Evaluating Safety Considerations for Deepwater Drilling Technology

■ As the industry pushes the HP/HT threshold, a systematic technology qualification process for deepwater drilling systems is needed.

BY HARISH PATEL, ABS

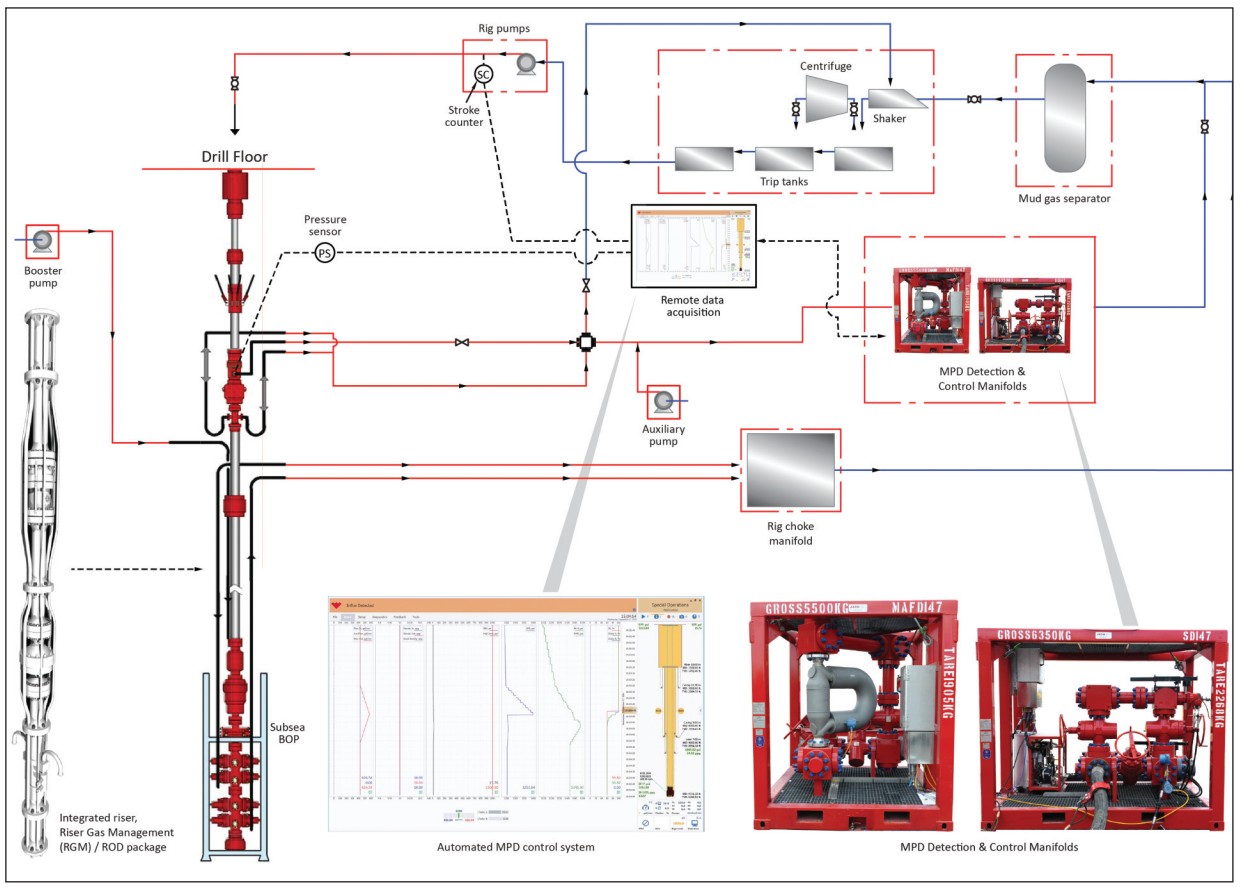
New drilling challenges are manifested with pressure extremes or higher temperatures than ever before required. Failure consequences are so great that the likelihood of once-routine risks must be reduced even further in these new operating environments of extreme depths, temperatures and pressures.

Drilling challenging wells places new demands on existing well control equipment. Systematic technology qualification processes for HP/HT discoveries—those rated at more than 15,000 psi and greater than 121 C (250 F)—must be followed since existing codes and standards have no clear requirements for such extreme operating conditions.

