DNV·GL

OIL & GAS

Operational barrier elements

Good practices

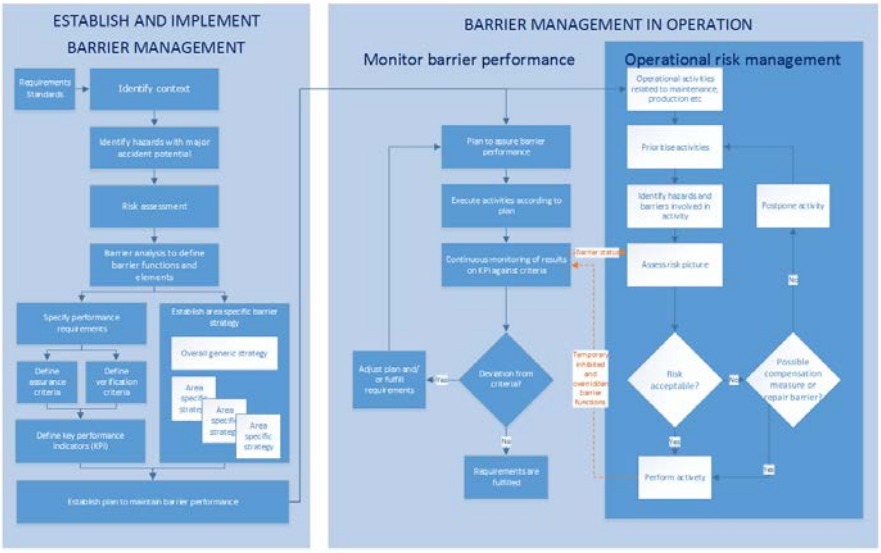
Sondre Øie
16 October 2014

Contents

Barrier management in operation: Good practices

- Ordered by the Norwegian Shipowners Association (Norges Rederiforbund)
  - Drifts- og miljøutvalget (DMU)
  - Two 2-day workshops, one comment round, one clarification meeting
- Philosophy behind the report:
  - Build on existing practices
  - Take it one step further (e.g. HF)
  - No "moon landing"
  - Practices, incl. examples
- Well received by the industry
- Available on www.rederi.no

Framework for barrier management

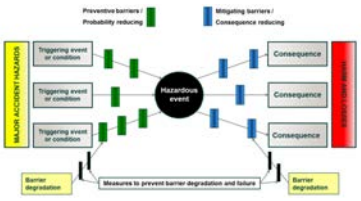


Barrier definitions

Barrier
Barriers refer to measures established with an explicit purpose to (1) prevent a hazard from being realized, or (2) to mitigate the effects of a hazardous event.

Barrier function
The purpose or role of a barrier.

Barrier element
Technical, operational or organisational measures which alone or together realize one or several barrier functions.



The "curse" of accident investigations

Poor supervision contributed to the accident by...

Due to insufficient management of change the crew failed to...

The operator was inexperienced and lacked training...

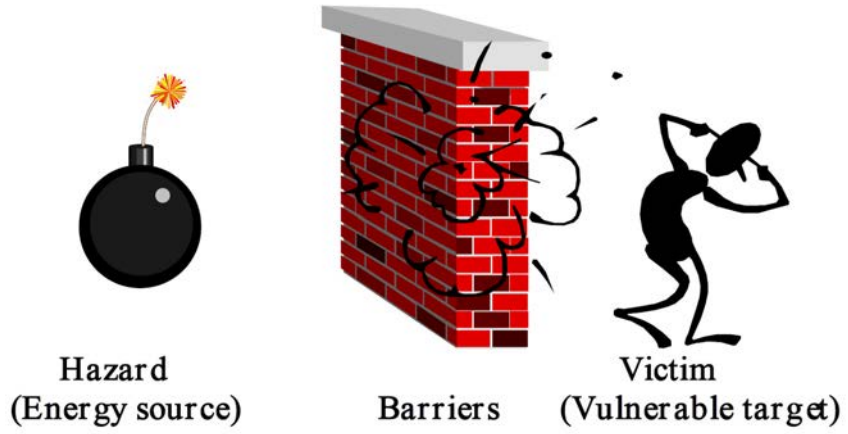
"Non-physical barriers"

"Soft barriers"

"Non-technical barriers"

Important factors for safety, but should they be managed as barriers?

