Accelerated Organic Matter utilization by Electro-Methanogenesis

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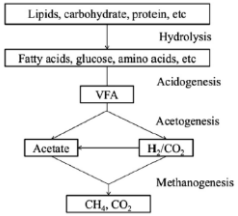
novonesis · AALBORG UNIVERSITET · Helix Lab

Introduction

Anaerobic digestion plays a cost-effective and climate-friendly role in degrading organic matter from wastewater and producing energy in form of biogas.



Due to the production expansion and possible fluctuations, it is necessary to increase the capacity and performance of the reactors at Novonesis.

Enhancing the process can be done by adding H_2 or applying electricity.

$$CO_2 + 4H_2 \rightarrow CH_4 + 2H_2O$$

$$Anode: C_2H_4O_2 + 2H_2O \rightarrow 2CO_2^- + 8H^+ + 8e^-$$

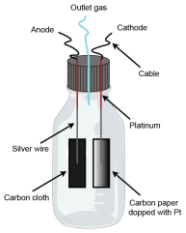
$$Cathode: CO_2 + 8H^+ + 8e^- \rightarrow CH_4 + 2H_2O$$

Objectives

- Biogas Production
- Reduction of COD
- Increase Capacity

Methods

Batch



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Cycles turning ON and OFF the cell

Chemical Measurements

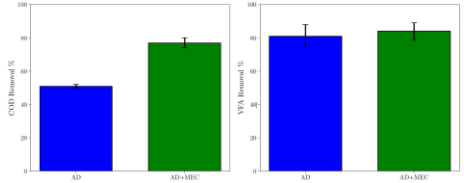
COD removal
VFA removal
Gas evolution

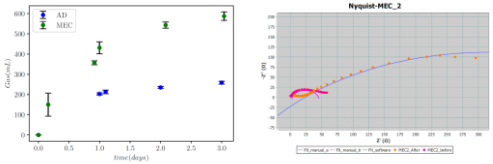
Electrochemical Measurements

Cycle voltammetry
EIS

Results

Batch





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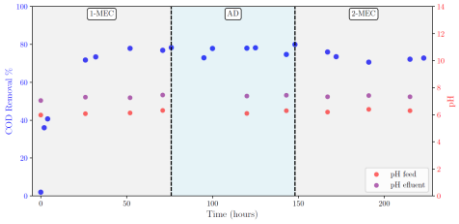

Conclusions

- Faster stabilization with the MEC ON
- Necessity to decrease power consumption and increase current density for profitability
- Needed better evaluation of the gas