

## High-pressure/high-temperature technology comes of age

**H**P/HT technology is a reality. When the oil and gas industry discovered oil fields a few years ago where the pressure and/or temperature exceeded the maximum threshold allowed by existing standards, field development was put on hold due to lack of existing equipment suitable to operate under those conditions. To address the limitations of these standards, the industry has mobilized to create new technology that will enable the exploration and production of such fields.

The complexity of the application required strong partnerships. Operators engaged equipment manufacturers, subject matter experts, drilling contractors, design firms, testing laboratories, and international suppliers of parts and components to advance the new wave of technological evolution. Independent third parties have been engaged to verify design and construction and have qualified the technology to operate in a HP/HT environment.

These new boundaries have also called the attention of standards development organizations, who quickly reacted to establish standards and requirements to be followed by the industry. Work groups and committees have been formed to discuss requirements to address the novel technology.

Acknowledging that the HP/HT environment demanded new technology where no regulatory provisions existed, regulatory agencies also had to quickly react and develop requirements to determine the suitability of the newly developed equipment and to facilitate its acceptance for the application. Brand new qualification acceptance processes have been created and implemented based on the technical opinion of qualified independent subject matter experts from competent industry organizations.

To accommodate the industry needs and regulatory requirements, design has been created, loading and fatigue have been evaluated, analyses have been carried out, and failure modes have been exhaustively discussed and mapped out. Materials have been specified considering fluid chemistry and subsea conditions, and have been tested under different environments. Prototypes have been built and submitted to stringent pressure and fatigue tests, which have been successfully carried out. The technology development phase is mostly complete, as so is the technology qualification process.

The next step is to start producing the equipment that will go into the water and connected to the well. However, standards are still evolving and technical requirements are still maturing. Field development schedules demand that the industry move forward into the next phase of product realization. As such, the production of the HP/HT equipment will need to be based primarily on the principles established during the technology qualification phase. The challenge is then evident: measures need to be put in place to verify that the equipment is manufactured and tested based on those principles.

While industry is quickly moving toward setting appropriate standards for the HP/HT application, a process must be put in place to govern the certification of the equipment being produced for real-life application. This is not a geography-specific issue: it is a global challenge reaching all areas where discoveries exceed the current limits of pressure and temperature.

In addition, due to the physical similarity with existing equipment while using different materials and specific design and construction details, a tracking mechanism is needed to ensure the components and assemblies have been certified and are suitable for the application.

To verify that the product realization results in an equipment that meets pre-determined parameters and criteria, the certification process must be tailored to accommodate the global reach of the application of the technology and maintain track of the product through its lifecycle.

A proper product realization management process must account for a management system that maintains current equipment information and is accessible to manufacturers, equipment owners, users, as well as other stakeholders who one way or the other need access to the technology. It must also be maintained by competent entities with qualified technical personnel to ensure technical aspects of the equipment being produced meet strict parameters for optimal performance.

To be successful, the management system must be maintained by independent entities to ensure proper execution and transparency. Competency, independence, availability and reliability are some of the fundamental characteristics required for the entities driving the management system.

Because they are independent and have a global footprint, classification societies are in a unique position to respond to this challenge. With technological capabilities and skilled team of engineers and surveyors, these entities count on the experience with management processes typically used for the classification activities.

The engagement of classification societies in developing and implementing a management system will address the global needs of the industry, regardless of where the manufacturers are located or where operations are taking place. A classification society-run management system provides a platform to support the certification and incorporation of key safety principles in the application of the vast variety of equipment, assemblies and components used in the oil and gas activities around the world.

The utmost goal of the industry is to operate safely, and this is directly dependent on the use of proper equipment that is designed and built with safety in mind. As the equipment will shortly move into the production phase, classification societies will be prepared to manage the certification of equipment and components. This will go a long way toward addressing the industry's need to facilitate a safe production of highly technological equipment, so that it can safely operate in the challenging HP/HT environment.

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This page reflects viewpoints on the political, economic, cultural, technological, and environmental issues that shape the future of the petroleum industry. Offshore Magazine invites you to share your thoughts. Email your Beyond the Horizon manuscript to David Paganie at davidp@pennwell.com.

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