methanation reactor

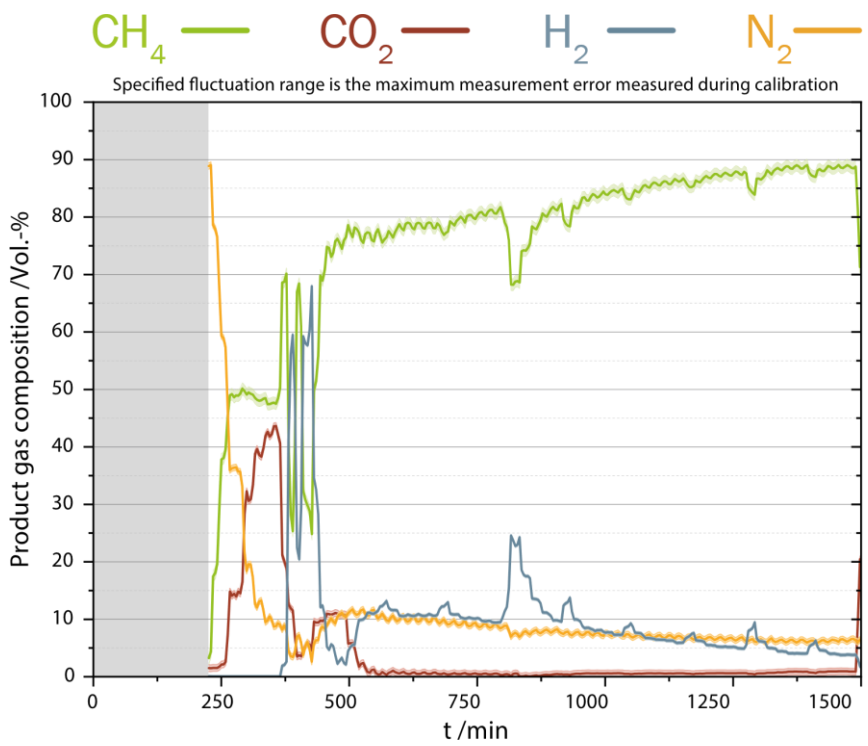
Catalytic methanation

Start-up process

Biogas composition:







▶▶▶ $Ru2/Al_2O_3$, T = 320 °C, p = 18 bar(g), $H_2:CO_2$ = 4, $\dot{V}_{biogas}$ = 60 L/h, GHSV = 449 h^{-1}

Focus booklets in pilot-sbg project

Methanation - Provision of renewable methane from biogas and hydrogen

- Upgrading biogas to biomethane
- Catalytic and biological methanation
- Technical, economic and ecological comparison
- Demonstration plant locations

[German version only]

Download:

www.dbfz.de/pilot-sbg

Interested? Contact us!

Philipp Wilker
Department Biorefineries
Research associate

Deutsches Biomasseforschungszentrum gGmbH
Torgauer Straße 116
D-04347
Leipzig

philipp.wilker@dbfz.de
+49 (0)341 2434-458

www.dbfz.de/pilot-sbg