



RISER & DRILLING SYSTEMS

# Managed Pressure Drilling



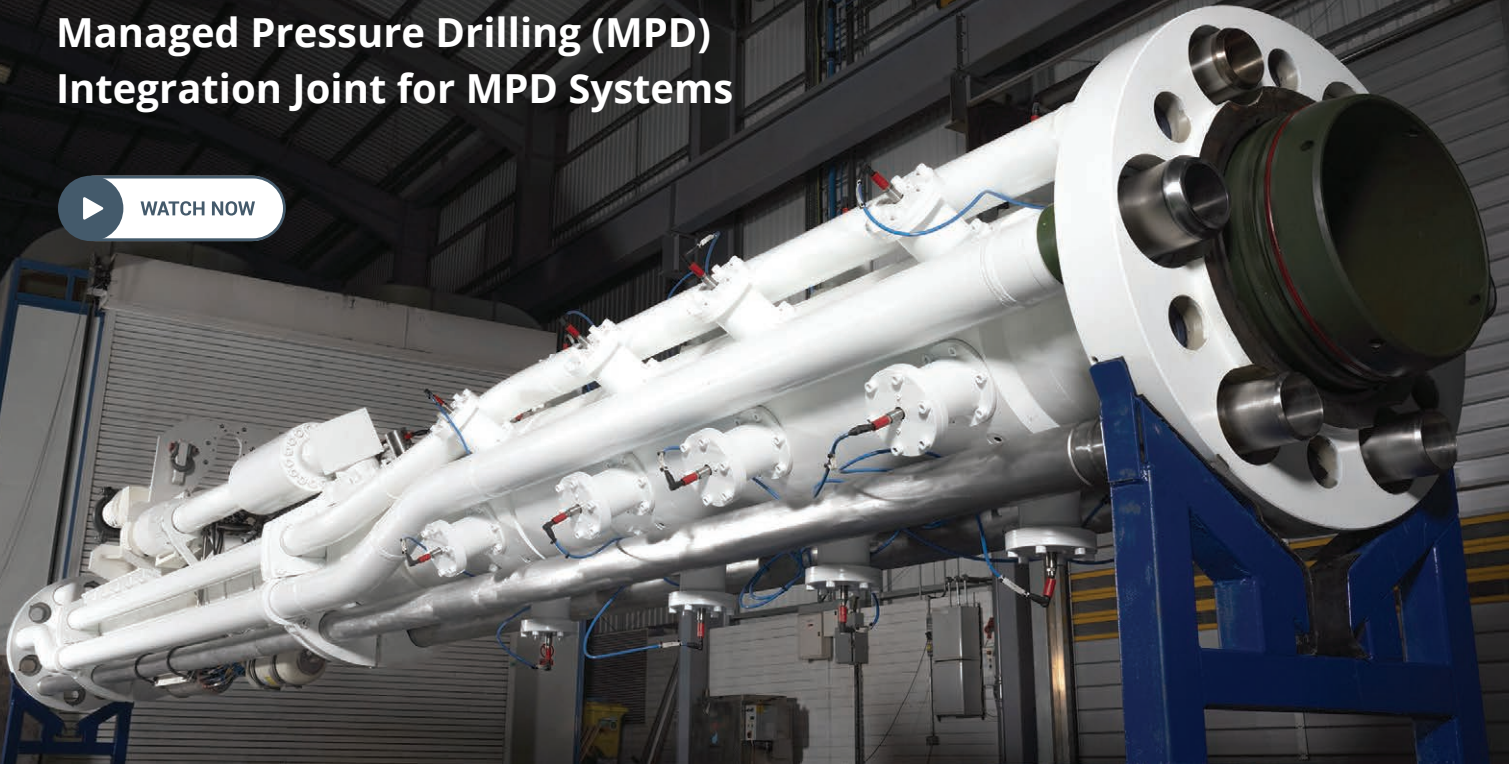


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# Managed Pressure Drilling

## Managed Pressure Drilling (MPD) Integration Joint for MPD Systems

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*Managed Pressure Drilling System (IRJ photographed without protection)*

Working alongside drilling contractors and operators, Oil States has gained a full understanding of their requirements and developed a product that addresses today's market needs.

Oil States' Integration Joint is lighter, more compact, easier to handle, and simpler to run and maintain than existing systems in the market. It offers a unique retrievable stripper sealing system in place of the large spherical strippers used on conventional MPD systems. The stripper packers can be retrieved to the surface through the telescopic joint without the need to pull the full integration joint, creating significant time and cost savings. The stripper packer elements have been designed using Oil States' vast experience in designing, manufacturing and testing elastomeric products.

The rotating control device (RCD) bearing assembly can be retrieved independently or collectively with the stripper packers. This reduces nonproductive time (NPT) and unnecessary trips. The RCD bearing assembly offers enhanced bearing and seal life and has been developed using established industry experts.

This Integration Joint allows the auxiliary lines to be simplified and reduces the need for crossovers. Oil States also offers a range of riser coupling designs rated to meet the needs of deepwater drilling risers and existing riser systems.

