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Drilling and completion of the three CO2SINK boreholes in Europe's pilot CO2 storage and verification project in an onshore saline aquifer

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This paper reports the CO2SINK drilling and permanent monitoring completions, as well as the well testing techniques applied in Europe's first scientific carbon dioxide onshore storage test in a saline aquifer near the town of Ketzin, 40 km east of Berlin/Germany.
Three boreholes, one injection and two observation wells have been drilled in 2007 to a total depth of about 800 m. The wells were completed as "smart" wells containing a variety of permanently installed down-hole sensors, which have successfully proven their functionality during over their first injection year and are the key instruments for the continuous monitoring of the CO2 inside the reservoir during the storage phase.

Constructing three wells in close proximity of 50 to 100m distance to each other with a dense sensor and monitoring cable population requires detailed planning and employment of high-end project management tools.
All wells were cased with stainless final casings equipped with pre-perforated sand filters in the pay-zone and wired on the outside with two fibre-optical, one multi-conductor copper, and a PU-heating cable to the surface.
The reservoir casing section is externally coated with a fibre-glass-resin wrap for electrical insulation of the 15 geo-electrical toroid antennas in the open hole section.

A staged cementation program was selected in combination with the application of a newly developed swellable rubber packer technology and specialized cementation down-hole tools. This technology was given preference over perforation work inside the final casing at the reservoir face, which would have created unmanageable risks of potential damage of the outside casing cables.

Prior to the start of the injection phase, an extensive production and injection well test program as well as well-to-well interference tests were performed in order to determine the optimum CO2 injection regime.