RISER & DRILLING PRODUCTS

Marine Drilling Riser System

Oil States Industries (UK) Ltd. is a world-leading manufacturer of advanced connection systems for offshore tubulars. Our connectors are fast make-up, high-performance connection systems ideal for SCRs, TLPS, tethers, conductors, casing, new and replacement caissons, HP risers, pipelines and jacket piles. We're a proven provider of riser components for deep water, production, drilling and completion riser and we offer comprehensive riser system design services, completion, drilling, subsea and surface equipment to complement our trusted worldwide field proven connector technology.

MARINE DRILLING RISER SYSTEM (MDRS)

A Marine Drilling Riser System is a temporary extension of the wellbore to the surface, i.e. the connection between the subsea BOP stack to a floating surface rig, facilitating mud returns to the surface.

Oil States has designed and developed the Marine Drilling Riser System, connecting the drill floor to the subsea wellhead. The subsea well is drilled through the riser string, allowing the drilling mud to circulate back to the rig. Risers are supplied with a selection of auxiliary lines such as, choke, kill, booster and hydraulic lines with maximum working pressures up to 20 Ksi.

Risers can be supplied either slick or with Buoyancy modules installed.

The risers can be supplied in effective lengths of 5 feet up to 90 feet.

The Oil States MDRS is made up of the following components:-

Diverter System: during drilling operation, the diverter system is used to protect against shallow gas kicks. If there is a shallow gas kick, the Oil States diverter is energized to seal around the drill pipe and divert the gas safely through one of the overboard lines, depending on the wind directions. Our diverter systems are easy for use on the rigs and provide long service life.

Termination Joint: functions as an attachment point for the auxiliary line gooseneck terminations. It provides termination from the hard piping on the riser below to the flexible hoses required to accommodate the relative motions between the riser and the vessel.

Tension Rings: tension rings attach to the telescopic joints and form termination points between the riser system and the tensioning system on a floating rig. They are used to pull and support tension to give the riser string more stability.

Telescopic Joint (TJ): the telescopic consists of inner and outer barrel, packer housing, barrel latch, tensioner ring and auxiliary lines. The TJ compensates for heave and offset of the vessel and is available together with the riser system. This compensating movement is achieved through the stroking of the inner and the outer barrel of the telescopic joint. To remove the need for rope riding operations and the associated risks, a range of hydraulic latch and auxiliary line remote connection solutions are available.

Packer Housing: a total of 12 OR-6C dogs secure the API 16F qualified hydro-mechanical packer housing to the Telescopic Joint. Both upper and lower packers benefit from Packer Wear Indicators. These features enable live monitoring of packer condition, providing predictable packer change out with fast and easy access to the packer elements.

Packer Elements: are qualified to API 16F and are mechanically energised.

Testing has shown Oil States' bespoke material compound offers a life cycle that far exceeds the industry standard. Elements are available in solid or split variations.

Retrofit Packer Elements: Oil States has a number of retrofit options available for existing standard TJs.
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Riser Joints/Connection: Oil States offers a range API 16R classified 21” Marine Drilling Riser couplings; OR-6C, OR-21 and OR-F, with rated tensions from 1 million to 2.5 million lbf. Each offers a fatigue resistant pre-loaded connection with the ability to carry external Choke Kill, Booster and Hydraulic lines.

Flexible Joints: Oil States is a pioneer in the design and supply of Flex Joints, which offer 360 degrees of flexing movement. They are a flexible, frictionless, maintenance free alternative to the standard ball joint. The different types available are Diverter Flex Joint, Intermediate Flex Joint and Subsea Flex Joint, as described below:-

Diverter Flexible Joint: the Diverter Flexible Joint is installed at the top of the riser below the diverter housing where it will encounter significant compression. It is capable of free angular rotation of 115°, up to 4,000 kips tension and 500 psi maximum pressure. The Diverter Flexible Joint is available in different configurations, based on the maximum working tension requirements. The Diverter II Flexible Joint contains two flex elements (double-ended) for applications requiring rotation at both ends. Each flex element comprises a primary and secondary flex element. The Diverter III Flexible Joint utilizes one flex element for situations with one fixed end and the other subject to rotation.

<table>
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<th>Subsea</th>
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<tr>
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Gimbal Bearing: proven through more than 25 years of offshore application, the Oil States Gimbal Bearing is designed to absorb loads imposed on the spider/riser due to vessel motion. It is installed directly between the spider and the rotary table and is composed of two halves, each housing three or four flex elements depending on the Gimbal Bearing diameter size. These Gimbal Bearings are available in 49.5", 60", and 75" I.D. sizes. The flexible bearings are made of high-grade steel and nitrile elastomer for durability and long service life under harsh conditions.

Subsea Connector: the Lynx-Grip™ family of Connectors are designed to be simple and reliable. Hydraulic cylinders are connected to a cam ring which pull down to lock dog segments onto the Well Head profile.

Intermediate Flexible Joint: the Intermediate Flexible Joint is a double-ended version of the Subsea Flexible Joint designed for installation below the telescopic joint. It has the capacity to handle rotation angles up to 120°, axial tension up to 4,000 kips and pressure up to 3,000 psi. When necessary it can also withstand extreme compression loading with limited rotation through metal-to-metal contact of its internal elements.

<table>
<thead>
<tr>
<th>Intermediate</th>
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<td>Max. Operating Pressure (psi)</td>
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