Post Deepwater Horizon – HOF Audit for NSOAF

Author: Rob Miles OSD 4.8
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Section 1.01 Background

The safe and successful drilling of a well on an offshore installation is achieved by a complex interaction of man and machine. The crew monitor displays and other information and make decisions and take actions based on how they interpret that information.

All this activity takes place within a wider system of plans, objectives, monitoring and the relationship between individuals in a team, teams and management and between organisations; clients and contractors. When things do not progress as expected or planned these technical and human elements must all function as a single system to prevent a disaster.

The relationship between the actors (the people and the organisations) must be clear so that everyone knows and understands their role and can deliver it competently. The displays and other monitoring equipment must present to the crew the most accurate representation of the situation possible. The operators must perceive and interpret that information correctly and achieve the most accurate awareness of the situation that they can. They must then interpret that situational awareness and understand the implications it contains for the future. They must then make decisions and take the correct actions to ensure that this future is controlled and safe.

This document focuses specifically on those parts of this socio-technical system in which the human element is the key component. In a loss of well control event the most critical human element is the operator's hand that presses the BOP and emergency riser disconnect controls. No amount of improvements to the BOP capability can overcome the situation in which no one presses that shut-down control until it is too late. The riser disconnect may be even more challenging; whereas the operation of the BOP will occur shortly after the decision to shutdown, the riser disconnect may require a number of tasks that need to be completed before action can be taken. The decision to initiate these actions has to be taken in good time.

The issue to be addressed by the human and organisational factors programme is to ensure that the final human element (the “hand on the button”) is a reliable component in the emergency control (and avoidance) system.

(a) Working back from the action of “pressing the button”:

1. They must know and agree who is to take the action
2. They must know and agree when to take the action
3. They must be confident that they have the full support of those above them in the action they take.
4. They must be empowered to take the action in the time available.

(b) They must be confident that they are taking the right action.

To achieve the required level of confidence to shutdown or disconnect the person taking that action must have the best possible understanding of the situation along with the range likely outcomes and options available. This requires training and experience, pre-planned and rehearsed scenarios that they can draw on to help them interpret the situation and procedures to guide them through that interpretation.

(c) They must have situational awareness.

To achieve the required situational awareness they need accurate and timely information from the displays and other equipment around them. The design of these displays should help them to rapidly assimilate the information and their training and procedures should help them reach an accurate situational awareness.

Before any activity is undertaken that could result in a situation that has the potential to become a major incident there must be in place the organisational foundations to create a safe and organised workplace. This will be the supervision, training, drills, procedures and equipment to ensure readiness. The equipment must function as intended and so this organisational preparedness includes monitoring, testing, verification, auditing, management of change and inspection. These safety management systems should be working “behind the scenes” to deliver the equipment, information and procedures well in advance of any requirement along with the appropriate level of independent audit and verification.

(d) They must be in an effective organisation.

Drilling is an activity that usually requires the coming together of a number of organisations: the driller, the client, specialist contractors. These organisations must agree their roles and responsibilities and those of their staff. They need to agree what information is shared, when and how and who is responsible for taking action, when and what. This cannot be done once problems occur, it must be done well in advance. These roles and responsibilities are usually set out in management interface documents and contracts and these must be sufficiently specific to provide

