



Donnerstag, 29. Februar 2024, 17.00 Uhr
Baden Arena Kongress 2 – Oberflächennahe Geothermie

Thursday, 29 February 2024, 5.00 pm
Baden Arena Congress 2 – Shallow Geothermal Energy



Applying Coating Technologies from Oil and Gas to Advance Geothermal Drilling

Anwendung von Beschichtungstechnologien aus der Öl- und Gasindustrie für die Entwicklung von Geothermiebohrungen

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Geothermal operators face competing temperature challenges in their efforts to extract high-energy heat from deep, hot reservoirs. First, they want to keep produced reservoir fluids as hot as possible to maximize the geothermal energy delivered to the surface. Second, they want to keep drilling muds and sensitive electronics in downhole directional drilling tools as cool as possible to avoid tool damage and expensive downtime associated with pulling the string to make repairs.

This paper presents a novel temperature control solution for geothermal drilling that NOV originally developed for the oil and gas industry: an insulating drillpipe coating that keeps drilling mud cooler to protect drilling tools from high-temperature failures. The coating retains the same features that extend tubular life in aggressive oil and gas environments—reliable protection against corrosion, wear, and deposit buildup—while improving hydraulic efficiencies to reduce pumping horsepower. It also includes components that minimize thermal conductivity, lower heat transfer rates through the tubing string, and keep the mud cooler.

The paper also reviews NOV's collaboration with an operator developing a series of enhanced geothermal system (ESG) projects. Using the operator's modeling simulation results as a guide, NOV designed and tested several low-conductivity coatings to arrive at a coating with a k value of just 0.1808 W/mK, which was nearly three times lower than the operator's target of 0.5 W/mK. In the field, drillpipe coated with the new insulative coating helped the operator drill an ESG well a total of 18,000 ft into a reservoir at temperatures up to 250°C (480°F). The coated drillpipe kept the mud temperature below 95°C (203°F) for the duration of the run, well below the operator's temperature threshold of 120 °C to prevent BHA damage.

Finally, the paper discusses how NOV is taking the lessons learned from this first geothermal drilling application to develop coatings with even lower thermal conductivities for deeper, hotter reservoirs.