Model-based analysis to increase the efficiency of a biogas plant

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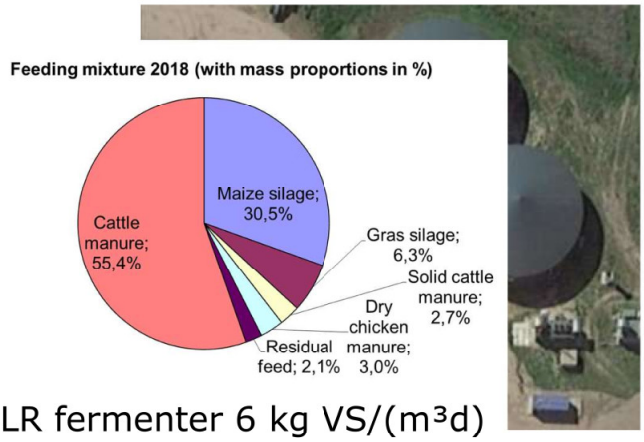
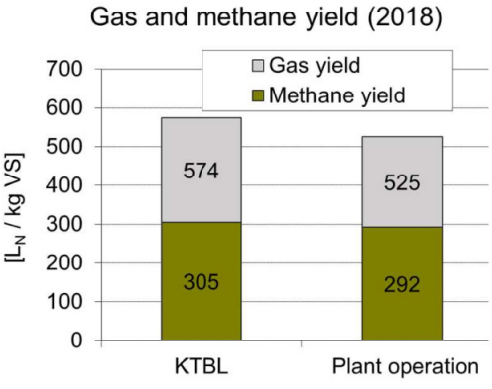
Background

- "**ThermoFlex**" process enables heat to be stored in secondary digesters for efficient flexibilisation of biogas plants
- R&D project "ThermoFlex-WAVE" (FKZ: 03KB142)
- **Example biogas plant** for the large-scale testing



OLR fermenter 6 kg VS/(m³d)



