Improving UPTIME for Drilling Rigs

Why Modular Control Systems Make Sense

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Reliability

In general, **reliability** (systemic def.) is the ability of a person or system to perform and maintain its functions in routine circumstances, as well as hostile or unexpected circumstances.

In our world, KEEP DRILLING!
Keeping a Rig Drilling

1. Use the most reliable, field proven components available

2. Predict if a component needs replacement

3. Make the replacement without stopping
Reliability of Components

- Reliability of Components has been the focus
  
  Improvements made on PBOF connections, Valves, etc.

- Products from other similar industries should be used
  
  Production systems, Aerospace materials, Aircraft

- Taking reliability from 99% to 99.99% is extremely costly
  
  All mechanical devices will wear

- System Reliability is dependent upon various factors
  
  Maintenance timing, assembly, fluid cleanliness, design, ease of replacement, redundancy
Predicting Component Maintenance

- The system must have the ability to monitor itself
- Additional sensors must be installed to obtain data
- Software must be capable of analyzing the data and sending notices to operator in real time
- Costly, sometimes impossible to add to existing system
- Must be incorporated at the onset of system design
Predictability

Compact Packaging Design

Subsea Proven Solenoids from Aircraft Industry

Additional Pressure Sensors
Real Time Prognostics

Making your maintenance effective

- MODSYS® has real time monitoring on
  - solenoid electronics
  - hydraulic output of solenoids
  - hydraulic output of DCV and Regulators
- MODSYS® has real time trending to identify component degradation before failure
Contributions to Downtime

- Improper Assembly
- Ineffective Maintenance
- Time to Retrieve the Subsea equipment
- Time to Troubleshoot
- Repair Time on Deck
- Time to Test System
- Time to Run Equipment Subsea
Reducing Down Time

A Modular System

Reduces the time to retrieve equipment for repair

- Current systems require the LMRP to be retrieved should there be a component failure
  - Can take 3-7 days
  - At rates of $500,000/day
  - 1trip = $3,500,000 runtime

- MODSYS® allows an ROV to descend with a replacement Module, Install it and Operate
  - Can take 4-8 hours
  - At rates of $500,000/day
  - 1trip = As low as $0!

DTC INTERNATIONAL, INC.
The Deeperwater Technology Company®
One Type of Modular System

All Valves, Batteries, Solenoids, Electronics, Filters, Shuttle Valves, etc. are mounted about a central latching mechanism in an ROV retrievable module.
Receptacles for a Modular System

Receptacles for the Modules incorporate alignment features to facilitate reinstallation.

A system would use a receptacle for each module required for control of the subsea equipment.
Mounting the Receptacles

The Receptacles are mounted on the subsea stack, tree or other equipment where needed and the rear of the receptacle is plumbed to the port in the same manner as currently.
Reducing Down Time

A Modular System

*Uses an ROV to retrieve equipment, no need to pull the Stack*

- MODSYS® Skid Mounts under Work Class ROV of Opportunity
- Neutral buoyancy design
- “Hard Docks” prior to exchange operation
- Semi- or Automated sequence for installation and retrieval, once in place
Reduces the time to Troubleshoot and Repair

A Modular System

Reduces the time to Troubleshoot and Repair

Current systems require repair work to take place on the deck while the stack waits OR a new pod must be ready.

MODSYS® allows the replacement to be installed and working while the module comes to the surface to be repaired off-line.
Reducing Down Time

A Modular System

Is small enough to be sent back to the OEM for repairs

- MODSYS® modules are 17” in Diameter and 27” Long
- Can be shipped back in a Helicopter
Advantages for Maintenance

- Interchangeability of components
- All Modules are modular

*Individual subassemblies, such as valves and solenoid assemblies can be replaced on the rig and the subassemblies sent back to the shop*
Components are **Field Proven**
- Solenoids
- Directional Control Valve Cartridges
- Electrical Connectors
- Hydraulic Couplings
- Pressure Transducers
- ROV Interfaces

Controls have **Increased Monitoring**
- Trending Analysis for Failure Prediction
- Know exactly where problems arise
- Less Time spent on Maintenance
- Additional Emergency Control
- Time-based valve replacement not necessary
- Service only what needs replacement

All Control Components are **ROV Retrievable**
- Reduces Downtime for Maintenance
- All Repairs are Completed “Off-Line”
Additional Advantages

- No Internal Tubing or Fittings
- Easier Maintenance
- Built-in Expandability and Upgrades
- Reduced Lead Times
- Controls are Located at Subsea Components
- Lighter Weight and Smaller
- Cost Savings
Thank you