



Wedge Series 500™ Connections chosen for Challenging Eagle Ford Shale Well

Summary

Much of the Eagle Ford shale formation in central south Texas is being drilled and completed “horizontally” in an effort to economically maximize wellbore contact with narrow, small vein oil pay zones. This technique requires wellbore deviations as much as 90° from vertical before reaching the target depth (TD). During the running of casing into the wells, the casing string is subjected to bending forces induced by doglegs that stress both the casing and connections.

To be certain their casing string could negotiate a series of severe multiple doglegs and reach TD without getting stuck, local Eagle Ford operator Escondido Resources selected TenarisHydril Wedge 513™ and 563™ casing connectors for their Seidel #2H well in the Eagle Ford shale.

Challenges

The Eagle Ford shale is an oil/gas reservoir roughly 30 to 100 miles wide stretching from the Mexican border through central south Texas. The dark, dense shale rock layer lies at depths ranging between 2,500 and 15,000 ft where hydrocarbon deposits reside in small veins 1,000 to 2,000 ft in length. The rich liquid hydrocarbons give the shale a dark and dense appearance and make it highly desirable to oil and gas producers. Among the challenges Escondido Resources face in drilling and completing Eagle Ford wells are:

High build rate curves

Changes in the build angle of this horizontally drilled well created high bending loads in the pipe and connections. This bending simultaneously produces tension on the pipe’s outside curvature and compression on its inside curvature which adds to existing loads. This well plan required highly reliable, rugged connections capable of withstanding stresses from the high build rates necessary to deviate the wellbore from a vertical to horizontal orientation.

Severe torque loads

Often, high torque loads are placed on casing as it is run to depth. When this torque is applied while the pipe is simultaneously being subjected to bending loads, the possibility of a connection failure increases. Operators require connections that offer excellent torque resistance and which can ensure proper safety margins against failure.

PROJECT PROFILE

Location

Eagle Ford Shale-Texas

Well Type

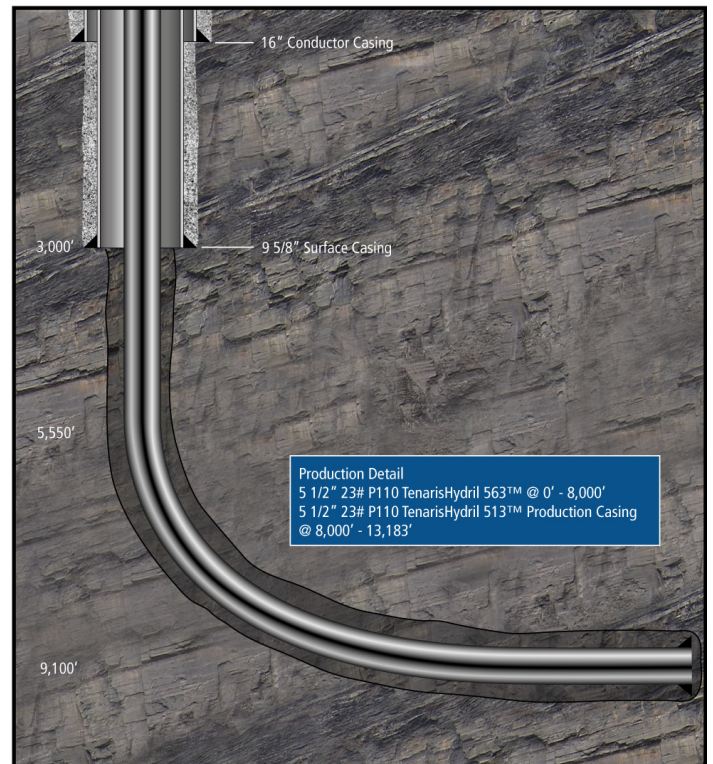
Shale-Extended Horizontal Reach

Products Highlighted

Tenaris casing and Wedge Series 500™

Operator

Escondido Resources



▲ Escondido Resources Well Schematic

Operational efficiencies

Typically, shale wells are expensive to drill and complete because they require specialized knowledge, equipment and techniques to ensure a high probability of success. Therefore, operators expect the equipment used on their wells to deliver operational efficiencies that add value and cost-effectiveness.

