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FluMo - A mobile fluid-chemical monitoring unit for geothermal plants

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A versatile fluid-chemical monitoring unit has been developed in the framework of the geothermal research laboratory Groß Schönebeck, Germany. It enables online and in-situ measurements of a variety of physico-chemical parameters at different locations of a geothermal fluid loop above ground. The scientific and technical purpose of the system is to monitor (a) a compositional variability of the produced fluid and (b) chemical processes potentially occurring within the plant. The latter may result from reactions between fluid and surrounding materials and/or mineral precipitation, e.g. in the course of a temperature decrease or oxygen contamination. This information is of paramount importance as so induced reactions might lead to failure of plant components through corrosion and scaling and/or damage the reservoir upon fluid reinjection and thus decrease injectivity.
Within the fluid loop above ground a number of locations can be defined where fluid-chemical monitoring is of interest, e.g. after the degasser, the filters and the heat exchanger. The monitoring unit is set up close to these installations and permits selective fluid bypass and monitoring through solenoid valves. The fluid passes through tubings from one device or sensor to another until it is pumped back into the main fluid line right before the injection pump. Sensors are provided for pressure, temperature, volumetric flow-rate, density, pH-value, redox potential and oxygen content. Two flow through-cells are installed each containing a pair of pH and redox sensors with different temperature ratings. A small heat exchanger is placed between these two flow-through cells to both cope with individual sensor specifications as well as for online investigations concerning temperature effects on both parameters and fluid chemistry. Additionally, two fluid samplers - one before and one after the mentioned heat-exchanger - have been installed to collect fluid and analyze the solution composition. All devices are mounted on a rack allowing easy transfer of the apparatus to other geothermal plants. The maximum operating pressure and temperature of the unit are 15 bar and 150°C, respectively.
In our contribution we will present details of the system including its implementation into the plant installations as well as first results that highlight the functionality and the performance of the device.