

Grant Prideco Delta connection improves drilling efficiency, reduces risks in extended-reach wells

Delta's high torsional strength supports single-string designs for consistent, lower-cost drilling

Background

An operator conducting an extended-reach drilling (ERD) campaign in New Mexico sought to improve drilling efficiency, safety, and overall well delivery performance. The original approach used a dual-string design: a 5-in. drill string with API NC50 connections for vertical sections, followed by a full-length 4½-in. slim-hole string with double-shouldered connections (DSCs) for laterals averaging 1.5 miles.

This configuration required laying down the 5-in. string and then picking up and running a rental 4½-in. string to drill the lateral. The process added rig time, increased costs, and introduced safety risks due to additional pipe handling and larger crew requirements.

Analysis showed that a single 5-in. drill string could improve rate of penetration (ROP) by delivering improved hydraulics. However, conventional API connections lacked the torsional strength and fatigue resistance needed to support this approach, limiting efficiency gains.

Solution

NOV introduced the Grant Prideco Delta™ drill pipe connection, a fourth-generation DSC engineered to enable single-string ERD operations while improving durability and performance.

The Delta connection combines high torsional capacity with a streamlined design suited for slim-hole environments. Its torque capability meets or exceeds that of larger connections, allowing drillers to run a single pipe size through both vertical and lateral sections without sacrificing performance.

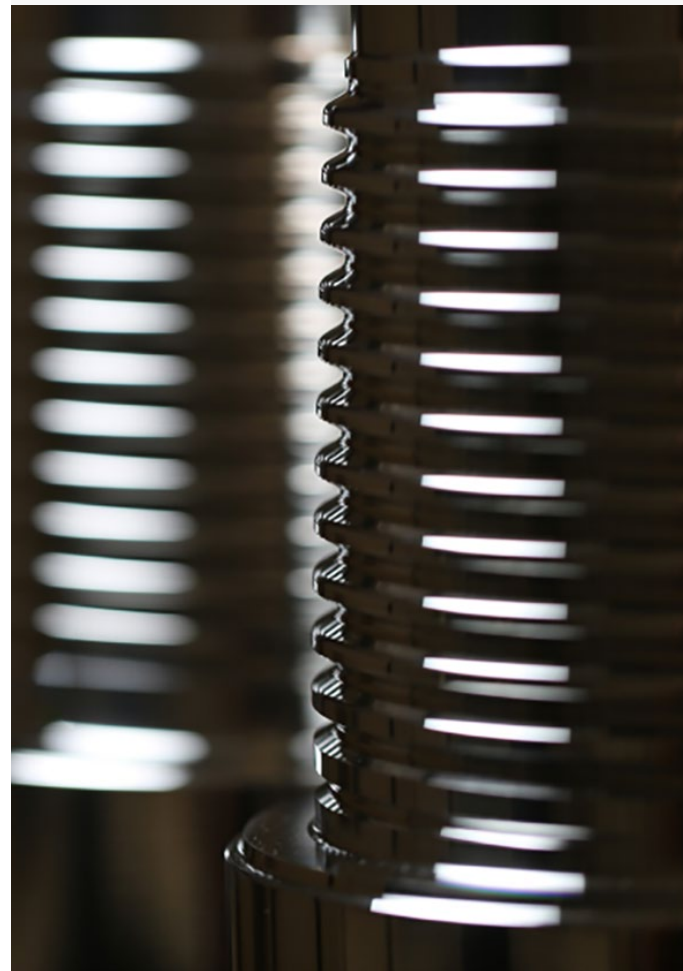
The connection is built for enhanced fatigue resistance, with high-strength materials, optimized stress distribution, and a robust tool joint design engineered for repeated use under demanding loads. Combined, these features help extend run life and make Delta well-suited for long lateral sections typical of ERD campaigns.

Delta connections also exhibit improved life-extending characteristics that translate to fewer repairs, increased refacing capability, and reduced material loss during recuts. These features extend service life and minimize downtime, supporting more consistent drilling operations and reducing total cost of ownership.

Case study facts

Switching to a single 5-in. drill string with Delta connections delivered:

- Improved drilling efficiency by eliminating pipe changeouts and reducing nonproductive time
- Higher fatigue resistance, extending connection life and reducing repair frequency by over 50%
- Streamlined slim-hole performance with improved hydraulics for better hole cleaning and faster drilling
- Reduced crew requirements and safer operations through minimized pipe handling and full use of automated systems
- Increased ROP, including average gains of 54% in 8½-in. laterals and 71% in 6¾-in. laterals



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Results

Since adopting the Delta 471 connections in 2019, the operator has adopted a unified approach with the same drill string configuration from surface to total depth. Drilling operations standardized on a single 5-in. drill string for both the 8½-in. top hole and 6¾-in. laterals. The 5⅞-in. tool joints outside diameter (OD) allowed the streamlined Delta 471 connection to be run in the lateral.

Standardization extended across the operation. Drilling crews could use the same bottomhole assembly (BHA) and blowout preventer (BOP) components and apply the same torque limits along the entire well length. Together, these features simplified planning and execution while improving consistency.

Operational efficiency improved immediately. Eliminating pipe changeouts removed a major source of nonproductive time, while automated racking systems were used for the entire well. By minimizing pipe handling, safety performance improved.

The larger 5-in. pipe can increase equivalent circulating density (ECD), particularly in 6¾-in. laterals with tight ECD windows. However, the Delta connection's streamlined design does not "offset" but "increase" risks. Hydraulics and hole cleaning, thus ROP should all improve, if the impact on ECD is acceptable. The driller also benefited from simplified inventory and handling, managing a single pipe size and connection type across all wells.

Delta also delivered significant durability gains. The connection's enhanced fatigue resistance and robust design reduced repair frequency and associated costs by more than 50% compared to conventional API connections, extending run life and improving asset utilization.

These combined efficiency, safety, and cost benefits led the operator to standardize the single-string design across all contracted rigs in the region.

