

Digitalization of Drilling Rig Workflows with mobile enablement

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Abstract

Oil field services and drilling services companies shall include digitalization of workflows as a key agenda in digital transformation strategy. In absence of ready to deploy COTS SW products to fulfil the needs, companies need to engage appropriate capabilities, choose best suitable enterprise mobility platform and define roadmap for workflow digitalization across different disciplines. Business can possibly lead such initiatives supported by IT department to extract tangible benefits.

Key takeaways



Benefits of workflow Digitalization

- *Improve SOP Compliance*
- *Optimize drilling cost per feet*



Define department wise workflow digitalization roadmap



Enterprise Mobility platforms- will establish foundation for digitalization



Value creation and associated mapping will help to track and measure success

Introduction

Digitalization has become one of the most important battlefields for business innovation. One can attribute this enormous speed of digital adoption to the pandemic. However it is the resilience of Oil & Gas industry that has played key role in this accelerated mode of digitalization and innovation. There is big struggle for Drilling services industry to recover. But power of digitalization can help to fast track recovery. Drilling a well can cost Millions of dollars to companies. Non-compliance to SOPs can cause drilling costs to overshoot due to penalties and well work overs.

Digitalization of rig operations brings tremendous competitive advantage to improve compliance and to optimize cost per feet and reduce time from Spud to Total Depth.

At Tech Mahindra, in addition to our comprehensive understanding, we also interviewed drilling SMEs and gathered insights from our customers in the drilling domain. This paper summarizes these findings and learnings from our experience, uncovers opportunities for drillers in digitalization of workflows used between offices and rigs. SOPs are a subset of the workflows. It also substantiates role of enterprise mobility in this revolution

Standard Operating Procedures (SOP) on a Drilling rig

There are standard operating procedures (SOP) defined by drilling contractors in order to meet compliance and efficiency goals. SOPs are defined for a host of disciplines / functions performed on the drilling rig and onshore facilities as well. Representative classes of procedures are;

- Operations Procedures : Drilling , Marine, Subsea, Electrical, Crane, Engineers, Mechanics
- Maintenance & Inspections : Surveillance, operator rounds, safety permits, work order management
- HSE Procedures: Safety drills, process safety, Human safety and environment safety
- Shop Floor Procedures – MRO Centers

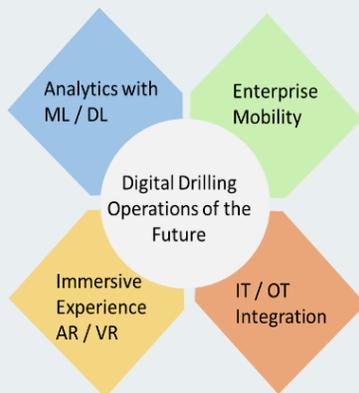
Industry has made many attempts to automate the processes or digitally enable, but it has happened in pockets and success has been limited. Maintenance & Inspection, Inventory management, shop floor procedures are few early adopters of procedure digitalization. For these functions, companies have been drawing benefits of mobile enabled digitalized procedures and operations either through COTS products or custom developed SWs. However digitalization of rig operations is evolving.

Adoption of digital technologies in Oil & Gas Drilling process

Historically the advances in oil and gas technology have been incremental changes driven by the need for answers to immediate needs. Year 2020 has witnessed and has pioneered convergence of digital technologies at an accelerated speed.

Digital transformation of drilling rigs can provide an unprecedented stream of high-quality information that has never been accomplished in the industry, through the utilization of automated real-time drilling downhole tools, data analytics and predictive analysis. Enforcing the importance of integrating this novel concept of digital transformation is mandatory to improve overall efficiency of the drilling process. Therefore, a real-time measurement and processing technology based on automated rig activities execution and detection is required to improve the performance of the rig crew and drilling operations. Deep water rigs deployed in Norwegian Continental Shelf seem to be early adopters of automated rig operations.

Real time data acquisition, surveillance, management and analytics is well known and widespread application of digital in drilling , packaged under ‘Automated Drilling Control (ADC)’. But one less explored dimension that falls under ADC is the high potential “digitalization of workflows and SOPs”. Indeed, it is about making the operations paperless and improving predictability and consistency of the process. It probably sounds like renaissance of the drilling procedures, and this is need of the hour for this industry.



Convergence of Digital Technologies

Why SOP compliance is difficult to achieve

Drilling rigs (land and deep water) operate in harsh conditions, not very conducive work environment. Use of computers or hand held devices can be limited to the driller shack or the dog house, as outside on the rig floor, crew operates heavy machinery and use lot of industrial fluids. Drillers use traditional paper based procedures on the rig.