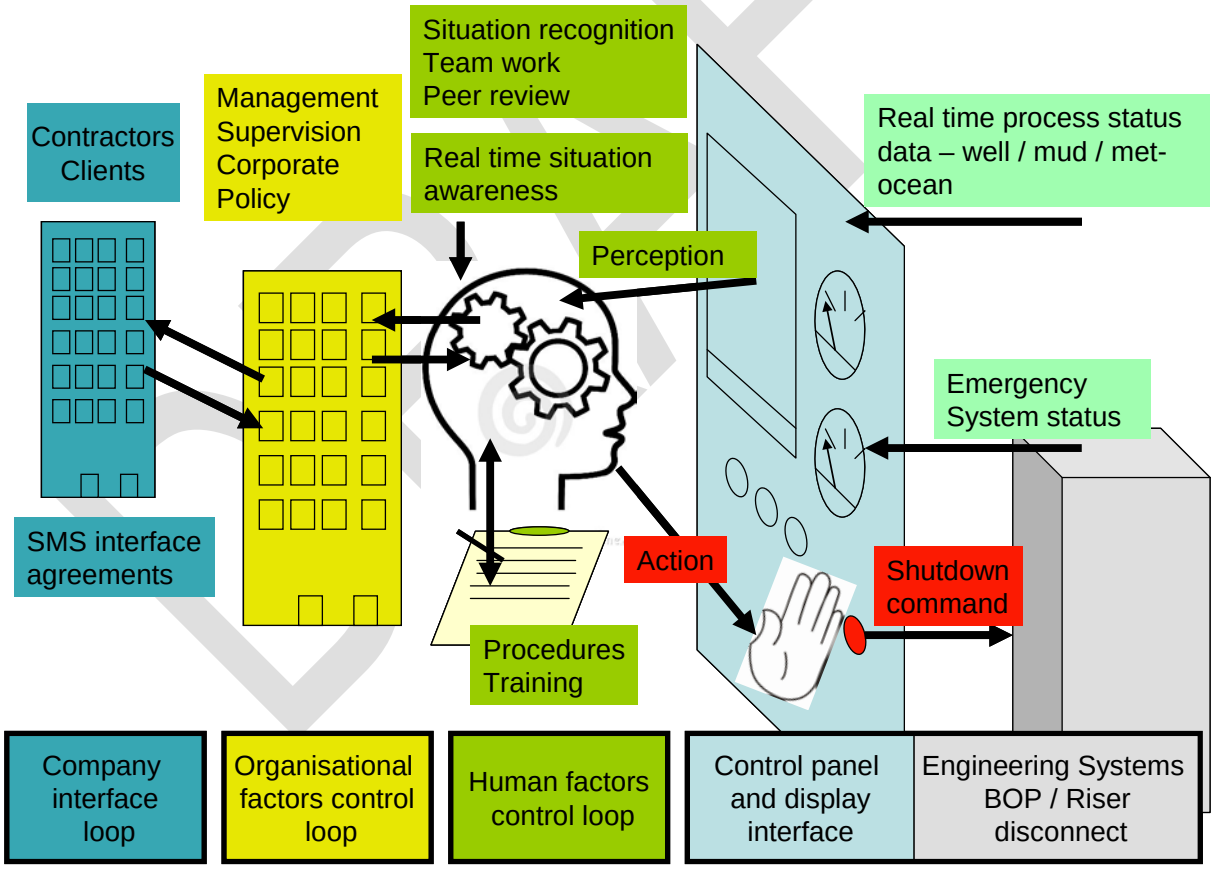
guidance that can be followed without further clarification in the event of an emergency.

(e) Like every other critical element, the management interfaces should be tested and verified.

When wells are planned and the key stages agreed and rehearsed, for example when “drilling the well on paper”, these safety management interface documents and other arrangements should also be included in these exercises and tested for a range of realistic scenarios as “desk top” exercises. Any gaps and other area of confusion or conflict should be corrected and the new “verified” documents used as a basis for training and collaboration.

Section 1.02 The key control loops

The process can be represented as a number of control loops:



(a) The Engineering System / Control Panel Control Loop.

- The display of data about the well and the reservoir,
- Information about the environmental conditions – weather

- Status information about the equipment including emergency systems and “time to operate”.
- Controls to operate the equipment.
- Emergency shutdown controls

(b) The Human Factors Loop.

- A competent person or persons to monitor the control panel with the authorisation to shut down in an emergency
- The perception of the information and comprehension of the information
- The availability and use of prepared procedures and task aids (for example checklists and decision flow charts) to aid the operator in processing information, reaching decisions and taking appropriate action.
- The integration of a number of information flows into a real time situational awareness that includes forward prediction of at least the “time to operate” for emergency systems.
- Emergency situation recognition that will result in human action to initiate the correct emergency protection equipment.
- Team working and peer to peer monitoring and review to support these processes.

