MALEG

Machine Learning for Enhancing Geothermal Energy

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A digital twin for simulating geochemical processes in geothermal power plants

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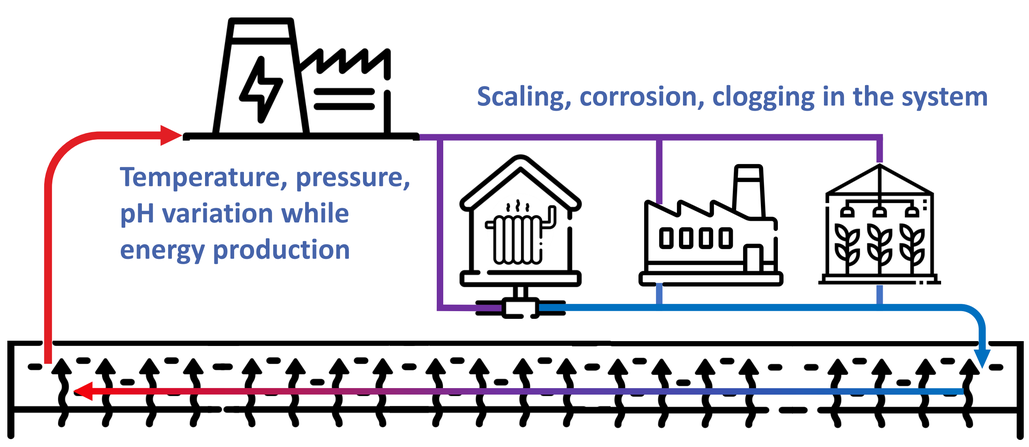
Motivation

Real-time simulation of the hydrochemical conditions of the thermal water cycle in a geothermal power plant. These process simulations are conducted based on the power plant's current operating parameters.

Issue

The digital twin mimics and models the geochemical processes of the power plant's thermal water cycle. Changes in parameters lead to a perturbation of the chemical equilibrium, which the digital twin models.

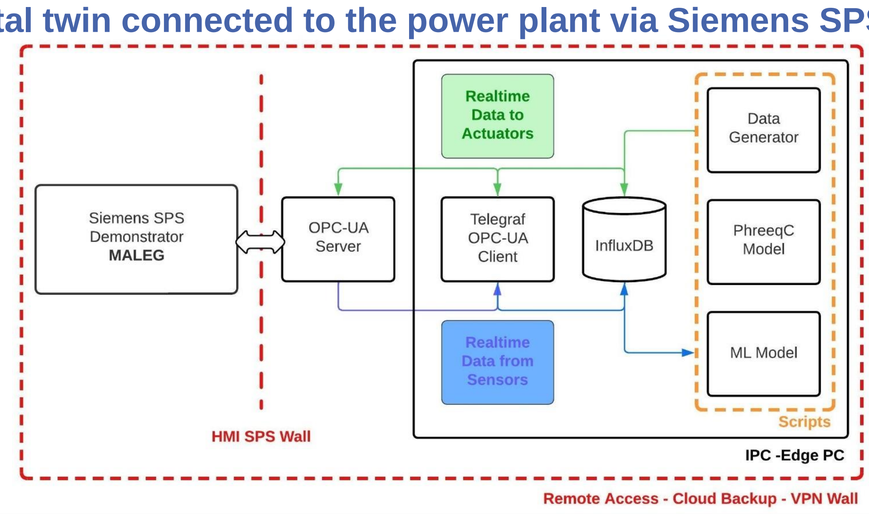
Parameter variation through power plant & thermal water cycle



Structure of digital twin

Systematic monitoring of operating parameters (pressure, temperature, pH, redox potential and flow rate) throughout the thermal water cycle. Communication between the power plant's sensors and actuators and the digital twin.

