Shifts in microbial communities indicate oxygen ingress during downtime phases of a geothermal plant

WESTPHAL, A.[1], LERM, S.[1], MIETHLING-GRAFF, R.[1], SEIBT, A.[2], WOLFGRAMM, M.[3] AND WÜRDEMANN, H.[1]

[1]GFZ *German Research Centre* for Geosciences, Telegrafenberg, 14473 Potsdam, Germany. Email: wuerdemann@gfz-potsdam.de

[2]BWG Geochemische Beratung GmbH, 17041 Neubrandenburg, Germany. Email: aseibt@bwg-geochemie.de

[3]Geothermie Neubrandenburg (GTN), 17041 Neubrandenburg, Germany. Email:gtn@gtn-online.de

Little is known regarding the temporal variation in microbial community composition and function in fluids of a geothermal plant affected by corrosion and high partical loading rate after plant downtime phases. In this study, the microbial composition in the brine produced from the cold well of a geothermal plant in the North German Basin was analyzed during regular plant operation and immediately after plant downtime phases. Genetic fingerprinting revealed temporal variations, whereas sulfate-reducing bacteria (SRB) and fermentative *Halanaerobiaceae*-relatives dominated during regular plant operation while sulfur-oxidizing bacteria (SOB) were detected additionally directly after shut down phases. Quantitative PCR analyses showed an enrichment of Bacteria in general as well as SRB, and SOB during stagnant conditions going along with higher concentrations of dissolved organic carbon, sulfate, and hydrogen sulfide in the produced fluids. The recurrent detection of SOB is regarded as an indicator for oxygen ingress into the well during the downtime phases. Corrosion processes occurring in the well, might have been enhanced due to the oxygen ingress and the co-existence of SRB and SOB during downtime phases. Furthermore, microbial influenced scale formation was indicated by the sulfur isotopic signature of scales.