Asset Integrity

Stakeholders must understand, share asset integrity responsibilities, Dutch regulators say

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Editor's note: This is the final article in our series focusing on the critical issue of asset integrity. First, the International Regulators Forum presented findings from a three-year inspection programme. Then, the Petroleum Safety Authority Norway and the UK Health and Safety Executive discussed life extension for mobile offshore units. Australia’s National Offshore Petroleum Safety Authority also provided an overview of its Facility Integrity National Programme. Here, the Netherlands’ State Supervision of Mines offers its “helicopter view” of critical asset integrity issues.

At the December 2007 International Regulators’ Offshore Safety Conference, regulators and industry representatives discussed management practices critical to maintaining the asset integrity of offshore oil and gas facilities worldwide. The reason was that the average age of the industry infrastructure is increasing. This is not only the case for fixed production installations but also for the current aging drilling fleet.

In the case of a MODU, asset management encompasses hull and main rig structure, safety critical devices, lifesaving appliances and third-party equipment. Throughout their life cycle, rigs are exposed to corrosion, fatigue, wear and tear, degradation, accidental damage, extreme weather conditions, geotechnical/geological hazards and modifications in technology or use. These exposures underline the importance of effective asset integrity management.

During the conference, a sense of urgency was felt by all stakeholders comparable with that seen in the post-Cullen era. The stakeholders, involved in assuring asset integrity, are rig owners, classification societies, operators and service contractors.

INTRODUCTION

The IRF defines asset integrity as the ability of the asset to perform its required function effectively and efficiently throughout its lifecycle whilst safeguarding life and environment. Managing asset integrity means going through the process of knowing:

• About the design and safe operation of all plant, equipment and systems;
• What can go wrong;
• That effective measures are in place to prevent and control undesired events;
• Whether personnel are trained and competent;
• That monitoring, inspection and auditing arrangements will verify that the desired outcome is achieved.

Clearly, the outcome of this process is meeting certain performance standards for effective control of risks, supported by effective management systems.

Overall asset integrity can be subdivided into three categories:

1. Design integrity: assurance that facilities are designed in accordance with governing standards and meet specified operating requirements;
2. Technical integrity: appropriate work processes for inspection and maintenance systems and data management to keep the operations available;
3. Operational integrity: appropriate knowledge, experience, manning, competence and decision-making data to operate the plant as intended throughout its lifecycle.

Adequate and coherent management of all three categories will result in safe processes, thereby securing overall asset integrity.

A HELICOPTER VIEW

In 2008, the State Supervision of Mines (SSM) carried out a survey amongst the key stakeholders involved in assuring asset integrity in the Dutch offshore drilling sector. Drilling operations on the relatively shallow Dutch continental shelf are carried out solely by jackup drilling units of international drilling contractors. The survey contained a gap and interface analysis.

Building on SSM’s experience in this area, the following resulting helicopter view was perceived.

DESIGN INTEGRITY

Design integrity is governed by a classification system that entails design and construction requirements. This system is embedded in the rules of the classification societies and the requirements of the Flag and Coastal State.

Verification of compliance with classification is a crucial element in the management of asset integrity. The verification is carried out by classification societies that are involved in the rig’s integrity management from the design stage onwards. Classification societies verify whether required rules and standards are being implemented, observed and maintained according to the verification scheme.
Still, it is of course the rig owner’s responsibility that the rig complies with the rules and standards at all times. Therefore, timely execution of essential verifications according to the scheme is paramount. Being consistent is a safeguard to assure asset integrity objectives. Challenges arise when this consistency is jeopardized by operational pressure, thus compromising the validity of the certificate of fitness.

A challenge for rig owners arises when modifications are planned and executed on the rig. For example, in 2006 a serious accident was replicated in Dutch waters because of a non-fail-safe link tilt system. Although this unsafe system had led to several accidents in the past and those had been published in various safety alerts worldwide, the drilling industry did not react to prevent similar incidents. Following the 2006 SSM ban on non-fail-safe link tilt systems in Dutch waters, it was noted that adapting new systems proved to be cumbersome.

Further, SSM is alarmed that serious accidents still occur from the use of other non-inherently safe drilling equipment. SSM notes that, for instance, the principles of safety integration, i.e., implementing inherently safe design measures, are still not being applied in the design of something as straightforward as a side door collar-type elevator.

