

Improving Asset Utilization and Reliability in the Oil and Gas Industry

Abstract

After a golden period of growth, European refineries are in immense crisis as they face a shortage of skilled personnel as most are due to retire soon. To address the challenges in this asset-intensive industry, it is necessary to reduce instances of unanticipated equipment failures and minimize plant downtime. This makes it imperative for O&G executives to prioritize safe and reliable asset performance with continuous proactive monitoring.

Navigating through Limitations

As oil prices plummet, global oil production is more than twice the consumption levels, rising by 2.3%. Regulatory pressures have increased, and decision makers seek to cut losses and adopt sustainable growth strategies. A recent review declared the global refinery utilization rate to be 79.6%, the lowest since 1987. Industry trends reveal the drastic increase in demand for gas fuel, supported largely by the US revolution in shale gas.¹

In a report by the International Labor Organization, nearly four out of five Oil and gas (O&G) enterprises reported a shortage of technical skills, with half the respondents facing a dearth of management skills.²

Nearly a third of the assets in the O&G sector have been in operation for over two decades now, with a majority operating past their expected useful life. Moreover, operations undertaken at extreme temperature and pressure conditions, such as drilling in the Arctic region or at sub-sea levels, or business expansion in heavily populated areas, further strain these assets.

O&G enterprises are also under immense pressure to reduce risks and limit operating costs by adopting technology innovations. To increase their competitive potential, industry players are aggressively pursuing mergers and acquisitions to onboard affordable assets.

Additionally, they are aggressively exploring methods to increase the return on capital employed (ROCE) by assessing four key factors:

1. Capital employed—both in-field assets and working capital
2. Costs incurred—both operating expenses and maintenance expenditure
3. Output levels—driven by availability, reliability, and productivity of oil plants
4. Risks involved—process safety, environment protection plans, and asset integrity.

To improve the ROCE, the cost of maintenance and operations needs to be reduced. However, stringent regulations and industry standards such as HSSE and RoHS, coupled with the need to ensure high asset availability, are driving maintenance and operational costs up. A fine balance is therefore required to realize maximum returns on investment, while avoiding risks and failures and improving asset availability and utilization.

Asset integrity is vital to assess effective asset performance and prevent ageing infrastructure from rapid deterioration. Most O&G enterprises, however, find it challenging to closely monitor IT asset expiry levels and incorporate timely upgrades.

Charting the Way Forward

The machinery in an O&G enterprise experiences a considerable amount of equipment stress and chemical degradation, due to the impact of the different types of fluids involved.

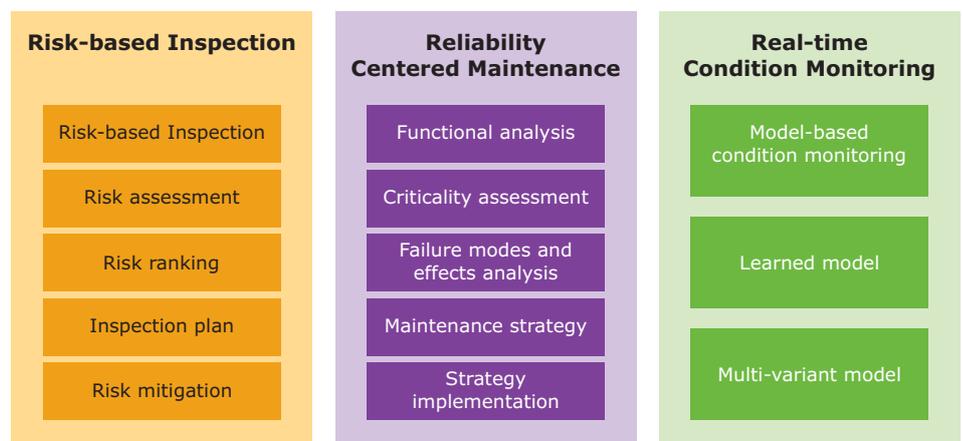
Through enterprise asset management, O&G companies can:

- Enhance operations across the value chain and extend equipment life
- Increase plant productivity by reducing downtime, limiting risks, controlling operating costs, and ensuring compliance with safety and regulatory norms.
- Understand how fluid changes will affect material performance to conduct asset life extension research that incorporates historical performance data.

This facilitates near-accurate prediction of asset life and allows for better equipment design in the future. Materials assessment also helps predict corrosion cracks and coating erosion; corrosion analysis can predict pipeline damage and increase the life of an asset.

The Asset Maintenance Triad

The Asset Maintenance Triad is a three-pronged approach for proactive asset maintenance that comprises risk-based inspection (RBI), reliability-centered maintenance (RCM), and real-time condition monitoring (RTCM).



The Asset Maintenance Triad: RBI, RCM and RTCM (Source: TCS Internal)

- **RBI** is mainly applied in the case of static assets such as heat exchangers, pressure vessels, and piping. It involves laying out an inspection plan driven by knowledge of equipment failure risk. This is a structured approach that includes

Asset management solutions need to offer:

- A risk-proof EAM strategy with criticality evaluation
- Asset management and maintenance policies
- Effective leverage of RBI, RCM, and RTCM
- Resource optimization strategies
- A KPI dashboard

The benefits gained from successful implementation of RTCM are staggering—ConocoPhillips estimates that it can cut drilling costs by US \$250 million annually by analyzing data along the drill line and tweaking drill bits accordingly.³

collecting previous maintenance and inspection data, assessing process flow diagrams, marking material flows, and identifying damage mechanisms and corrosion flows.

- **RCM**, on the other hand, takes into account the current reliability and availability of assets to study failure events and their consequences. Cost-effective maintenance techniques that can minimize failure are then evaluated and adopted to safeguard the health of assets.
- **RTCM** involves round-the-clock monitoring of critical assets to better predict the possibility of failure. It helps accelerate and streamline the information exchanged with responsive incident management systems to enable timely issue resolution. Digital technologies such as Big Data, predictive analytics, machine-to-machine (M2M) interaction, and sensors and control systems are enabling O&G enterprises to manage assets effectively. They help develop a network of 'connected' surface or sub-surface assets that can be tapped for real-time information.

Conclusion

For effective Enterprise Asset Management, O&G enterprises must understand the risks associated with equipment failure, and devise optimal, cost-effective maintenance strategies that deliver real-time, contextual data to all stakeholders.

The RBI-RCM-RTCM triad is undoubtedly the future of asset management. With equipment reliability at its core, RCM advocates the identification of failure scenarios and related impacts, while RTCM monitors equipment health in real-time.

A future-ready asset environment will help cater to changing industry demands, while enabling a transformative performance. O&G enterprises need to focus on establishing a comprehensive asset management framework based on the RBI-RCM-RTCM triad in order to drive significant improvements in their ROCE.

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