The energy-barrier perspective



Rosness (2010), adapted from Haddon (1980)

Management Regulations, Section 5 Barriers

Barriers shall be established that:

a) reduce the probability of failures and hazard and accident situations developing,

b) Limit possible harm and disadvantages

[...] Personnel shall be **aware** of what barriers have been established and which **function** they are intended to fulfil, as well as what **performance requirements** have been defined in respect of the technical, **operational** or **organizational elements** necessary for the individual barrier to be effective.

[...] Personnel shall be aware of which barriers are **not functioning** or have been **impaired**.

Falling into the trap of comparing  **with** 

Management Regulations, Section 17 Risk analyses and emerge…

[…] Risk analyses shall be carried out to identify and assess **contributions** to major accident, […]

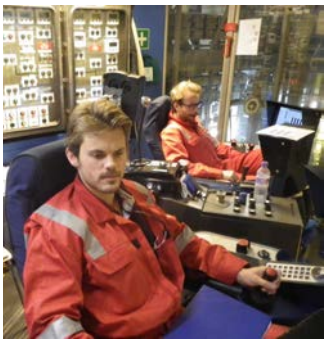
Risk analyses shall be carried out and form part of the basis for making decisions when e.g.:

a) identifying the need for and **function** of necessary barriers, with reference to Sections 4 and 5,

b) identifying specific **performance requirements** of **barrier functions** and **barrier elements**, […]

Need for a integrated framework, with suitable definitions and methods

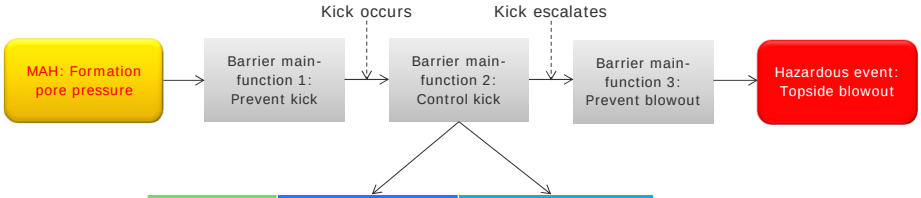
Task-based approach to operational barrier elements



Operational barrier element
A task performed by an operator, or team of operators, which realizes one or several barrier functions.

Organisational barrier element
Personnel responsible for, and directly involved in, realizing one or several barrier function.

A well control example



Barrier sub-functions	Operational barrier elements	Technical barrier elements
2.1 Detect kick	Detect gain in mud pit volume	Pit volume totalizer
	Perform flow check	Return flow line / CCTV
	Etc.	Etc.
2.2 Shut in well	Space out drill string	Drawworks
	Close upper annular preventer	Blowout preventer
	Etc.	Etc.
Etc.	Etc.	Etc.

Examples of what is and what is not

What is…

- Tasks which are required to activate safety instrumented functions (SIF), such as emergency shutdown, blowdown, and blowout preventer
- Tasks which are directly part of avoiding release of major accident hazards, such as heavy lifting operations and primary well control
- Tasks which are necessary to alert, rescue and evacuate personnel

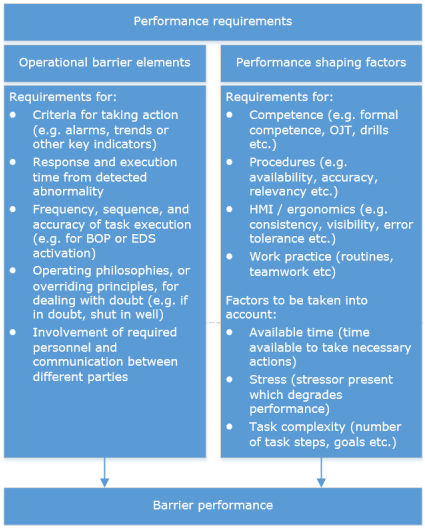
What is not…

- Assurance activities of technical barrier elements, such as testing, maintenance and inspection tasks (though these *can* be critical…)
- Overall planning activities part of operational risk management, such as management of change, safe job analysis, and tool box talks

