Chair of Energy Systems
TUM School of Engineering and Design
Technical University of Munich

Term Project / Research Internship

(Theoretical / Constructive)

Development of a TwinCAT Control System for an Electrolyser

Description

Reversible solid oxide cells (rSOC) generate electricity in fuel cell mode and convert electricity into hydrogen and methane in electrolysis mode. Their economic viability depends largely on the lifetime of the cells. In the joint project Life4rSOC, we are investigating the degradation of SOC short stacks together with a start-up. To this end, the chair is building the StaTe 2.0 test rig: it operates an SOC short stack at up to 900 °C and supplies it via six gas lines (H2, CO2, N2, CH4, CO, forming gas).

In this project, you will automate the test rig. Based on a hazard assessment, you will develop the safety concept and implement it as a hard-wired safety circuit using Siemens components that brings the test rig into a safe state in the event of faults. You will then implement the control system in the Beckhoff software TwinCAT: signal processing, operating sequence control, alarming, control of the self-regulating mass flow controllers (setpoints, actual values) and temperature control of the furnace, evaporator and pipe trace heating. The electrician on site takes care of the control cabinet and field wiring.

Requirements

- Knowledge of PLC programming (IEC 61131-3, e.g. Structured Text) and automation engineering
- Reading P&IDs and circuit diagrams
- Helpful: experience with TwinCAT/Beckhoff and basic knowledge of safety engineering
- Willingness to attend a safety briefing (working with flammable and toxic gases)

Work Packages

1. Familiarization, review of the P&ID and creation of the signal and I/O list
2. Hazard assessment, safety concept, setup and testing of the safety circuit (Siemens)
3. TwinCAT project: I/O configuration, signal processing, control of the MFCs, heater control
4. Operating sequence control and alarming, interface to the plant PC
5. Testing, commissioning on the test rig and documentation

Start	Available immediately
Scope	Term project or research internship, 11 ECTS each (330 h)
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