



TerraTherm™ High-Performance Water-Based Geothermal Drilling Fluid, Coupled with Extensive Experience Proved Critical to Success on 450°C Well for the Icelandic Deep Drilling Project (IDDP)

Dubbed ‘the hottest geothermal producing well’, the operator chose Newpark thanks to leading technology and extensive experience drilling geothermal wells around the world

CHALLENGE	SOLUTION	RESULT
<ul style="list-style-type: none"> • Drill well in HT conditions up to 450°C • Control product degradation • Monitor and control any modification of the physical behavior of drilling fluid 	<ul style="list-style-type: none"> • Extensive laboratory testing and pre-project planning • TerraTherm™ high-performance water-based geothermal drilling fluid system • Enhancing supply chain operations, guaranteeing continuous supply of product 	<ul style="list-style-type: none"> • Safely and successfully drilled to 2,101m at 450°C in just 37 days • Minimized downhole losses significantly

OVERVIEW

Iceland generates all its electrical power from hydroelectric and geothermal power stations. Newpark was invited by the largest electrical company on the island to discuss the advantages of drilling with alternative fluids systems.



The Iceland Deep Drill Project (IDDP) is an international project which invites only experienced companies to participate. The main focus of the project was IDDP-1, a well proposed to be drilled to the magmatic chamber which would then produce steam for the nearest geothermal power station.

CHALLENGE

IDDP-1, with temperatures up to 450°C (842°F), was the hottest productive steam well ever drilled in the world. Challenges were expected during the pre-spud fluid studies, including:

- Product degradation
- High evaporation rate
- Modification of physical behavior of the drilling fluid



- Total losses management

Drilling on the IDDP-1 well had previously started when the unexpected magmatic chamber was discovered. The downhole temperatures at 2,100m rose to 450°C.

The well was already drilled to 800 meters, but in order to reach 4500m, the operator wanted to drill the 16 ½” section from 800m to 2600m to ensure a good cement job around the 13-3/8” casing and beyond the first reservoir. Newpark support was also required to drill the 12 ¼” and 8 ½” past the magmatic chamber. The operator ultimately chose Newpark because of our extensive experience drilling challenging geothermal wells worldwide.

SOLUTION

- **Laboratory study:** Working at 450 degrees Celsius involves meticulous preparation, including extensive laboratory testing to find the appropriate products, in the right formulation to maximize efficiency.
- **Drilling Fluid System:** After extensive testing, Newpark selected its industry recognized premium TerraTherm™ high performance water-based geothermal drilling fluid system, which is built with a powerful resin, premium thinners and several other essential components.
- **Fluid Preparation:** Experience in HT wells allowed Newpark technicians to plan and prepare the correct additive treatments. Field engineers were faced with downhole losses that resulted in 885 m³. While our robust supply chain ensured the continuous supply of products, an engineered drilling fluid build schedule was put in place, enabled by the addition of two 5000 l/min flow rate pumps to keep up with water supply feed rate.
- **Dilution Rate:** the combination of correct fluid selection, experienced management and proactive monitoring ensured the well was drilling with a rate of dilution of only 5.5 (total m³ fluid / m³ drilled), thereby minimizing waste management challenges.

RESULTS

Performance summary results are below:

Expected magmatic chamber depth	>5.000 m
Actual magmatic chamber depth	2101 m
Temperature at 2101 m	450 Celsius
Operational Days	37 days
Rate of dilution	5.5 (m ³ fluid /m ³ drilled)
Total downhole losses	885 m ³

Geothermal expertise and experience from Newpark resulted in numerous performance benefits for the customers, including increased ROP, reduced overall costs, and significant time savings compared with similar projects.

IDDP-1 is now one of the the most productive wells in the world, producing steam which supplies power for over 16.000 homes in Iceland.