Up for discussion…

- Permit to work, e.g. as part of the barrier function “prevent ignition”
- Sand production monitoring, e.g. as part of the barrier function “prevent leak”

Performance requirements



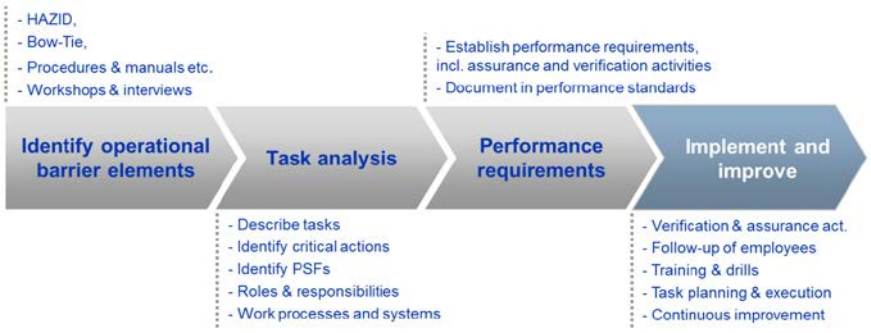
Example of requirement for OBE (kick detection):

- Clear instructions shall be given to the Driller for this occurrence, prior to start drilling an oil based mud section:
  - Monitor active pit for small gains (< 5 bbls/0.8m3).
  - Be prepared to shut-in or handle increases in pit volume, when circulating after drilling breaks.
  - Flow checks taken after any kick indicators have been observed, should be extended to between 15 and 30 min. Even with a static flow check, consideration should be given to circulating bottoms-up.
  - Etc.

Example of requirement for PSF (HMI):

- The RS's BOP control panel shall be equipped minimum as per point 5.2.8 of API Specification 16D, i.e.:
  - Control all functions associated with BOP stack and associated equipment.
  - Display the position status of all functions.
  - Warning lights alarms of all the critical functions.
  - Etc.

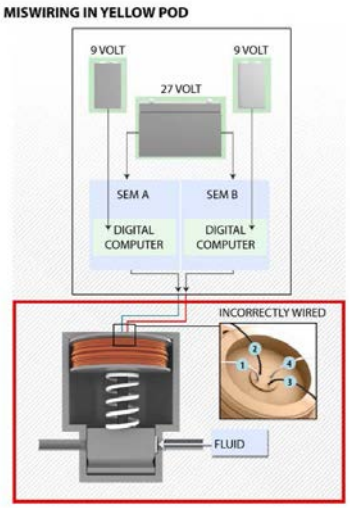
Identify – analyse – establish – follow up



Note that this process is part of an overall barrier analysis

The Devil is in the details…

- Introducing or not revealing *latent failures*
- Part of barrier performance assurance activities (testing, inspection, maintenance etc.)
- *Safety Critical Tasks* (SCTs)
  - Type A, B, and C
  - Criticality ranking
- Manage through good procedures, mentoring / follow-up, training and workplace design – this is where safety culture and leadership comes in



Summary

Strengths and benefits

- Fits nicely and is in-line with regulations and requirements
- Builds on existing SBM practices
- Not an "add-on" to technical barrier management
- Utilizes well knows and tried terminology and methods (task analysis)
- Can be measured and followed up
- Separates apples from oranges
- Much is already in place with the companies through normal practices, just need to link it to the hazards

Challenges and limitations

- "Bureaucratic" way of managing safety
  - Human error, blame
  - Operator responsible, predominant focus on sharp-end performance
  - "We have everything in place"
- Overly focused on barriers (and not e.g. critical maintenance tasks)
- Does not include social and organizational aspects on a higher level, such as culture, leadership and management systems
  - Should also be managed, but not as part of SBM

Thank you!

Sondre Øie
sondre.oie@dnvgl.com
+47 948 61 628

www.dnvgl.com

SAFER, SMARTER, GREENER