FMECA and Commissioning
Guidelines to effectively deliver technology and systems for successful Drilling Automation

Authors:
• John de Wardt, DE WARDT AND COMPANY
• Tom Moore, Southwest Research Institute
• Andy McKenzie, National Oilwell Varco

Special acknowledgement to Tony Beebe, SPE DSATS
Our paper has key insights for drilling systems success

- **Reliability** for automation is an issue
- **Failure Modes Effects and Criticality Analysis (FMECA)** delivers in other industries
- **Commissioning** is a critical link from construction to operation
Generally there is a perception of lack of reliability in automated systems
- Industry experience
- Feedback at ATW Galveston April 2011

We want a perception of reliability based on experience
- DP systems has a achieved this
But the framework is large!
Systems reliability challenges surpass component reliability. Systems involve multiple sources of sensors and tools and different (competing) companies.
What is FMECA?

• Methodology to determine, characterize and document possible failure modes and effects on operations

• Systematic analysis of design through all stages
  • Concept through detailed design
Objective of FMECA

• Identify failure modes
  • Way can occur

• Identify failure effects
  • Consequences of failure modes

• Identify criticality
  • Severity in terms of safety, operability and well operations
How to apply FMECA

• Establish a team
  – Experience in FMECA
  – Knowledge of product
    • development, operation, control

• Data Gathering
  – Product functioning / operating environment
  – Functional block diagram
  – Design docs, drawings, past experience, component reliability
How to apply FMECA

• System Diagrams
  – Determine critical functions
  • Remove secondary / non critical

• Graphical illustrations
  – Functional block diagrams
  – Process diagrams
  – Flow charts
  – Inputs / outputs
FMECA Process

- Team drills down into what is relevant
- Tabulate to capture observations
- Use tools appropriately to analyze failure modes and effects
  - Fault trees, FEA, CFD, ........
FMECA process output

- Functional requirements
- Detection and warning systems
- Interdependent hierarchy
  - System – including computer software
  - Subsystem
  - Component – including sensor error / failure
- Economic analysis of corrective action
What is commissioning

Process by which equipment, facility or plant is tested to verify it functions according to its design objectives or specifications
Commissioning value

• The stage where multiple systems and sub systems are brought together
  – First time
  – Specifically tailored to project
Commissioning current practice

- Equipment installed
- Equipment commissioned individually
  - Vendor and owner
- Sign off
  - Vendor and owner
- Process level testing
  - Owner and operator
- Repeated change orders to meet operator requirements
Issues with today’s practice

• Disconnect between vendor and end user
  • Multiple intermediaries
• Delayed delivery of a machine impacts system commissioning
• No testing of downhole tools into the system
Improvements have been made

• Organization structures dedicated to installation and commissioning

• Dedicated resources addressed:
  – Improved documentation
  – Process wide commissioning

• Better testing processes
  – FAT
  – Hardware in Loop (HIL) simulation
Commissioning future practice

- Enhanced relationships
  - Vendor, owner, operator
- Mesh tool level testing with systems integration testing
- Pre-plan commissioning
- Make time for commissioning
  - There is a benefit
Challenges to improve reliability of automated drilling systems

• Inter company commissioning
  • Especially downhole to surface

• Integrate and standardize methodologies
  • FMECA / Commissioning / ……

• Identify the integrator
  • Responsible to manage the integrated system
Need to coherently map the best methodologies.
SPE DSATS and IADC ART

Working groups addressing these issues
Thank You

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