Noble Energy’s Application and Views on RTM Utilization

Committee on the Application of Real-Time Monitoring of Offshore Oil and Gas Operations Workshop

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Overview

- Definition and intent of terms as used during this presentation
- Noble Energy’s Operations Response Model
- Target questions answered
- Additional comments
Term Definitions as Intended Use in this Document

Real Time Monitoring, RTM
- Active monitoring in a remote location

Remote Location
- Location other than the site or facility where the activity is performed

Real Time Monitoring Center, RTMC
- Central facility staffed with personal where RT data is sent and evaluated.

Safety Critical Activities
- Are activities that are essential to provide, maintain, and verify the necessary controls and recovery measures associated with barriers, where failure could lead to a process safety event; e.g.; pressure testing, kick detection

Drilling Optimization / Performance Improvement Activities
- Activities monitored that could affect operating performance; e.g.; hole cleaning parameters such as ECD, Torque and Drag parameters
Noble Energy’s Operations Response Model
The Role of RTM Data

Noble Energy utilizes competent rig site personnel.

- Site personnel are empowered to make swift safety critical decisions.
- The ability to realize and react swiftly to a process safety event can often limit escalation.
- Upon stabilization of an event, collaboration and offsite support becomes an essential part of the strategic response to unplanned events.
Noble Energy’s Operations Response Model
...a metaphor

Noble Energy Response Model parallels that of the aviation industry

Utilizing the aviation industry as a metaphor:

- The Pilot and Co-Pilot are the onsite personnel acting as the interpreters and responders of well site data utilizing situational data to make swift tactical decisions to unplanned events.

- Air traffic controller personnel are the shore-based personnel aid in strategic response planning and providing strategic guidance.
1) Does your company use real-time monitoring for its offshore operations? If not, why?

- The use of real-time monitoring is utilized with targeted activities in a collaborative environment when business needs dictate. Potential activities identified are those:
  - Flagged as “High Risk”
  - Extremely complex
  - Require a targeted expertise
  - Examples include: jetting operations, critical FIT operations, difficult casing seat selections, pore pressure estimation, high angle casing running operations, gravel pack operations, well test, production well start up(s)

2) If your company does use real-time monitoring, what are the critical operations and specific parameters that your company monitors?

- The parameters depend on the activities.
3) Do you believe there are specific types of wells or operations and parameters (for drilling, completions or workovers, or production operations) that always should be monitored with real-time monitoring?

- Monitoring should be activity focused based on risk. Monitoring without a clear purpose can distract and dilute focus. Such distractions can lead to unintended consequences such as missed or misinterpreted events.

- High risk or targeted activities are identified when monitoring could further reduce risk or add value and monitored as appropriate.

4) Are there specific criteria or risk thresholds that your company uses to prompt real-time monitoring requirements (e.g. factors such as well or water depth, frontier area, HP/HT wells, or well complexity)?

- Each well is rigorously reviewed and activities are identified if involvement would benefit the operation. Refer to answer to Question 1.
5) Does your company rely on any automation and predictive software in real-time monitoring?

- When business needs dictate **Predictive software (not automation)** is utilized to determine anticipated baseline trends and deviations are flagged. Examples include:
  - Torque and Drag modeling
  - ECD prediction
  - Pore Pressure prediction
  - Pressure profiles of production functions
  - Fingerprinting flowback

6) What role could automation and predictive software tools play in real-time monitoring?

- For automation to be reliable, both the sensor data and the process have to be reliable and consistent, without significant false alarms.
- Until there is redundancy and assurance of the accuracy and precision of critical sensor measurements, automation is not a viable option for many complex operational tasks.
- Predictive software, if used in conjunction with reliable sensor data, can trigger flags/alerts when deviations from trends occur in limited activities.
7) Condition-based monitoring is viewed by BSEE as monitoring the operating condition of critical equipment and using any generated data to predict and proactively intervene when needed. As such, what role could condition-based monitoring play in real-time monitoring?

- Potential data use includes RT data driven algorithms that create notifications of required equipment PM (preventative maintenance) based on usage and estimated wear and tear vs predetermined scheduled time intervals, i.e.:
  - Monitoring actual ton-miles for slip and cut procedures
  - BOP actuations/utilization for rubber-goods replacement.
  - Casing tests based on anticipated wear as a function of rotating and tripping hours
  - Monitor (Annular Pressure Buildup) APB changes in production wells

8) Describe how operating equipment using condition-based monitoring could be tailored and/or used for real-time monitoring.

- See Question number 7.
BSEE would like to use real-time monitoring technologies to accomplish many of its safety and environmental protection responsibilities. Real-time monitoring technologies could be incorporated into BSEE’s existing safety and environmental regulations in order to replace or supplement its on-site inspection program.

9) How could BSEE leverage such technologies?

- Monitoring simple systems could allow for oversight on and off the rig of fundamental safety systems to ensure compliance. Items include:
  - BOP testing
  - Alarm systems and fundamental safety systems

- Remote interpretive use of surface and downhole data for intervention and monitoring is extremely subjective. Loss of situational awareness could compromise decision making.

- With the current available technology, reliable consistent oversight for complex systems is difficult. Counter productive responses can occur if data is incorrectly interpreted.
10) Which activities could [BSEE] real-time monitoring supplement or replace?

- Examples of items that could be supplemented:
  - BOP test results and BOP testing & functioning frequency
  - Casing test results and testing frequency
  - Safety systems status such as purge alarms
  - Rig systems such as crown-o-matic testing frequency
  - BOP status, ground faults, control systems, etc.

11) What opportunities do you see for BSEE to use real-time monitoring to provide timely, functional, and value added inspections?

- Establish compliance KPI’s in addition to single violation INCs allowing for trend extrapolation.
- Discourage noncompliance between inspection periods and establish a culture of continual compliance and improvement.
- Identify problematic areas and opportunities for improvement.
- Will not completely replace onsite inspections activities
What would you recommend that BSEE do in the real-time monitoring area?

- Monitor simple systems allowing for oversight on and off the rig of simple fundamental safety systems ensuring compliance.
- Set sensor accuracy and precision guideline and requirements for safety critical measurements.
- Provide guidelines for communications protocols for data transfer including channels for redundant sensor measurements.
- Continue pursuing algorithms and solutions that may improve interpretative results.
Conclusions

- Noble Energy’s Operation Philosophy of keeping our operational expertise focused at the well site has been effective in managing and improving safety and performance.

- **Targeted** remote RTM has been effectively utilized to enhance performance for specific collaborative activities.

- Remote RTM without a targeted goal can be distracting and may result in a false sense of security, distractions and dilute focus resulting in missed signals.

- Sensor accuracy, controls surrounding calibration standards, data management, and bandwidth requirements are all obstacles that need to be resolved for RTM utilized for process control like solutions to be effective.

- Until there is redundancy and assurance of accuracy and precision of critical sensor measurement, automation is not a viable option for many complex operational tasks.

- Due to the risk of unintended consequences vs. perceived benefits Noble Energy questions the overall advantage of a 24/7 remote monitoring center (RTMC) as a regulatory tool.
Questions?