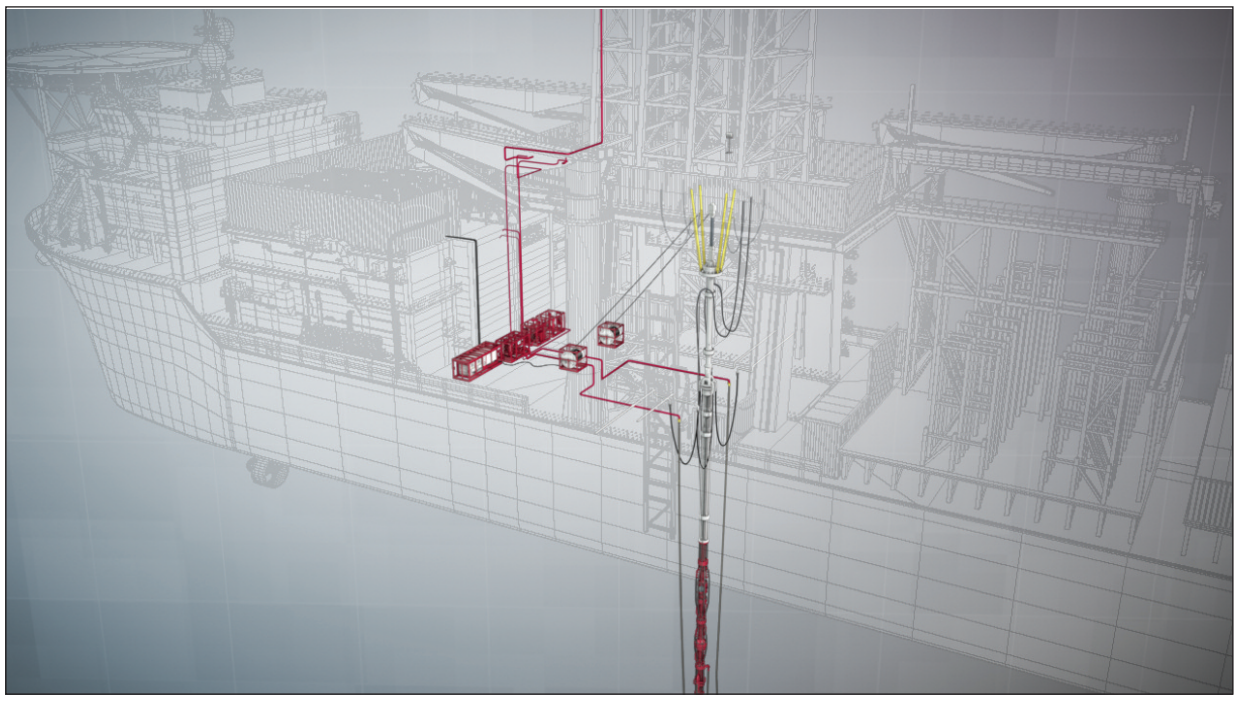
As a technical adviser to the offshore industry, ABS recognizes the need to develop offshore equipment design qualification standards. The company is assisting designers and manufacturers with developing design standards for constructing HP/HT subsea BOP stacks and related systems that may be used safely in 20,000 psi and about 177 C (350 F) load conditions.

Another innovative technology that is significantly impacting planned offshore drilling operations is the managed-pressure drilling (MPD) system, parts of which have been used onshore for about 10 years. MPD techniques have proven cost-effective, reliable and safe when drilling difficult onshore wells as well as when drilling from mobile offshore drilling units (MODUs) with a surface BOP.

Only recently have operators begun viewing MPD as an enabling method in drilling increasingly complex offshore wells from MODUs with subsea BOPs. MPD techniques are being used offshore to drill previously "undrillable" wells and also to enhance a well's primary pressure barrier. Having systematically qualified MPD technologies for various designers and manufacturers, ABS is finalizing requirements that specify certification for MPD systems. These include applied surface pressure systems and dual-gradient drilling (DGD) systems with the associated subsea components for both types of MPD systems.



A typical equipment schematic for offshore MPD with a subsea BOP is shown. (Images courtesy of Weatherford)



Based on actual offshore experiences and knowledge gained in recent years working with MPD designers and developers, ABS has developed sets of requirements for offshore MPD that are now being incorporated into the ABS CDS Guide.

Updating requirements to reflect MPD

The primary function of any MPD system is to contain wellbore pressures in a controlled flow system within the well's pressure-design "envelope," while providing both a means of adding fluids to the wellbore and allowing controlled volumes to be removed from the wellbore. The requirements will be applicable to any offshore drilling operations where the primary barrier maintains a state of constant overbalance, actively managing pressure in the well by using one or more of several technologies.

Because the overall MPD system and all of its subsystems will be considered a part of the primary well pressure barrier system, for any ABS-classed rigs all associated components used in MPD operations will require ABS design approval and an ABS survey for installation.

Classification services will be delivered in accordance with new ABS requirements currently being developed for the design, construction and commissioning of MPD systems, subsystems and components. These new criteria will be published in 2015 as an appendix to the *ABS Guide for Classification of Drilling Systems* (CDS Guide).

Applying new technology offshore

When any new technology is proposed for application in any drilling operation, it requires a systematic qualification process by both validation and verification. Qualification is the process of validation and verification that the technology will function safely within specified limits.

Applying MPD systems offshore requires careful consideration with regard to both equipment and system designs as well as any operational, maintenance and safety issues. Specifically, this will include the inherent risks associated with offshore drilling practices, ultradeepwater drilling rig configuration and systems integration with any new technology being evaluated.

In some cases, no specific requirements may exist for the proposed application of a new technology, which was the case when installing the world's first fully integrated DGD system on the *Pacific Santa Ana* ultradeepwater drillship now working for Chevron in the Gulf of Mexico. As certified verification agent for this industry-first project, ABS performed the safety reviews and worked closely with the U.S. Coast Guard and Bureau of Safety and Environmental Enforcement to certify the MPD technology.

Validation and verification of proposed innovative technology by an independent third party, such as a classification society, facilitates compliance with applicable rules' intent and requirements for drilling on the U.S. Outer Continental Shelf and other environmentally sensitive offshore areas.

The objective for design verification is to confirm that the HP/HT equipment design is in compliance with its functional specification and the equipment has adequate protection against failure modes identified for HP/HT equipment. The design validation process is required to demonstrate that the equipment maintains the mechanical integrity and functionality/operability to its functional specifications.

As operators seek ways to increase safety and reliability in the offshore drilling process while continuing to economically develop previously unreachable offshore reservoirs, class societies can assist the industry with understanding the safety aspects and the core steps needed to apply new or adapted technologies in challenging operating environments.

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