OPERATIONS PLANNING AND MANAGEMENT TOOL

“INTERACTIVE FMEA”

Olve Mo, Marine Cybernetics
Suman Muddusetti, Shell Int. Expl. and Prod. Inc.
Steven Cargill, GL Noble Denton
BACKGROUND

- Shell
  (end user requirements, operation knowledge, funding)

- GL Noble Denton
  (field work, information collection, maritime systems knowledge)

- Marine Cybernetics
  (simulator technology, maritime systems knowledge)

Shell initiated the Enhanced Reliability Workshop

Ideas for an interactive Advisory and Decision Aiding Tool

Pilot version developed for a vessel operating for Shell
THE MISSION

---

Provide a tool that can **aid** the crew in making better decisions

---

Reduce downtime and enhance reliability
THE SOLUTION

- Successful operation
- Drilling systems
- Auxiliary systems
- Station keeping systems
- Power plant

Operations planning and management tool

- Making visible the interdependencies
- Making visible consequences of non availability of equipment on
  - on-going operations
  - upcoming operations
  - efficiency impacts
- Facilitate training and learning
Adapting existing Hardware In Loop simulator technology

FMECA of DP and Power Plant systems

FMECA of Critical Drilling Systems

Mapping of the well construction process (multidisciplinary team)

Mapping interdependencies DP/Power/Drilling/...

Configure tool

Customer Demonstration

Collecting:
- Drawings
- Oper. procedures
- Protect.rely coord.
- Crew knowledge
- Lesson learned
- Pictures
- Videos

Final tool
HOW DOES IT WORK?

- The operator set up a planned configuration for a given operation (including setting equipment out of service if applicable).

- Operator immediately get feedback and guidance on whether a planned scenario is possible or involves increased risk compared.

- Tool indicates four possible conditions for a selected operation and configuration:
  
  - Operation possible
  - Operation possible with reduced efficiency
  - Operation possible with increased vulnerabilities and risk of failure
  - Operation not possible
EXAMPLE OF USE
green = operations possible
DEPENDENCIES: OPERATION - EQUIPMENT

- For each operation:
  - List of equipment / system that are necessary for the operation
  - List of equipment / system that may add efficiency
  - List of equipment / system that can facilitate concurrent activities for upcoming operations
For each system

- Tool keeps track of dependencies of other equipment / subsystems
- Tool keeps track of any redundancy (in equipment 1 out of 4 specified pumps must be available)
DEPENDENCIES: EQUIPMENT – POWER FEEDER

- Tool knows which switchboards and MCC feeders must be powered in order to operate each piece of equipment and system.

- Tool keeps track of any redundancy in power supply to equipment.

- Also mapped into tool:
  - All consumers on each MCC and switchboard;
  - The complete power distribution system (the single line diagram).
EXAMPLE: WHAT IF «MCC BLOWERS» IS UNAVAILABLE?

Opens breaker to MCC
red = operations no longer possible
WHY IS OPERATION NO LONGER POSSIBLE?
WHAT SYSTEMS / EQUIPMENT DID WE LOSE?

The answer is found by browsing the operation tree:
**CONFIGURATION ADVISORY**

- Possible to include configuration advisory
- Non-optimal or dangerous configuration will give a “red” configuration advisory
- Configuration advisories can be taken from:
  - vendor recommendations
  - procedures (vessel, contractor, client)
  - ‘lessons learned’ (vessel specific or others)
OPERATIONS PLANNING AND MANAGEMENT TOOL

Main benefits
- The ability to plan operations in advance and validate contingency plans
- Easier planning of maintenance and repair (fewer surprises)
- Facilitates training
- \( \Rightarrow \) Safer and more efficient operations

Technology
- Standard PC/Mac/Laptop
- Used everywhere (on board, onshore, support center, office, at home)
- Not connected to any control system or equipment onboard
- Adaptable to any vessel (independent of equipment vendors)

Prospective users
- Contractors Vessel Management Team (Master, Chief Engineer, Rig Superintendent)
- Operational team members (Chief Electrician, DPO)
- Client’s drilling supervisor.
- Shore based support teams.

Important:
- Tool makes no decisions by itself!
- It is a decision aiding tool
VESSEL SPECIFIC TRAINING AND FAMILIARIZATION

- Can facilitate crew understanding of (vessel specific):
  - Consequences of failures
  - Consequences of setting up the power system in different configurations
  - Consequences of having one component / machinery / equipment / out of service (maintenance or repair)
  - What is the critical equipment for each operation?

- Offline tool, no risk from allowing inexperienced users unsupervised access for familiarization and self-learning purposes

- Possible to include easy access to drawings, pictures, circuit diagrams and instruction videos (e.g. blackout recovery instruction video)
CONCLUSION AND WAY FORWARD

Vessels in operation

- Tool methodology have the potential to add values in any project where one of the objectives of the industrial mission is to enhance reliability and maximize uptime.

New builds

- Configuring such tool already in the concept and design phase will give the stakeholders an effective means to assess and improve the design of new build vessels and conversion projects.