Solution

In the area of south Texas where the Escondido Resources' Seidel #2H well was planned, the top of the Eagle Ford shale lies at an approximate depth of 8,700 ft while the targeted pay zone is located at approximately 8,800 ft. The well plan specified the well be drilled vertically to 5,550 ft then kicked off to begin deviation to a horizontal orientation. The 90° deviation would require 3,679 ft and employ build rates ranging from 8°/100 ft at the kickoff point to a high of 13°/100 ft during the transition. Total cased depth of the well was planned for 13,183 ft.

During well completion, a total of 8,000 ft of 5 ½-in., 23 lb, P110 casing with TenarisHydril Wedge 563™ connections followed by 5,183 ft of 5 ½-in., 23 lb, P110 casing with Wedge 513™ connections was specified to be run into the well.

According to Escondido Resources, Wedge Series 500™ connections were chosen for the Eagle Ford well completion because the connection's thread technology has been designed for use in applications where torque strength is critical because strings may require rotation as they are pushed into place. The excellent compression and bending resistance of the Wedge connection is due to the Wedge thread design that creates an internal pressure metal-to-metal seal and an external pressure thread seal generated by full-form contact of the "dovetail" threads.

Also, Escondido engineers indicated they preferred the integral flush Wedge 513™ connection for transitioning the tight clearances of the severe doglegs because it was specifically developed for slim-hole applications.

Results

The well was drilled as planned by the operator and no problems were experienced during casing string make-up or running. Following completion of the well, Escondido Resources officials stated they were impressed by the performance of both the Wedge 513™ and Wedge 563™ connections in their Eagle Ford well. They cited:

Superior torque

The torque resistance and capability of the connections to handle the high torque loads placed on them by the well's severe doglegs reassured Escondido Resources that their well's casing would reach the total desired depth and provided an adequate safety margin against unpredictable down-hole torque.

Bending strength

The bending capabilities of the connections allowed the casing string to withstand the extreme stresses that resulted from the high build rates used during wellbore deviation from vertical to horizontal. For TenarisHydril Wedge 563™ threaded-and-coupled connections, the bending efficiency is equal to tensile efficiency: 100% of the pipe body for most sizes (higher than 95% of the pipe body in all cases). For the Wedge 513™ connections, the bending efficiency is more than 60%.

Thread design

Operator concerns regarding connection internal movement when the connection is under very high bending and compressive loads were alleviated by the Wedge series 500™ thread design. The negative angles of load and stab flanks form a "dovetail" shape that mechanically locks the pin and box together. This shape and the large thread surface contact area create a more rigid connection that resists internal movement when subjected to very high bending and compressive loads such as those encountered in this Eagle Ford well.

Furthermore, the connections withstood the repetitive 10-12 kpsi burst solicitations from the multi-stage fracturing process necessary to profitably exploit this shale. Despite the fracturing stresses, the connections retained the metal-to-metal, gas-sealing capabilities necessary to safely produce the well's natural gas.

Tenaris Technical Sales collaboration

Drawing on their comprehensive experience in drilling and completion of numerous U.S. shale plays, Tenaris's Technical Sales team provided materials selection and string design assistance to the Escondido well team. This cumulative experience enables Tenaris to understand, and therefore provide, in advance, assistance customers need for their shale drilling projects.

Tenaris inspection and running assistance

During this drilling project, the Tenaris Field Services team was on standby to assist the customer at the drilling site during completion string makeup and running. When this operation began, the team was deployed to provide both inspection and running assistance to ensure the pipes and connections were handled and run properly. The result was a problem-free installation.

After running was completed, an Escondido Resources supervisor stated that his crew found the Wedge connections to be very "user friendly" and easy to run, thereby resulting in greater operational efficiency. And, they indicated they were very pleased with the assistance they received from the Tenaris team.



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