Geophysical Research Abstracts
Vol. 16, EGU2014-14168, 2014
EGU General Assembly 2014

Influence of shutdown phases on the microbial community composition and their effects on the operational reliability in a geothermal plant in the North German Basin

Anke Westphal (1), Stephanie Lerm (1), Rona Miethling-Graff (1), Andrea Seibt (2), Markus Wolfgramm (3), and Hilke Würdemann (1)

(1) German Research Centre for Geosciences, Section 4.5 Geomicrobiology, 14473 Potsdam, Germany (wuerdemann@gfz-potsdam.de, (49)3312881516, (2) Boden Wasser Gesundheit GbR (BWG), 17041 Neubrandenburg, Germany, (3) Geothermie Neubrandenburg (GTN), 17041 Neubrandenburg, Germany

Microbial activity can influence the dissolution and/or precipitation of minerals, as well as corrosion phenomena that may lead to a lower efficiency of engineered systems. To enhance the understanding of these processes, the microbial biocenosis in fluids produced from the cold well of a deep geothermal heat store located in the North German Basin (NGB) was characterized during normal plant operation and immediately after plant downtime phases. The microbial community composition was dominated by three different genera of sulphate reducing bacteria (SRB) and fermentative *Halanaerobiaceae* in the 46 ˚C tempered fluids during regular operation, whereas after shut down phases sequences of sulphur oxidizing bacteria (SOB) were additionally detected. The detection of SOB is regarded as an indication of oxygen introduction into the well during the downtime phase. This corresponded to the higher redox potential of fluids taken directly after the restart of fluid production in the cold well. In addition to an extremely high particle loading rate after plant restart, a higher DNA content as well as an increase of specific gene copy numbers of SRB and SOB by a factor of 10^4 and 10^5 respectively were observed. Obviously stagnant conditions favored the enrichment of biomass and particles in the well. This is supported by the determination of a higher sulphate and hydrogen sulphide content in the fluids taken initially after plant restart. With increasing fluid production during the restart, SRB specific gene copy numbers decreased much slower than SOB specific gene copy numbers, which led to the assumption that SOB abundance is limited to the near wellbore area. Besides the absence of particle removal by fluid flow and the deposition of particles by sedimentation during the shut down phase, oxygen introduction and subsequent activity of SOB may also have favored microbial induced formation of precipitates in the well. It is quite likely that the interaction of SRB and SOB during plant downtimes enhanced corrosion processes and increased scale formation. This effect is already known from cases of corrosion in other technical systems. The increased turbidity during the restart of fluid production mobilized the particles that were transported with the fluid flow to the filter system installed at the above ground facility and led to a particle loading rate increased by a factor of 500,000.