GeConnect – Thermal Response of Casings with Flexible Coupling Connections

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According to study in the EU Horizon 2020 project GeoWell, collapse and axial tensile rupture are the most common casing failures found in high-temperature geothermal wells. In addition, for medium enthalpy geothermal wells, temperature and pressure cycles above 100 °C during construction, operation and shut-in phases have the potential to severely deteriorate the integrity of the cemented annulus. The GeConnect project aims at increasing the reliability of the downhole construction of geothermal wells beyond the state of the art, using new innovative technology developed in EU Horizon 2020 projects GeoWell and DEEPEGS, of flexible couplings (patent filed 19th of December 2016, WO 2017/103950 A1). The concept of flexible couplings is to reduce the risk of casing failures resulting from axial compressive forces during well heat-up. Full-scale prototypes of the flexible coupling that allow axial casing displacements have already been laboratory tested in GeoWell. In GeConnect the concept will be tested in real working environment. Along with the connection, cement sheath integrity and cement-metal boundary will be evaluated with a ~12 m long surface test setup and by simulating thermal cycling loads at moderate <100 °C) to high temperatures (~300 °C). Fiber optic distributed strain sensing technology together with acoustic sensors will be used to validate the operation of the flexible coupling. Possible implications and risks associated with using the new flexible couplings will be assessed through structural modeling and by risk assessment analysis. Structural analysis will be used to evaluate the performance of flexible connections and demonstrate the benefits to well integrity of reducing thermal axial stress in casings.