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## **Deepwater BOP Control Monitoring—Improving BOP Preventive Maintenance With Control Function Monitoring**

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### **Abstract**

The goal of Blowout Preventer (BOP) preventive maintenance is to reduce downtime due to equipment failures. A corollary issue is the reduction of unnecessary maintenance. This becomes increasingly important as the BOP control system ages or nears its five-year maintenance cycle.

Appropriate / timely proactive BOP maintenance can only be performed when accurate function cycle data is available. As such, an effective BOP preventive maintenance program requires accurate record keeping on all BOP function cycles – during drilling operations as well as during testing. Manual record keeping is generally missing or unreliable.

A system has been developed for (1) automatically monitoring and recording BOP control state changes, (2) transporting the state change data to a database server on shore and (3) analyzing and presenting the BOP information to interested personnel via the web. The system provides a detailed historical record of the BOP status. Using this data the number of valve cycles can be accurately counted and the valve cycle information can be used to estimate when maintenance is required for each valve in the BOP control system.

In addition, the information captured by the system can be used to troubleshoot BOP control issues and as input to evaluate BOP operational procedures.

### **Introduction**

Proper maintenance of a rig's BOP is critical for insuring the safety of offshore drilling operations. In many regions of the world regularly scheduled BOP testing is a regulatory requirement. Unexpected BOP problems or failures can lead to significant downtime [Holand 1997, Holand 1999]. Fixing BOP problems can be extremely expensive, particularly if the problem or failure requires the marine riser and BOP to be round tripped. The various valves contained in a BOP control system and the number of times they are cycled is a significant factor affecting BOP reliability [Shanks 2003].

New technologies can be used to continuously and accurately monitor BOP operations over time. Having accurate historical information on BOP operations, valve cycles and pressures can lead to more proactive BOP maintenance programs. Better maintenance can, in turn, result in safer operations and reduced costs.

Over the years a number of new technologies have been integrated into offshore drilling programs. In most cases these technologies have resulted in improved operations and reduced expense. In many cases the next step to achieving improved operations and greater cost reductions is to integrate several existing technologies.

This paper describes a system for continuously monitoring a BOP control system. The monitoring system combines several recent technologies: (1) data acquisition technology for continuously monitoring the BOP, (2) database technology for data storage, (3) Internet technology for transferring BOP data to a repository on shore and (4) web technology for turning the BOP data into useful information for operators and contractors. The paper starts with a brief overview of technology