



Iceland Deep Drilling Project relies on TenarisHydril connections

The first of three groundbreaking wells drilled in Iceland by a consortium of local energy companies and the Icelandic government has been completed with the help of products and services provided by Tenaris.

Summary

A long geothermal tradition

The development of geothermal technology has played a major role in the way modern Iceland generates and consumes its energy. Sitting on top of the tectonically active Mid-Atlantic Ridge, the country has abundant geothermal resources.

In the early 20th century, a group of farmers started using natural hot water springs to heat their farmhouses. Their success led the government to invest in a number of geothermal drilling projects around the Reykjavik area from the 1930s onwards, using the extracted energy to provide space heating for schools and public buildings through increasingly sophisticated pipe networks.

Today, over 90% of homes in Iceland are heated in this way, while geothermal power plants distributed across the country are also used to generate over 25% of the nation's electricity.

Searching for supercritical hydrous resources

A consortium established in 2000 by key local and global energy companies and the National Energy Authority set up a long-term study of high-temperature hydrothermal systems called the Iceland Deep Drilling Project (IDDP). Its main objective is to determine whether supercritical geothermal fluids can be economically extracted and used to improve the electric power output of conventional geothermal wells.

To find out, the IDDP is planning and testing three wells at three different geothermal fields currently being exploited in the northeast and southwest of the island. But unlike wells typically drilled at these fields (which are 2.5km deep, bring water to the surface as 235°C steam and yield approximately 5 MWe of power), the IDDP boreholes are expected to be 4-5km deep, where reservoirs holding hydrothermal fluids at supercritical conditions (450°C to 600°C) could yield as much as 50 MWe.

PROJECT PROFILE

Operator
Landsvirkjun

Location
Northeastern Iceland

Field / Well
Krafla / IDDP-1

Well type
Geothermal

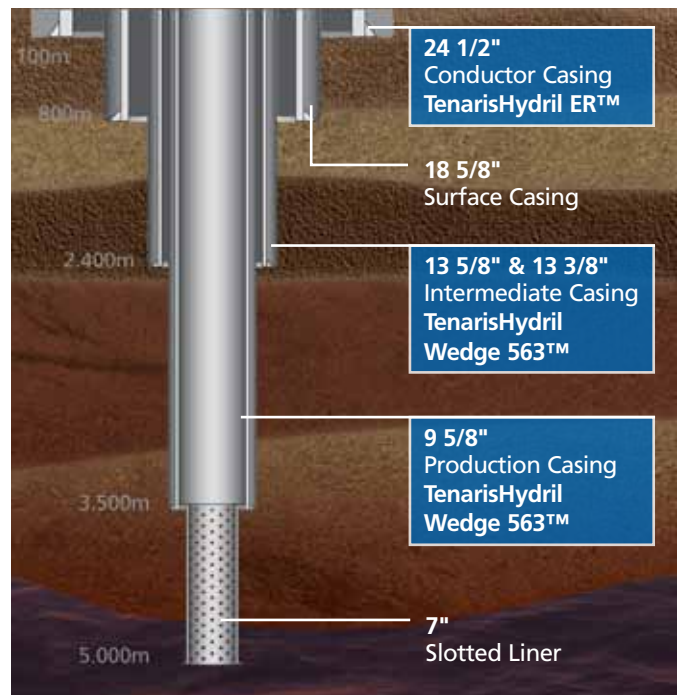
Products highlighted

- 13 5/8", 13 3/8" and 9 5/8" casings with TenarisHydril Wedge 563™
- 24 1/2" casing with TenarisHydril ER™

Services provided

- Field inspection
- Running assistance
- Training

Expected well schematic for IDDP 1, 2 and 3



Challenges

Uncharted subsurface behavior

The unprecedented drilling depths for this highly volcanic region, extremely high temperatures generated by close proximity to the magma and uncharted downhole conditions pose specific challenges to the ongoing project.

Both the pipes and the connections selected for well casing need to be able to withstand high expected levels of thermal loads (even beyond the elastic limits of the material) as a consequence of the temperature variations.

Solution

Proven connections

IDDP-1, the first of the three experimental wells, was completed by Landsvirkjun (the company in charge of the Krafla field) in mid-2009. For the 13 5/8", 13 3/8" and 9 5/8" sections of the well, the operator chose to deploy TenarisHydril Wedge 563™ casing connections.

Thanks to its wedge thread profile, this premium connection provides a compression rating of 100% of the pipe body. The Wedge 563™ relies on its interlocking dovetail thread profile to prevent radial disengagement and thus maintain the integrity of the connection under the most extreme environments.

The TenarisHydril Wedge 563™ also comes with a roller-stenciled make-up confirmation band for visual reference and accepts a wide range of make-up torques. As a result, the connection is both very easy to handle and ideal for those operations where computerized torque-turn equipment is not available.

For the 24½" first intermediate casing (cemented to a depth of 254m), Landsvirkjun decided to run TenarisHydril ER™ coupled connections because of their low Threads Per Inch (TPI) profile and increased taper, which simplify running and minimize cross-threading risks even in large diameter sizes. The TenarisHydril ER™ is a connection that has been used in geothermal operations in Italy for over 20 years, with a non failures proven record.

Technical assistance

Prior to the running operation, Tenaris provided specific training to help rig staff familiarize with the procedure. Additionally, a team of field service specialists sent by Tenaris was available to carry out field inspection and running assistance work.



▲ TenarisHydril Wedge 563™ and TenarisHydril ER™.

Results

Successful completion and future perspective

During drilling of the IDDP-1 well, a magma body with a temperature of around 1,000°C was encountered and unintentionally penetrated at 2,100m. Fortunately, the 9 5/8" production casing had been previously cemented to 1958m, which allowed for the well to be successfully and safely completed with a slotted liner to just above the magma chamber. After the well was allowed to heat up, flow tests began in 2010.

Between 2011 and 2015, the IDDP intends to drill the two remaining experimental wells at the Hengill and Reykjanes geothermal fields to a target depth of 4-5km. Having verified the excellent performance of the TenarisHydril Wedge 563™ and ER™ connections, both IDDP-2 and IDDP-3 will use the same tubular products and connections as IDDP-1.



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