



Twenty years and counting of faultless TenarisHydril ER™ use in geothermal wells

Geothermal energy has the potential to be one of the most reliable, sustainable and affordable types of renewable energy. In Italy, Tenaris has been helping a world leading geothermal electricity supplier to optimize its operations.

Summary

A geothermal pioneer

The region of Tuscany in central Italy might be more famous as the birthplace of the Renaissance or for the leaning tower of Pisa. What is less known is that in a small Tuscan village called Larderello the world's first experimental application of geothermal energy took place in 1904.

By 1913, electricity generated by steam extracted from underground reservoirs was being industrially produced at the first geothermal power plant installed in Larderello. Today, Enel Green Power operates 33 geothermal power facilities in Tuscany, boasting an installed capacity of 737 MW.

A multi-decade-long relationship

Tenaris, a long-term partner of Enel, has been supplying the operator with tubular products for several decades. During the past 20 years, TenarisHydril ER™ connections have been deployed (with zero failures reported) at most of the over 500 geothermal wells that the operator has so far drilled in the area.

Challenges

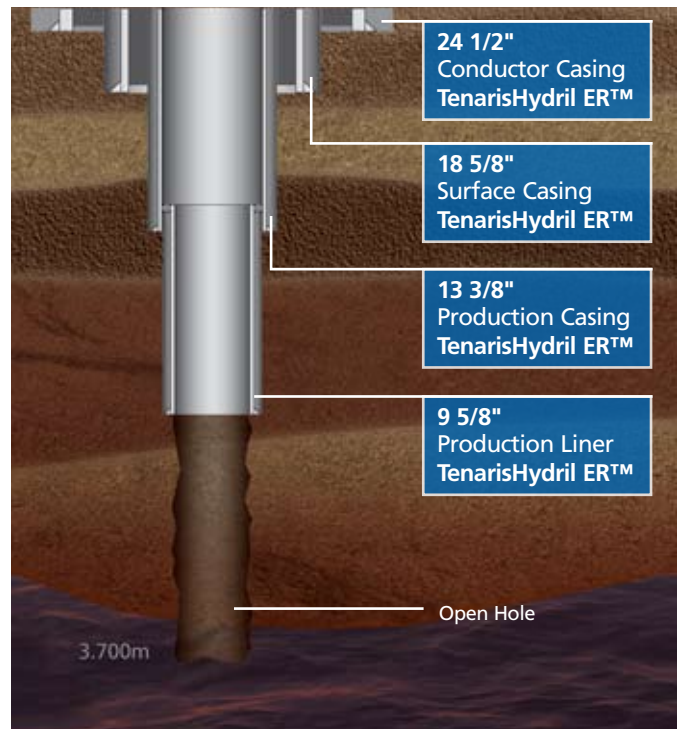
Dealing with thermal expansion

The reservoirs of the Larderello-Travale/Radicondoli geothermal system from where Enel extracts the high-temperature fluids that drive its turbines are located between 1,000m and 4,000m below the surface. At such depths, temperatures of more than 250°C are frequent. The compression resistance of the connection used for well casing becomes a critical parameter to withstand thermal expansion and cycling.

With both the number and depth of its geothermal wells increasing, Enel was also seeking a connection that could significantly contribute to the company's overall efforts to simplify its running operations.

PROJECT PROFILE

Operator Enel Green Power	Well type Geothermal
Location Larderello (Tuscany, Italy)	Products highlighted TenarisHydril ER™



Fighting corrosion

The high-temperature fluids found in the deepest Larderello wells (essentially oversaturated steam) are characterized by the presence of chlorides that may create heavy acid condition when the steam condensate at the upper part of the well. This introduces specific corrosion problems to conventional steel grades, so careful consideration must be given to the selection of pipe material.

Solution

Faster connections

The relationship between Enel and Tenaris dates back several decades. After many years of sales through spot contracts in 1990, the first long-term agreement was signed between the energy company and what was then Dalmine (now part of Tenaris).

In the late 1990s, just as Enel's pioneering implementation of re-injection wells was proving a successful strategy to increase production flow rates across Larderello, the electricity supplier finally found the ideal connection for its geothermal operations after having tried different types of connections.

TenarisHydril ER™, the proprietary technology which Enel has now been using for over 20 years, is a coupled connection that provides both easy stabbing and fast make-up, while maintaining 100% compression efficiency.

In order to maximize the amount of fluid per well that will feed the steam turbines of geothermal power stations, wells typically use large-diameter production casings. Thanks to their low Threads Per Inch (TPI) thread design and increased taper, TenarisHydril ER™ connections are particularly well suited to improving running efficiency in such large diameters.

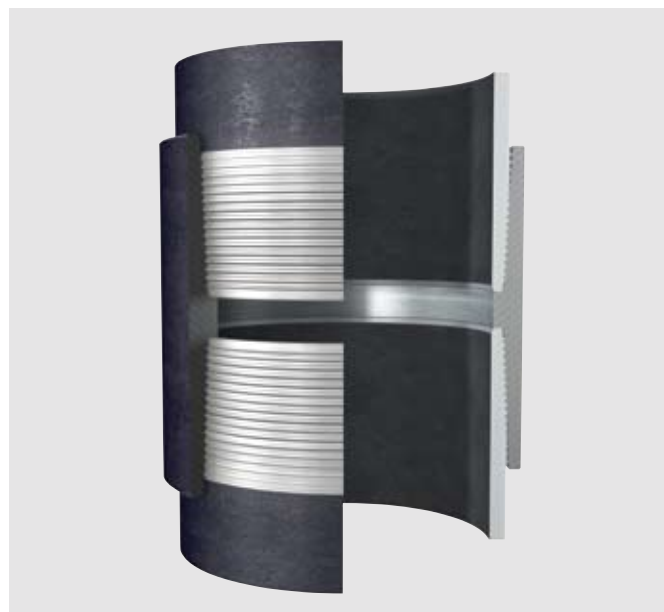
The CRA approach

Working in close collaboration with Enel, Tenaris was able to provide the Italian operator with a solution against corrosion. For the upper portion of production casing exposed to the production fluid a Tenaris CRA (corrosion resistant alloy) pipe is used to cope with possible acid condensation. This CRA steel has proven much more resistant than conventional API carbon steel pipes in such conditions.

Results & future outlook

Sustainable energy for future generations

Operating in the area where the geothermal energy industry was born over a century ago, Enel is currently producing over 5,000 GWh of this type of green electricity every year – enough to meet the average consumption of two million Italian households.



▲ TSH ER™ connections provide 100% compression efficiency as well as easy stabbing & fast make-up.

Unlike other forms of renewable energy generation, such as solar or wind, geothermal power relies on a guaranteed, constantly available source of energy. Ongoing research on new techniques including Hot Dry Rock (HDR) and binary cycle power plants may extend the economic viability of geothermal energy exploration to virtually every region of every country in the world.

Enviably track record

After more than 20 years of uninterrupted and faultless operation, Tenaris's tubular products and premium connections have demonstrated unparalleled reliability.

The long-term agreement that Enel and Tenaris have had in place has ensured that the right resources have always been available when needed.

The next step in this long and fruitful collaboration is likely to be the trial by Enel of Tenaris's field-proven Dopeless® technology. Incorporating a specially engineered, dry coating that is applied at the mill, Dopeless® connections eliminate both the need to deal with dope at the rig site and the release of grease or other additives for the connection inside the well.

Should the energy group add the technology to its growing geothermal operations, it will benefit from further simplification of its drilling operations. And it will serve to reinforce the Italian company's already impressive environmental credentials.



For contact information, please visit our site:
www.tenaris.com