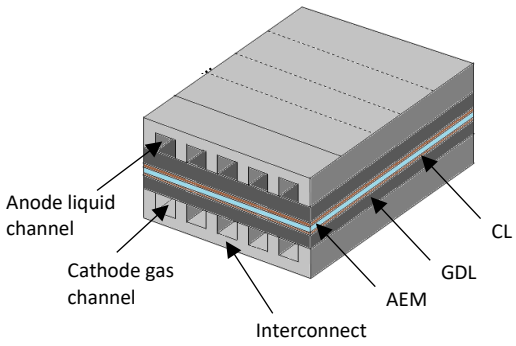
MSc Project Posted on: 23-09-2024

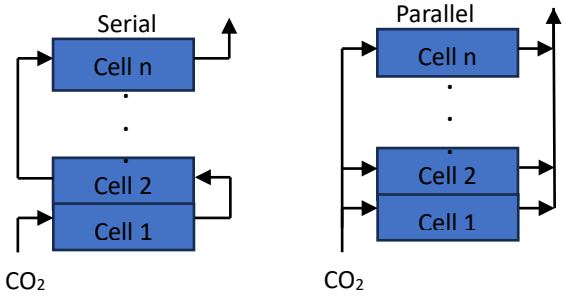
Industrial strategies to develop multiple-cell electrolyzer stack

Motivation and background

Reducing greenhouse gas emissions while producing fuels and value-added chemicals requires transforming petrochemical plants toward sustainability. Electrochemical CO_2 reduction – converting CO_2 into useful chemicals – is one of the technologies aiding this transition. Industrial electrolyzers preferably can deal with fluctuating electricity supply which necessitate rapid response and feedback from different components of the electrolyzer cell/stack. This becomes highlighted when the intermittency in the energy profile affects the process dynamics in an electrolyzer integrated with renewable power sources. There are few studies dedicated to the transient analysis of CO_2 electrochemical reduction (CO2eR) and its integration with renewable energies.

This MSc thesis project is a component of the FlexEchem project, under the umbrella of e-Refinery, to investigate the design and control of the CO_2 electrochemical reduction process to ethylene over large load changes.





Objective of MSc-research project

For designing the electrolyzer unit which operates load flexibly, a validated dynamic model is required. This project aims to develop a time-dependent model for CO_2 electrochemical reduction to evaluate and predict the performance of the electrolyzer working with variable loads from renewable energy sources.

The following research question is considered:

How does the intermittent load input impact the electrolyzer stack performance, and what are the industrial strategies to develop an electrolyzer stack integrated with renewable energy?

Contact information:

If you are interested in improving your skills in process modeling and you are familiar with Python or MATLAB, then contact us at n.heydari@tudelft.nl. This project will be supervised by Nasim Heydari and Prof. Ruud van Ommen.