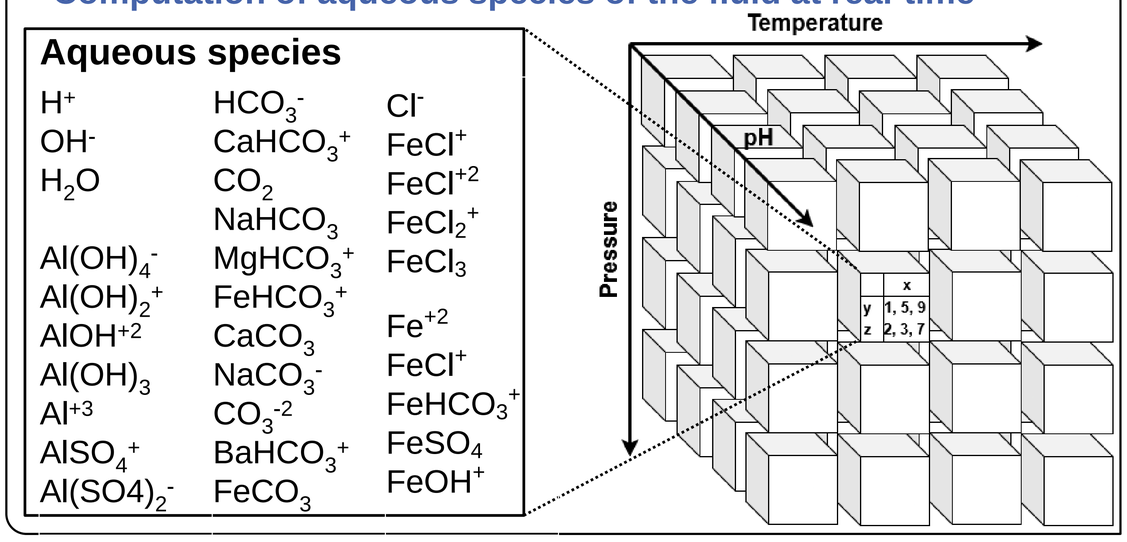
Digital twin connected to the power plant via Siemens SPS



Process simulation

Real-time simulation of hydrogeochemical processes in the system via numerical modelling of site-specific geochemical conditions, based on operating parameters.

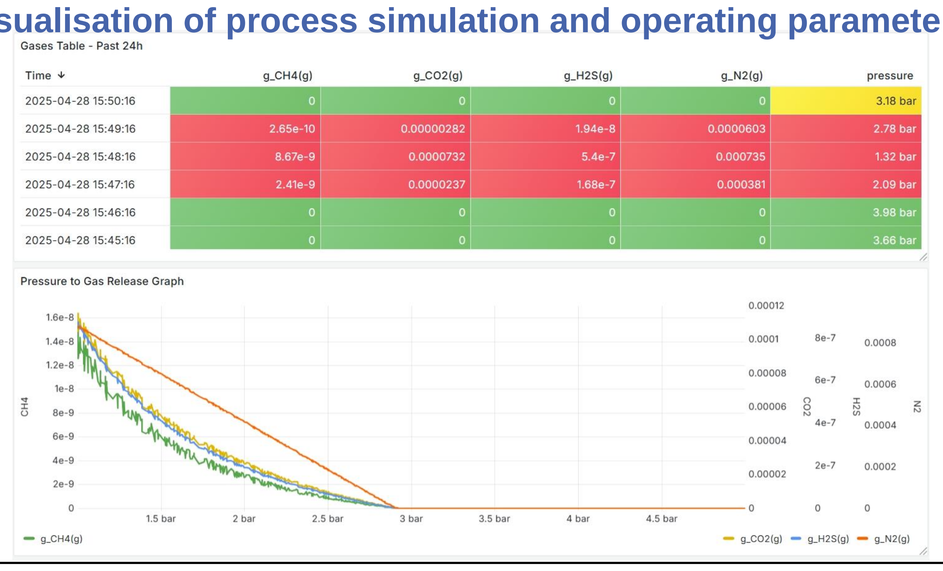
Computation of aqueous species of the fluid at real-time



Synergy of the digital twin

Visualise the operating parameters and the corresponding geochemical conditions in real time. Predict scaling, degassing and corrosion to sustain the chemical stability.

Visualisation of process simulation and operating parameters



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