

The Gulf of Mexico's First 20K Completion Tubulars



Challenge

Starting in 2009, McMoRan drilled two successful subsalt wells in the Davy Jones field. The Davy Jones No. 1 well logged 200 ft of pay in multiple Wilcox sands deposited during the late Paleocene. The Davy Jones offset appraisal well (Davy Jones No. 2), which is located 2.5 miles southwest of Davy Jones No. 1, confirmed 120 ft of pay in multiple Wilcox sands, indicating continuity across the major structural features of the Davy Jones prospect. These below-salt potential pay zones were at depths of 25,000-30,000 feet. Reservoir temperatures exceeding 440 degrees Fahrenheit and required tools and equipment purpose-engineered to take the heat and the bottom-hole pressure of $\pm 27,000$ psi. This project resulted in the development of several serial number one completion tools including the development of three new workstrings.

Workstrings International's Solution

In early 2011 Workstrings International began participating with NOV Grant Prideco to design, develop, and qualify three new specialty completion workstrings to meet the needs of the Davy Jones No.1 and Davy Jones No. 2 deep gas completions. Due to severe nature of these wells combined with the recent Deepwater Horizon Macondo blowout the project was very high profile and under the scrutiny of all involved.

The new connection designs were based on the CTM connection which was used on existing Workstrings completion pipe. CTM connection is a rotary-shouldered connection that incorporates high-strength tool joints and gas-tight, metal-to-metal, radial seals. However, the existing CTM designs were rated to 15,000 psi internal pressure and 10,000 psi external pressure. The new designs would require an internal pressure rating of 25,000 psi and the tight casing clearances of the Davy Jones No.1 well limited the connection outside diameters.

The 4" CTM39 and the 2 7/8" CTM26 designs qualified using extensive finite element analysis (FEA) and physical testing. Test samples were manufactured to tolerance extremes to the worst-case conditions. The connections were subjected to a combined load test per the requirements of a modified ISO 13679 CAL II Series A with no external pressure testing. The maximum pressure was capped at 27,500 psi (25,000 psi plus 10% additional pressure) and the maximum compression was 10% of the connection's tension capacity. The test also included 100 makeups and breakouts at maximum recommended make-up torque. These are believed to be the first rotary-shouldered connections qualified for 25,000 psi internal pressure service.

Due to the small diameter of the lower casing string in the Davy Jones No. 1 well, the 2-3/8" MW20 was designed with an outside diameter of only 2-1/2". MW20 is the smallest rotary-shouldered connection ever made and is even smaller than existing tubing connections that are typically used for workstring applications. MW20 was also qualified with extensive FEA and physical testing including 40 makeups and breakouts at maximum recommended make-up torque and a torque to yield test. Since the MW20 does not have a metal-to-metal seal it does not have a formal pressure rating. Like typical drilling connections, MW20 relies on the external torque shoulder for sealing. However, the connection qualification did include a combined load tension-pressure test (10,000 psi) to provide information to the operator.

In addition to the pipe Workstrings worked closely with McMoRan to design and build over 320 accessory items including crossovers, pup joints, lift nubbins, pump-in subs, and other specialty items to successfully run the above pipe and interface with all the other 3rd party tool companies that would design and run equipment on the Davy Jones and subsequent projects.

Results

McMoRan used these workstrings for completions on the following wells:

- Davy Jones #1 (SMI 230)
- Davy Jones #2 (SMI 234)
- SMI 217
- El 26 #2
- Jeanerette Minerals #1

Although the completions of the Davy Jones wells were not commercial, these specialty strings performed as designed.

Workstrings owns and maintains 31,000' of 4" CTM39, 40,000' of CTM26 and 15,000' of MW20 and these workstrings have continued to be used on subsequent projects.

In today's GoM deepwater completion environment, the 5-7/8 CTM57R connection is the industry's connection of choice and is OEM rated to 20,000 psi. Workstrings owns over 200,000 feet of CTM57R assets.

Workstrings International

Workstrings International is the leading rental provider of high-quality, high-specification downhole tubulars and accessories in the world including drilling landing strings, completion landing strings, intervention risers, and specialty tubulars.

Workstrings International operates globally in 40 locations and provides value-added engineering services and operational support while maintaining the industry's highest health, safety and environmental standards.

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