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Gas bubble induced scalings in geothermal systems

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Scalings in geothermal systems are affecting the efficiency and safety of geothermal systems. An operate-until-fail maintenance scheme might seem appropriate for subsurface installations where the replacement of pumps and production pipes is costly and regular maintenance comprises a complete overhaul of the installations. The situation is different for surface level installations and injection wells. Here, monitoring of the thickness of precipitates is the key to optimized maintenance schedules and long-term operation.

A questionnaire revealed that operators of geothermal facilities start with a standardized maintenance schedule which is adjusted based on local experience. Sensor networks, numerical modelling and predictive maintenance are not yet applied. In this project we are aiming to close this gap with the development of a non-invasive sensor system coupled to innovative data acquisition and evaluation and an expert system to quantitatively predict the development of precipitations in geothermal systems and open cooling towers.

Previous investigations of scalings in the lower part of production pipes of a geothermal facility suggest that the disruption of the carbonate equilibrium is triggered by the formation of gas bubbles in the pump and subsequent stripping of CO_2. Although small in it's overall effect on pH-value and saturation index, significant amounts of precipitates are forming at high volumetric flow rates. To assess the kinetics of gas bubble induced precipitations laboratory experiments were run. The experiment addresses precipitations at surfaces and at the gas bubbles themselves.