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Reestablishment of Proper Injectivity of the CO2-Injection Well Ketzin-201

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The onshore CO2 storage site Ketzin consists of one CO2 injection well Ktzi 201 and of two observation wells, Ktzi-200 and Ktzi-202. A production test at the Ktzi-201-in-jector in September 2007 revealed a productivity index of 0.06 m^3/d*kPa. After installation of the CO2 injection string, an injection test with water in the begin¬ning of October 2007 yielded a significantly lower injectivity of 0.002 m^3/d*kPa while the observation wells showed an injectivity consistent with the results of production tests. Sev¬eral possible reasons for the severe decline in injectivity were discussed, ranging from
- possible precipitation of iron oxide/hydroxide by contact of the formation brine with oxygen from air
- clay swelling by fresh water used to activate the packer
- gelling of remaining biopolymer from drilling mud with iron
- fines migration
- precipitation of iron sulphide by microbial processes.

Several different measures to re-establish the required injectivity of the injection well were considered: acidizing the reservoir interval, in¬jection at high wellhead pressure, controlled mini-fracs, backproduction of the well to remove plugging material. For reasons to be discussed in detail in the presentation, it was finally decided to carry out a nitrogen lift and to thoroughly analyse the back-produced fluids. The water produced by this procedure was dark-black in the begin¬ning. Chemical and XRD-analysis proved the black solids to consist mainly of iron sulphide which had been formed by sulphate reducing bacteria (SRB) using the organic compounds of the drilling mud as an energy source (cf. Wandrey et al. AGU General Assembly 2009). The lift of Ktzi-201 resulted in full restoration of the well productivity and injectivity.