The unique hands-free pull-in bridle offers a simplified and effective solution for remote make-up of flow lines and the umbilical in one operation. This can be adapted to existing vessels without adding complex structures in the moon pool.

### **Slimline MPD Integration Joint**

For operators with older vessels that have smaller rotary diameters, Oil States also offers the Slimline MPD Integration Joint which is capable of fitting through a 49.5-inch rotary. This enables operators to both expand the range of vessels available for use and reduce fuel costs by using older vessels suitable for mooring.

### **Topside Equipment**

The MPD Integration Joint is packaged together with a set of topside equipment, which includes an umbilical, an umbilical reeler and a hydraulic power unit. The umbilical passes down through the vessel and terminates at the Integration Joint. When paired with the Integration Joint, these controls help operators achieve higher operational availability, greater reliability and safety, and minimal NPT.



## Electro-Flow Controls

Field-proven Electro-Flow Controls (EFC) are now available with Oil States equipment. EFC's progressive mechatronic solutions have been relied upon in drilling and well control applications for more than 30 years, and have advanced hydraulic and electric controls for deepwater MPD since 2011.

EFC controls enable operators to remain competitive in today's global environment, providing the highest operational availability, reliability and safety while minimizing NPT.

Controls engineering services include PLC controls, software development, structural fabrications, hydraulic and pneumatic circuit design, safety-reliability-failure mode analysis, hazardous area expertise, installation and commissioning. Each system is strategically developed to meet operators' unique needs.

EFC has provided more 30 control system solutions for all MPD/RGH equipment, including:

- Hydraulic power units and accumulators
- Hydraulic control skids/panels
- Pressure relief valve control systems
- Ups (uninterruptable power supplies)
- PLC control systems
- Manifold actuator controls (hydraulic or electric)
- Controls for direct integration to drilling or service providers
- Reelers and umbilicals
- Umbilical stab plate terminations
- IRJ (integrated riser joint) equipment fit out

## Compliance

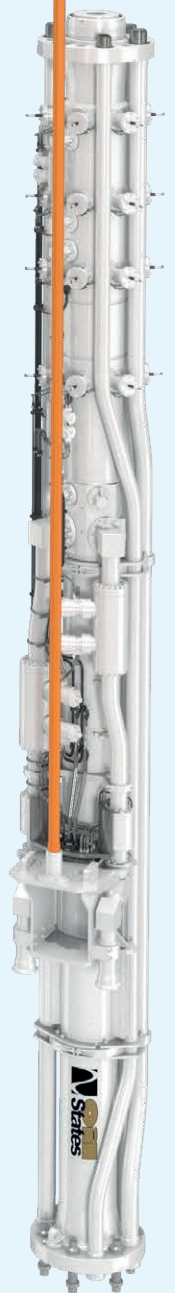
- API 16D (BOP & Diverter Control)
- DNV OS E101 (Drilling Plant)
- ABS-CDS (Certification of Drilling Systems)
- ATEX & IECEx (Hazardous Area)
- CE Marking (EU Machinery Directive)
- NORSOK
- FMECA Studies Undertaken

## Maintainability

- Individually serviceable hydraulic valves (manifold mounted)
- Individually serviceable instrumentation (pressure transmitters etc.)
- Internal maintenance 'corridor' within skid designs
- Instrument fault indication
- Condition monitoring

## Configurations

- Integrated reeler with annular, RCD and flowspool controls
- HPU with integrated manifold controls
- Accumulator banks
- Modular components:
  - User interface (control panels, HMIs)
  - HPU skid
  - Accumulator skid with surface manifold controls
  - Umbilical reeler (with annular/RCD/flowspool controls)
  - Subsea umbilical termination



## Design Features

- Retrievable RCD bearing assembly
- Retrievable stripper packers
- Hands-free pull-in bridle for flow line make-up
- Integral hard-pipe bleed and equalisation lines
- Pressure and temperature sensors
- Tension rating from 3,500 kips and beyond
- Full integration to existing riser string
- 40-ft long, 18,000-kg design weight
- 2,000-psi rated bore pressure

## Benefits

- RCD and stripper packers can be retrieved without pulling the joint, allowing ease of replacement/maintenance
- RCD utilizes new sealing technology and tighter control of run-out to enhance performance and life of the bearing assembly
- Dual stripper packers can be replaced independently, offering operational time savings and flexibility when stripping drill pipe
- Integration Joint outside diameter is substantially reduced due to packer design

- Flow lines can be connected/disconnected completely hands-free, removing the need for man riding operations
- Flow lines can be shorter due to the compact nature of the Integration Joint and higher position of the flow spool
- Integration Joint provides a direct interface to existing riser connections and auxiliary line configurations, which simplifies interfaces and make-up time without affecting riser auxiliary lines
- Substantially lighter and shorter than current designs on the market for ease of handling and all-around safer operations

## Testing

- RCD qualification testing exceeds API 16RCD
- Stripper packer testing includes a range of static and dynamic stripping tests

## Standards

- API 16RCD
- API 16F
- API 16C
- API 16A

## OIL STATES INDUSTRIES RISER & DRILLING SYSTEMS

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