Case Study

Successful Germany Geothermal Liner System Installations

Unique rupture disc design eliminates temperature-induced casing collapse issues

Background

With the combined heat and power plant, Germany's largest geothermal plant is currently being run in Munich, incorporating six wells that have already been drilled ranging from 2.8 to 3.1 km deep. With an output of 50 MWth, the HKW Süd of Stadtwerke München (SWM) supplies green heat for 80,000 Munich residents.

After approximately 900 m of vertical drilling, the wells were generally deviated and directionally drilled to target. The aim was to plant the production and injection wells in the deep aquifer 1,200 m apart. This distance prevents a hydraulic short circuit from occurring, which happens when the reinjected cooled water is lifted over the production well.

Solution

Using our completion tools expertise, we utilized our existing field-proven liner hanger technologies and combined them with various sizes and custom solutions to execute successful liner hanger installations for this geothermal application. Our liner hanger systems represented a crucial aspect of well design due to both the need to limit weight on the wellhead and improve the cement job quality by avoiding long string well design.

Based on lessons learned from previous installations and job requirements, the project required a system that mitigated casing collapse. The customer had noticed that in previous geothermal applications, when the temperature increased, it caused pressure to rise behind the casing. The pressure being trapped by the liner top packer caused the casing to collapse, resulting in costly workover operations.

After detailed studies and findings, the customer requested incorporating a burst disc to provide relief should the pressure in the annulus exceed the mechanical collapse rating of the casing. A two-stage liner cementing job utilizing the NOV duo wiper plug with a stage tool was recommended in order to reduce losses while cementing the 9⅝-in. liner hanger.

Case study facts

Location: Munich, Germany

Customer: Daldrup & Söhne AG

Products

- PBRs
- Setting sleeves
- Liner top packers
- Packoff nipples with burst disc
- GSP and GS liner hangers
- Duo wiper plug for stage tool
- TBSS
- Multiple stage tools

General well information

- Temperature: 90° C
- Maximum deviation: 60°
- Liner length: Over 1,400 m for both 9⅝- and 13⅜-in. liners

Successful geothermal liner systems installations in Germany

Utilizing our extensive experience in liner hangers, and specifically geothermal applications, six wells were constructed with no casing collapse issues reported using equipment including:

- 7-in. 23# x 9⅝-in. 47#, 9⅝-in. 47# x 13⅜-in. 68#, and 13⅜-in. 68# x 20-in. 169# liner hanger systems
- Tie back seal stem with six seal stacks where required
- Two-stage cementing with liner

Results

- Successfully ran 13 liner hanger systems over six wells in addition to multiple tie back seal assembly runs
- Incorporated custom rupture disc solution, thereby preventing casing collapse issues previously experienced by customer
- Two-stage cementing jobs successfully performed with minimal losses
- Provided liner hanger systems solution for variety of sizes and requirements including a 13⅜-in. 68# x 20-in. 169# system with more than 1,400 m liner length