



RISER & DRILLING SYSTEMS

Merlin™ Marine Drilling Riser

Introduction

Oil States Industries is a world leader in the design and manufacture of advanced connection systems for offshore applications. Our connectors provide fast make-up and high performance, ideal for risers, SCRs, TLPs, tethers, conductors, casing, new and replacement caissons, HP risers, pipelines and jacket piles. Oil States is a proven provider of riser components for deep water, production, drilling and completion risers. We also offer comprehensive riser system design services for completion, drilling, subsea and surface equipment to complement our field-proven connector technologies.

Connector Design

The Merlin™ connector has been designed and manufactured to meet a range of static, dynamic, fatigue and pressure loads. A two-part connector with no moving parts, Merlin™ is an elegant & economical solution for fast tubular make-up, with no requirement for bolts and dogs. The Merlin™ is a preloaded connector that uses a series of non-helical teeth; its geometry is designed on Poka-Yoke principals which ensures the connector cannot be mismade.

Being non-helical, the connector cannot back-off whilst in service. With a hands-free make & break spider, the connector has been designed to safely run 10 to 12 joints per hour.

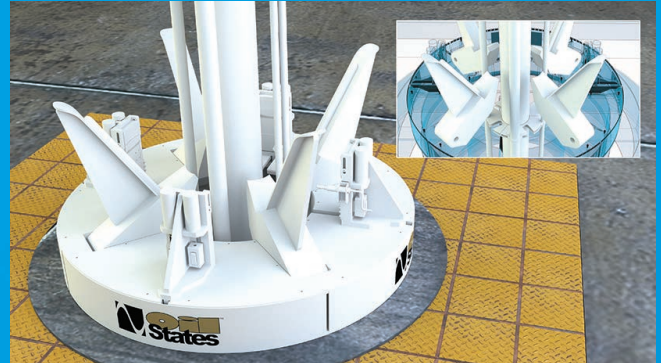
Riser Design

Oil States can supply the Ø19.25" ID x 1.0" WT and Ø19.25" ID x 1.125" WT joints to suit the Merlin™ Marine Drilling Riser system (MMDR). All joints are grade X80 (80ksi NACE compliant material) and can be supplied with Thermal Spray Aluminium (TSA) coating.

TSA coating offers up to 30 years corrosion protection, or the standard three-part epoxy coating.

Automated Spider

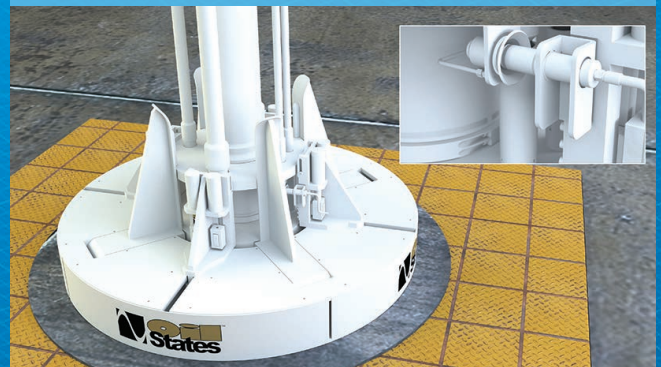
For increased safety and high performance, Oil States offers an automated spider. The system is controlled from the tool pushers' cabin, therefore removing personnel from the red zone and reducing risk of injury. The spider ensures that the joints are correctly aligned prior to stabbing therefore reducing the potential for aux line damage. Once the joint has been made, the clamp reverse pushes with pre-set load confirming the joint is correctly made-up. Automation of the spider allows a run/pull speed of ten to twelve joints per hour.



Running of MMDR



Land off



Riser Make-up





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Automated Spider Features

- Gimballed or non-gimballed auto-spider options
- No dogs required
- No bolts or threaded inserts required

The MMDR system can be upgraded by using high yield materials for the main riser barrel, choke, kill and booster lines. This option can yield up to 20% reduction in overall riser joint weight (dry). By reducing the weight of the riser string, the total number of buoyancy modules and system uplift requirement is reduced. Further reduced system weight may also lead to superstructure economies.

The riser system is designed and tested to comply with:

- API 16C, API 16F, API RP 16Q, API 16R, NACE MR0175, ABS CDS, DNVGL OS E101

MMDR System Features

- Preloaded connection
- 1.5 to 4.5 million lbs tension rating options
- Suitable for 20Ksi C&K lines
- Non-helical tooth profile
- Non-rotational make & break
- Cannot back-off
- Load sharing
- High yield low weight options
- Safe automated hands-free make & break

Load Sharing

Oil States offers a unique load sharing option that improves load sharing performance during temperature cycling of the riser barrel and aux lines. Load sharing allows an engineered reduction of the main barrel wall thickness and therefore weight reduction of the riser joint and the full system.

The bearing is assembled between the choke & kill box connector and the flange plate at the merlin pin end of the MMDR joint. The result is that any tension applied to

the riser is transferred between the main barrel and the choke & kill lines by placing the bearing into a compressive state.

The bearing has been designed to be pre-loaded once the joints are made-up during running, allowing for movement in the lines during temperature cycles at low tensions, and also allowing for progressive application of the load from the main barrel to the choke & kill lines, avoiding undesired sudden and full application of the tensile load to the lines.

The bearing response is non-linear and has been designed so that the initial movement in the bearing requires relatively low loads. Once the desired initial movement in the bearing has been reached, the stiffness increases, allowing much higher loads to transfer through the bearing, with lower deflections.

The bearing is currently designed for load sharing 1,000 kips through each choke & kill line, and 2,000 kips through the main barrel.

Telescopic Joint

The Oil States Telescopic Joint is supplied complete with our twin element Hydro-mechanical Packer System and includes packer element wear indicators, which provide a 3-stage indication of the element's wear condition. This wear indication helps to plan the replacement of the TJ sealing element at a time that suits the drilling programme.

Oil States' pull-in bridle hands-free gooseneck system offers cost effective robust hands-free stabbing of Aux lines. Removing man riding op's improves safety, removes operator fatigue and increases the weather window for aux line stab and retrieve.



Oil States' load share bearing

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