Goliat Barrier Status Panel

Operational Barrier Management
HFC Forum, 27-28th April 2016
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Eni Norge - on the NCS for more than 50 years

- Present on the Norwegian Continental Shelf since 1965
- Interests in 60 licenses (North sea, Norwegian sea and the Barents sea)
- Operator of the Marulk field (gas field in the Norwegian Sea)
- Operator of the Goliat field (oil field in the Barents Sea)
Goliat field

- Discovered in year 2000
- On stream March 2016
- Located 88 km northwest of Hammerfest
- Eni Norge is operator (65%), Statoil is partner (35 %)
- First oil field in the Barents Sea
- Estimated recoverable oil reserves: 179 million barrels
- Production lifetime of 15 years
- The world’s largest and most advanced cylindrical oil platform
- Tailored for Arctic weather conditions
- Supplied with electricity from shore

Integrated Barrier Management Project (2013-2016)

**Purpose**
- The purpose of the project was to establish the safety and barrier strategy and performance requirements for all barriers based on the specific risk picture on the Goliat FPSO; in order to be able to control risk through barrier management in daily operations.

**Participants**
- Eni Norge:
  - Goliat Project
  - Operations
  - HSEQ Dept.
  - D&T Dept.
- Professional support:

[Link to video]
Barrier Management Project - Methodology

**From this:**

- Barrier Strategy based on PS (technical safety systems)
- Requirements based on regulations & experience
- Limited risk control and barrier mngt (no clear link to area risk)

**To this:**

- Barrier Strategy based on identification of area hazards & corresponding required barrier functions
- Requirements linked to barrier elements for each barrier function
- Increased risk control and barrier mngt (clearer link to area risk)

Identify barrier functions by «barrier grid» technique

Barrier grids developed for all main areas:
- Shows the relationship between the hazards in a specific area (i.e. the area-specific risk picture) and the Barrier Functions (BF) needed to prevent or/and mitigate these risks

Ref. Goliat safety and barrier strategy (Figure by Safetec)
Barrier elements

- The barrier elements represent the solutions or "materialization" of the sub-functions necessary to realize a barrier function.

- Technical barriers need to be made operational (e.g., how to operate the barrier systems) and organisational responsibility needs to be assigned (e.g., who is going to operate the barrier systems; who is authorized to realise a barrier function).

Barrier Status Panel – Decision support & visualisation tool

- The Barrier Status Panel is developed by ABB (use of ACE):
  - Using real-time data from SAS (Safety & Automation System)
    - Condition Monitoring, Dangerous Undetected fault signals, Faults, Blockings
  - Using daily data from SAP (Preventive Maintenance & Corrective Maintenance)

- The Barrier Status Panel show the current status of the barrier functions (and hence, the barrier elements):
  - Provides offshore & onshore users with up-to-date information regarding the barriers' health status - both for main areas and for the FPSO as a whole
    - Use of Barrier grids; showing where in the 'sequence of events' that barriers are not functioning or degraded

- The Barrier Status Panel is a planning & decision support tool to be used during activity planning:
  - It is not a system for handling of hazardous situations (e.g., during a high-high alarm or a gas leakage)

- Only the technical barrier elements are included so far.
Barrier Status Panel - offshore & onshore collaboration

- Use of the Barrier Status Panel leads to improved risk management and a joint risk awareness/understanding between the offshore and the onshore organisations:
  - Used offshore in daily activity planning
  - Used by the OSG (Onshore Support Group) in Hammerfest to prepare work packages and to monitor risk and barrier status
  - Used by TSG (Technical Support Group) in Hammerfest and Development & Technology at Forus to monitor and follow-up technical systems and performance standards
  - Used by onshore HSEQ to monitor and trend risk and barrier status
  - Used by onshore management to monitor high level risk and barrier status

Aggregation rule set

Below, a rule set for allocating traffic lights on a barrier element/tag level is presented:

On a barrier element/tag level at least one of these observations will give a red light:

- If PM overdue > 90 days, then red light \( ^1 \)
- If CM notification open OR overdue, AND priority in SAP = high, then red light
- If condition monitoring alarm = Failure (> 750), then red light
- If safety fault alarm = failure, then red light
- If tag manually blocked (i.e. inhibited) or suppressed\(^\text{2}\), then red light

On a barrier element/tag level at least one of these observations will give a yellow light:

- If 28 days ≤ PM overdue ≤ 90 days, then yellow light \(^1\)
- If CM notification overdue AND priority in SAP = medium, then yellow light
- If fault alarm = degraded, then yellow light

If none of the above conditions are present, then barrier element/tag has a green light:

Note 1: PM also includes functional testing (FT) of the barrier elements/tags
Note 2: Automatic suppression (e.g. of standby equipment) not to be included a barrier panel

The above rule set is sufficient to set a traffic light on element level. Red takes preference to yellow which again takes preference to green. In this way all the individual barrier elements can be given a traffic light.
Barrier Status Panel – front page - Video

Barrier management work processes

Test version; not 'real' data
Barrier management work processes

Experiences so far

- High number of ‘red’ barriers (due to start-up phase)

- Handling of barriers in the panel are being conducted:
  - Used daily – offshore/onshore collaboration; increased collaboration & common understanding
  - Focus on blockings and corrective maintenance on barrier elements
  - Some handling has to be transferred to onshore (system responsible)

- Feedback from users:
  - Positive focus; organisation has increased understanding and focus on barrier management
  - Workload due to the high number of red barriers
  - Would like more information from related systems (SAP, SAS, maintenance workplace etc) – want more text/info
  - Requests aggregation rules based on criticality assessments (note: ongoing)
Barrier management project – phase II; include O&O

- Establish system for monitoring the status of the operational and organisational (O&O) barriers for Goliat (i.e. use of Barrier Status Panel)
- Identifying indicators for degradation of the operational and organisational barriers
- Performance requirements and verification activities (performance indicators and audits)

Summary

- The Barrier Management Project has focus on linking barriers to the risk picture on Goliat FPSO in order to have more control with majors accident risk
- Barrier Status Panel: Planning & decision-making tool, but also a risk management tool; via monitoring the barrier status over time, we get an indication on how well protected we are against major accidents
- Barrier Status Panel to include indicators on operational and organisational barrier elements (Phase II) – 2016/2017