



# TenarisHydril Blue<sup>®</sup> connections qualified under protocol for thermal well applications

Tenaris partners with industry to develop globally recognized standard for demanding temperature applications.

## Summary

With temperatures up to 350 degrees C and multiple heating-cooling cycles, thermal oil production presents down hole tubulars and connections with the most severe conditions found in the industry. As a result, it is critical that operators of SAGD (Steam Assisted Gravity Drainage) and CSS (Cyclic Steam Stimulation) projects, popular in Canada's heavy oil reservoirs, have complete confidence in the casing and connections they install in their wells, as the potential consequences of failure are severe.

Previously, no recognized industry standard existed to evaluate candidate connections for thermal operations where stresses beyond the elastic limit of the steel tubulars are generated. Operators were left to rely on internally developed qualification guidelines for specific projects, and in this rapidly growing and fast moving segment, there was a clear need for a detailed, globally recognized standard.

Together with several thermal well operators, other manufacturers and industry resources, Tenaris participated in a multi-party project that resulted in the development of the Thermal Well Casing Connection Evaluation Protocol (TWCCEP) in May, 2010. TWCCEP is now a recognized industry standard and voluntary qualification process to evaluate connections for thermal operations where maximum temperatures range from 180°C to 350°C.

Since the inception of TWCCEP, Tenaris has tested and qualified three TenarisHydril Blue<sup>®</sup> connections.

## PROJECT PROFILE

### Location

Campana, Argentina

### Type of well

Steam-Assisted Gravity Drainage (SAGD) wells  
Cyclic Steam Stimulation (CSS) wells

### Products highlighted

TenarisHydril Blue<sup>®</sup>

## Challenge

### Establishing an industry protocol

Major CSS projects have been operating in Canada for more than 25 years, and the newer SAGD application has been implemented at several projects in the last 10 years.

The industry has been witness to serious failures that have occurred intermittently in the past, but with massive expansion of thermal projects planned in the future, there was a clear need to implement a qualification protocol to ensure that the risk of casing connection failures was minimized.

## Solution

Through a multi-party project, the TWCCEP was established. The protocol requires testing of connections under worst-case scenarios for a particular design considering the assemblage in the well and the operation during both steaming and producing.

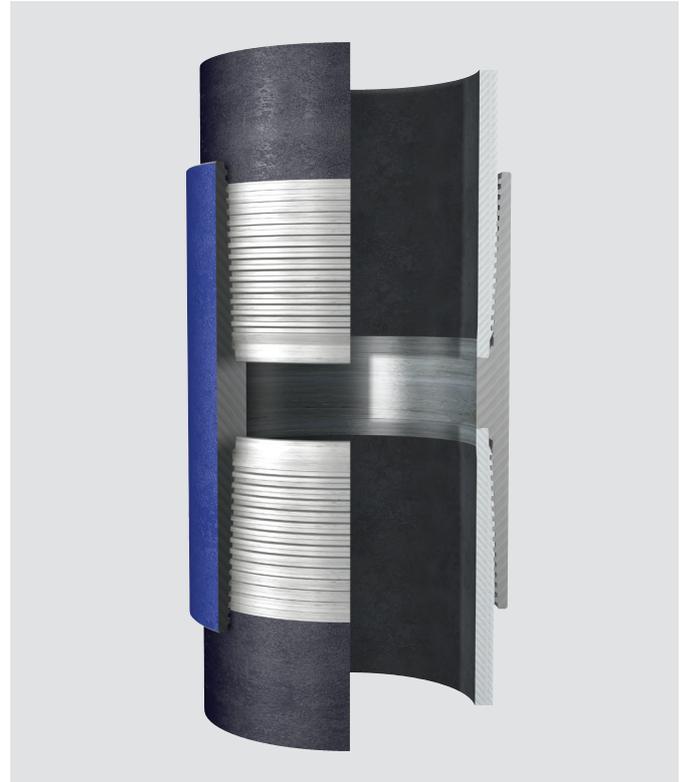
Connections shall undergo mandatory and optional tests to determine whether they are suitable for thermal well service. Mandatory tests assess galling resistance, structural strength and sealability. These characteristics are determined through make-up and break-out cycles, thermal cycling and tensile testing at increasing temperatures. Additional, optional, testing can be conducted to assess the performance of connections in loading conditions that are not consistent with all thermal well applications. Optional testing shall include a bending test and a limit-strain test. In all cases, test specimens shall comply with the very demanding seepage thresholds representing the operation in the well.

The next step following the release of the testing protocol was to conduct a full-scale physical test of a casing connection in accordance with the new TWCCEP guidelines.

A 9 5/8" TenarisHydril Blue® connection was chosen, as this casing size is utilized in several SAGD projects. Additionally, the TenarisHydril Blue® connection was deemed an appropriate connection for testing due to its suitability for intermediate casing applications, where thermal wells endure the most rigorous demands. The testing was undertaken at Tenaris's R&D facility in Campana, Argentina from August 2010 through January 2011.

Subsequently, Tenaris selected two additional sizes, 11 3/4" and 13 3/8", of TenarisHydril Blue® connection for evaluation.

In all three qualifications, six specimens were tested and, in accordance with the protocol, four were subjected to ten thermal cycles each in various specification combinations. To ensure the simulation represented the "worst case scenario", different combinations of thread interference and seal interference were tested.



▲ TenarisHydril Blue®

## Results

The 9 5/8" TenarisHydril Blue® connection was the first connection to successfully complete a testing program in accordance with the new protocol. The test results exceeded expectations, with seepage rates well below the requirements of the protocol. A Canadian thermal operator participated in the testing program and had third party inspectors monitoring all test activities, with no non-conformances being noted. Subsequent successful tests of two other sizes of TenarisHydril Blue® connections demonstrate Tenaris's dedicated response to its customers' most demanding application needs.

With nearly 2 million meters / 6.5 million feet of TenarisHydril Blue® connection run as intermediate casing in thermal operations since 2004, TenarisHydril Blue® serves as the foundation of Tenaris participation in the thermal segment in Canada.



For contact information, please visit our site:  
[www.tenaris.com](http://www.tenaris.com)