But practically, experienced rig crew operates procedures based on experience and knowledge. Many times they use paper procedures and do their day jobs as they have been doing it over the years. There is no visibility of SOP adherence, no accountability, no measurements and no robust mechanism to learn from mistakes and apply best practices.

Why Compliance is so important

Even a single miss in following standard procedure can result into a safety incident that can cost millions of dollars to the company. An operational glitch like a stuck pipe or casing collapse that can incur significant cost of work over. In short cost of error is very high. Adherence to SOPs is also required for regulatory compliance. Traditionally drilling contractors have been relying on paper based procedures and experienced crew to comply with the operational and regulatory standards. Changing economic pressures are demanding more and more cost savings which means less defaults by crew , minimize breakdowns, workovers and zero safety incidents.

Effective communication is important in all situations when a task and its associated responsibilities are handed over to another person or work team. This can occur at shift changeover, between shift and day workers, or between different functions of an organization within a shift e.g. operations and maintenance.

Digitization of SOPs and digitalization of office –rig-office workflows are the best mitigation techniques to meet the goals.

Value generated by Procedure Digitalization

Reducing operational risks, meeting compliance, and collecting real-time insight from the generated data are the key outcomes of the digitalization initiative.



Potential value creation identified by interviewees

Workflow Digitalization Capabilities in support of operational discipline

Collaboration between the rig crew and onshore operations personnel is critical for success of such digitalization initiative. Needless to say that the collaboration shall be in-built in the workflows. Following are indicative capabilities that are required in digital form.

Most important is simplify day-to-day jobs on the rig and improve personnel/employee engagement. Power of digital technologies, friendliness of mobile enablement can be leveraged to achieve the goal.

The Solution Features



Procedure Authoring.



Procedure Execution and Tracking



Interactive procedure-operator interface providing real time feedback to the crew



Each action on the rig is auditable. Capability to capture timestamped user actions.



Exception and emergency situation handling



Shift hand overs and shift management



Integration with process data / device data for measurements



Risk assessment and hazard tracking



Monitoring and reporting to fulfil business needs and regulatory compliance



Closed loop collaboration system

Minimum yearly reduction in spend on paper, ink would be around 500k USD”

... Operations Executive, Leading Drilling Company in US & Canada.

- ▼ Drilling cost per feet
- ▲ SOP Compliance
- ▲ Employee engagement

↓ Digital Drilling Operations of the future , targeting improved NPT, ILT and MDBF

Digital enablement through Mobility

With increasing number of personal mobile devices at the workplace, it has changed the way organizations approach their processes today. Many have actively instituted BYOD policies which is helping their employees with effective collaboration and real-time access to information which is transforming businesses.



Mobile devices such as iPads and Windows or Android tablets can be utilized in the drill shack or inside a dog house to ensure an intuitive and user-friendly experience. Outside the drill shack and dog house, rugged devices or devices with safety casings can be deployed. Devices on the rig are usually connected with each other using a local rig WiFi network. But some personnel operate from no-network zones on the rig floor, requiring their devices to need periodic sync whenever they move to WiFi zone.

Barcode and RFID scans can be recorded as data values or used to navigate data collection and photos and attachments can be stored. Operator workload is reduced, data is recorded consistently and rig issues can be highlighted and resolved quicker. Enterprise mobility platforms such as Kony, Outsystems, MS Power Apps, SFDC bring power packed features that any organization would need.

Business can roll out changes rapidly, after basic testing, and if a showstopper issue is identified, they can quickly roll back that particular module to its prior stable state. Agile change management is the answer to address the practical needs, which is also provided by enterprise mobility platforms.

References

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Features enabled by mobility platforms



Highly Secured platform



Omni channel user experience



Scalable enterprise grade platform



Cross Platform capability



Implementation in line with agile way of working.



Support of offline working mode



Real time synchronization between devices



Highly Interactive and Intuitive



Faster speed to market



MDM capability for automated and sophisticated deployment/distribution of application binaries

Scale up Digital Opportunities

Value creation from workflow digitalization can multiply as companies can build on top of foundation established. Data generated from execution of SOPs on the rigs can be a gold mine for the operational executives to exploit further optimization opportunities. Digital SOPs can be further enhanced by integrating with telemetry data, mining insights through analytics and machine learning, immersive experience through AR/VR, virtual operator rounds using Digital Twins are to name few which can revolutionize rig based operations. AI can have major role to play to handle approvals in the digital workflows.

Authors

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