(c) The Organisational Factors Loop.

- Management and oversight of the operator to support their activities and provide additional early warning of problems.
- The management of competence and training delivery.
- The audit and review of the safety management systems including procedures, check-lists and other decision and action support procedures.
- Safety leadership that empowers the operator to act when necessary
- Systems to gather and disseminate learning opportunities (i.e. near misses)

(d) The Company Interface Loop.

- The safety management systems (SMS) interface documents and other agreements that specify who does what in normal, escalating and emergency situations.
- The provision of joint training in emergency scenarios to validate company interface arrangements.
- The monitoring and auditing of contractors at both a individual (for example competence) and organisational level (for example contractor safety management systems.
- The access to specialist services and advice.
- The contractual “environment” (deadlines, penalty clauses) in which the activity takes place that could influence the Human Factors loop.

Section 1.03 The audit items

These audit items are structured around each of the four “control loops” identified above:

(a) The Engineering System / Control Panel control loop:

1. How is the necessary data about the well and the reservoir clearly displayed to the operator who requires it?
2. How is this data presented in a manner that enables them to establish and maintain effective situational awareness?
3. How is other real-time information such as weather and met-ocean conditions that influence the judgment on when to initiate shutdown action presented to the operator and in a clear and usable format?
4. How is information that describes the status and readiness of emergency systems including “time to operate” presented to the operator?
5. Are the controls to operate the equipment clearly labelled and functional?
6. Are the *emergency* controls clearly indentified and functional, i.e. not locked?
7. If there are multiple shutdown controls and/or levels of shutdown, are these clearly indentified?

(b) The Human Factors Loop.

1. How does the organisation ensure that there is always a competent person or persons with the responsibility to monitor the situation, including the control panel, and with the authorisation to shut down in an emergency?
2. How does the competence of this person enable them to fully understand the full range of the information presented to them and understand its importance?
3. Are there validated procedures and task aids (for example checklists and decision flow charts) to aid the operator in processing information, reaching decisions and taking appropriate action.
4. How does the competent operator integrate of all of the appropriate information flows into a real time situational awareness?
5. Does this situational awareness include forward prediction that, at least matches, but should exceed, the “time to operate” for emergency systems?
6. Can the operator demonstrate that they can recognise the early indications of an emergency situation and explain when this must result in action to initiate the correct emergency protection equipment?
7. Is it absolutely clear who takes this emergency action and are they provided with the necessary procedures and other decision aids to facilitate their action?
8. Are they given the authority to take this action in the time available?

9. Is the operator supported by team working and peer to peer monitoring and review?

(c) The Organisational Factors Loop.

1. What management systems are in place to support the operator responsible for monitoring the situation and making the shutdown action?
2. What are the management systems in place to provide oversight of operations and additional early warning of problems?
3. What is done to ensure the competence of operators including competence assurance and training delivery?
4. How does audit and review verify the safety management systems including procedures, check-lists and other decision and action support procedures?
5. How does safety leadership effectively empower the operator to act when necessary?
6. How does the organisation gather and disseminate learning opportunities from events, for example near misses, that occur within the organisation and elsewhere in the oil industry?
7. What evidence is there that learning information from events is influencing operations?

(d) The Company Interface Loop.

1. Are there in place agreed safety management systems (SMS) interface documents and other agreements that specify who does what in normal, escalating and emergency situations?
2. How are all those involved in emergency decisions made aware of these arrangements?
3. How have these interface arrangements and any other external joint actions tested and verified?
4. What processes are there for the monitoring and auditing of contractors at both an individual (for example competence) and organisational level (for example contractor safety management systems) and are these shared?
5. How does the company provide access to specialist services, information and advice when it is needed?
6. Are there any contractual issues that could negatively influence the Human Factors loop, for example dead-lines and/or penalty clauses that apply to the activity, and how are these potentially negative influences managed?

End.