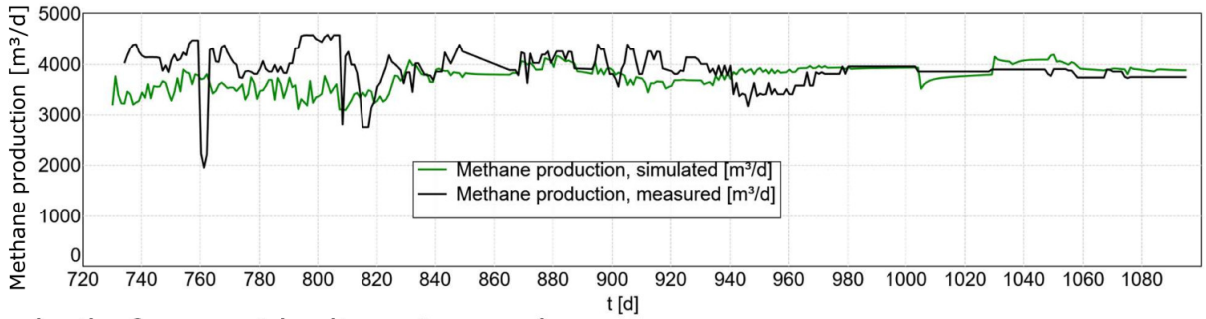
Below-average methane yield

Model of example biogas plant

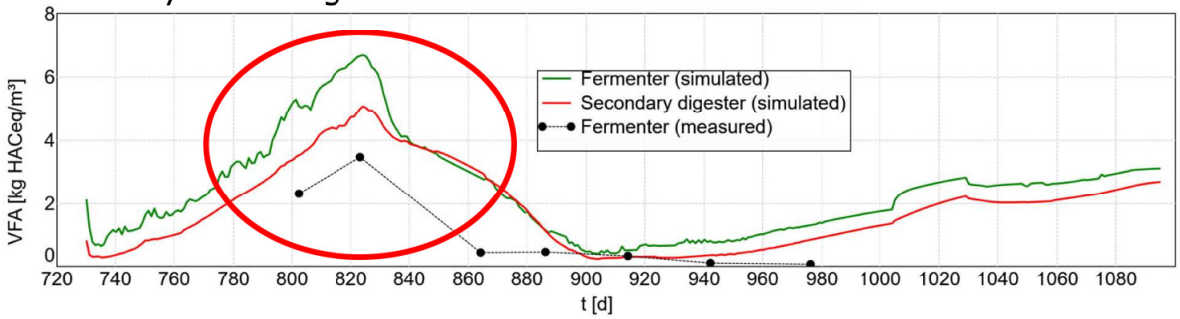
- Dynamic simulation model (basis: ADM1 / ADM1da) matched with daily values over an operating year (e. g. 2018)

Exemplary results of model adjustment

Methane production:



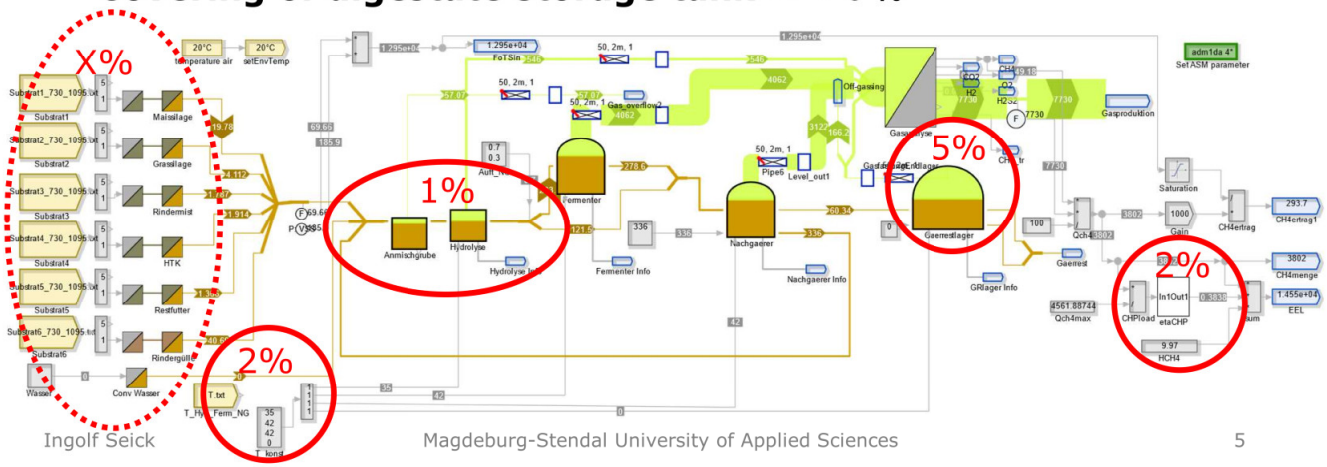
Volatile fatty acids digestion tanks:



Measures for increase substrate efficiency

Improvement potential analysed by simulation (constant substrate input):

- Internal sludge flows (feed distribution, mixing tank, …) => + 1 %
- Moderate increase in fermentation temperatures => + 2 %
- Avoidance of part-load operation of CHP => + 2 %
- **Covering of digestate storage tank => + 5 %**



References

[KTBL] Kuratorium für Technik und Bauwesen in der Landwirtschaft (KTBL): KTBL-Heft 107, Gasausbeute in landwirtschaftlichen Biogasanlagen, Darmstadt 2015.

[ADM1] Batstone, D.J.; Keller, J.; Angelidaki, I.; Kalyuzhnyi, S.V.; Pavlostathis, S.G.; Rozzi, A.; Sanders, W.T.M.; Siegrist, H.; Vavilin, V.A. (2002): Anaerobic Digestion Model No. 1. IWA Task Group on Mathematical Modelling of Anaerobic Digestion Processes. IWA Scientific and Technical Report No. 13. 2002.

[SIMBA] Institute for Automation and Communication: SIMBA#, Version 4.2, February 2021.