The challenge for the drilling industry is to insist on inherently safe design measures in rig equipment. Reviews in terms of performing full risk analysis and identification of conflicting interfaces are the minimum actions that should be taken. A further challenge is the management of safety critical software integration into existing systems and equipment, using techniques such as Failure Mode and Effects Analysis (FMEA).

**TECHNICAL INTEGRITY**

Driven by the mainly goal-setting Dutch legislation, rig owners are required to have a safety management system in place. Such a system delivers a coordinated and comprehensive set of measures designed to direct and control resources to optimally manage safety. Arrangements for achieving a safe operation are also laid down in IADC’s HSE Case Guideline for Mobile Offshore Drilling Units. The Safety Cases based on that format are recognised by North Sea regulators as recommended good practice.
tures, i.e., legs, hull, jacking system by the use of these management systems. The aforementioned safety management systems prove to be an effective tool to ensure these aspects of asset integrity.

**OPERATIONAL INTEGRITY**

Although it appears that control of both asset design integrity and asset technical integrity is well established through management systems and classification systems, some challenges remain. It appears from the survey that operational asset integrity seems more challenging. In the operational phase, it is not only the rig owner’s responsibility to assure asset integrity, it is also the phase where other stakeholders get involved. Appropriate knowledge, experience, manning, competence and decision-making data to operate the MODU, including presence of third-party equipment, become challenging.

The requirement for third-party equipment is often initiated by the operator. On the other hand, this third-party equipment is often connected to the rig where drilling contractor staff assist in their installation and operation. Proper coordination is the key to ensuring that both operator’s and drilling contractor’s interests are met. In this context, expertise should be shared and exchanged among operator, drilling contractor and third-party staff. A proactive approach by the drilling contractor is vital since the rig is the asset where this equipment is installed, maintained and operated.

One complication is that it is not mandatory for third-party and temporary equipment to be included in verification schemes. This introduces a loop hole in the verification process. That is why a proactive approach towards maintaining asset integrity of third-party equipment on a MODU should be a shared responsibility.

The most important challenge is to assure that sufficient time and resources are continually allocated for carrying out essential inspection and verification of safety critical equipment. For this, there seems to be a conflict between making time available during booming drilling business periods versus making financial resources available during the low-activity periods. Awareness of market forces and cycling rig rates should focus attention on safeguarding asset integrity at all times.

To overcome these cycling effects, consideration should be given to building long-term relationships and subsequent contracts between clients and third parties. This may be appropriate for larger operators, as smaller operators do not have long-term drilling programs. This introduces a challenge for regional and global umbrella organizations, such as IADC, to develop and disseminate recommended guidance on this issue.
The challenge of asset integrity assurance of third-party equipment was already recognised by North Sea authorities in the past. An international working group, established by the North Sea Offshore Authorities Forum (NSOAF), identified challenges in the interfacing of third-party equipment back in 2004. This was revealed after a series of systematic audits carried out on rigs that were active in two or more NSOAF member countries. The theme of the audit was “contract management related to third-party equipment, supervision and training.”

The main findings from that audit in relation to asset integrity aspects of third-party systems, equipment, maintenance and verifications were:

- Drilling contractors to follow up on the maintenance of third-party equipment; however, they rarely verify the quality of the work or witness testing of safety critical equipment (SCE);
- Roles and responsibilities of the drilling contractor and operator regarding maintenance of third-party equipment is not clearly defined and understood on the audited MODUs;
- Operators and drilling contractors do not in most cases verify the maintenance systems used by the third-party service contractors.

**Today’s Challenges**

The main challenges from this survey can be summarised as follows:

- Commitment to facilitate timely execution of the required verification by classification societies.
- Ensuring that inherently safe design measures are included in rig equipment.
- Execution of full risk analysis during the implementation of modifications or adding new systems to existing MODU infrastructure.
- Ensure proper management of safety critical software integration into existing systems and equipment.
- Constant vigilance that sufficient time and resources are allocated to carry out essential inspections and verification during both high and low rig utilisation.
- Eliminate unclear accountability issues between operator and (sub)contractors when working with third-party equipment.

So, one common challenge emerges: interface management. Interface management systematically controls all communications that support the management of the asset integrity process. Given the significance of human involvement in most operations, it is important that interactions between people, representing the stakeholders, be managed and carefully coordinated to avoid degradation of the overall asset integrity.

Interface management is an essential component of effective leadership in any organization. Not only within each individual organisation, but especially between different organisations. In other words, it means not only determining each stakeholder’s own responsibility, but also sharing the responsibility amongst the stakeholders, that is the key in assuring asset integrity of MODUs.

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