

exploration & production



Workshop on the new EU Directive (2013/30/EU) on safety of offshore oil & gas operations

Politecnico Torino, 25th June 2014

The Operators' point of view

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Scope and Field of Application – Art.1

Field of application

Future offshore oil & gas installations and operations and, subject to transitional requirements, to existing installations

Scope

- Limit possible **disruptions** to Union indigenous energy production
- Reduce as far as possible the occurrence of major accidents relating to offshore oil & gas operations and limit their consequences
- Protect **marine environment** and **coastal economies** against pollution
- Establish minimum conditions for safe offshore exploration and exploitation of oil and gas
- Improve the response mechanisms in case of an accident.

Definitions (1)– Art.2

Major Accident

Incident involving an explosion... release of oil... involving, or with a significant potential to cause, fatalities or serious personal injury... any major environmental incident resulting from... incident referred above

Offshore

...situated in the territorial sea (1), the Exclusive Economic Zone (2), the continental shelf (3)... the ecological protection zone... of a Member State...

Acceptable Risk

A level of risk for which time, cost or effort of further reducing it would be grossly disproportionate to the benefits of such reduction.

Operator

The entity appointed by the licensing authority to conduct oil and gas operations, including planning and executing a well operation...

Independent Verification

Assessment and confirmation of validity of particular written statements by an entity or an organisational part of the operator, or the owner, that is not under the control of the entity using those statements...

Material Change

Change to the basis on which the original Report on Major Hazards was accepted ...



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1. 12 nautical miles. 2. 200 nautical miles. 3. Isobaric line at 200 m depth. Conventionally, 200 m depth is defined “deep water”; technically, deep water extends below 450 m.

Definitions (2) – Art.2

Major Accident (MA): it is an acute and safety-related event that may result in (immediate) fatality or serious injury. The “major environmental event” in this context is intended as direct consequence of the MA. Any other environmental event is captured in the EIA

Offshore: any marine domain, with no exceptions. The main purpose of the Directive is to overcome the intransigent “moratorium” approach on the basis of a risk assessment and the Operator capability to keep consequences of a MA to an acceptable level

Points to Address

Acceptable Risk: strictly associated to the Operator’s financial project-related capability; it has no relationship with the global economic capability of the Operator, that goes well beyond the project’s value

Operator: in Italy, the only recognised Operator is the Licensee. Rig owners are not Operators, and in no way act on behalf of the Operating Company

Material Change: a material change that requires a new Report on Major Hazards (RMH) is effective only if an original RMH already exists. Installations to which the Transitional Provisions apply are not requested to comply with this requirement until 19 July 2016.

What does “significant potential” mean?

Key Elements

In a Quantitative Risk Assessment (QRA) not all events lead to a Major Accident. A MA is usually associated to events (containment losses) that exceed a certain size and, for this reason, potentially lead to a MA.

Implications

Looking at “major” releases only prevents an overestimate of the risk of MA.

Points to Address

- It is industry practice (*) to define a tiered reporting format, based on size of gas/oil leaks. Examples are:
 - Major Gas Release: > 300 kg or 1 kg/s lasting > 5 minutes or 0.07 to 0.15 kg/s lasting 1 hour (it is a 10 m jet fire or a flash fire: potential to cause serious injury or fatalities)
 - Minor Gas Release: 0.007 to 0.015 kg/s lasting 6 min to 1 hour (it is a <5 m jet fire: unlikely potential of escalation)
 - Major Crude Oil Release: 1000 kg (outdoor) – 500 kg (indoor) in any 1 hour period
 - Minor Crude Oil Release: 100 kg (outdoor) – 50 kg (indoor) in any 1 hour period
- Releases classified as “Major” shall be included in the QRA; minor releases should be considered for inclusion on a case by case basis.

Key Elements

Licenses are functional to the applicant's technical and financial capability to cover potential liabilities associated to the operations for which the licence was requested... attention is paid to sensitive marine and coastal areas .
The drilling of an exploration well shall not be commenced until... an effective public participation...

Implications

Before granting a license, the licensing authority shall consult the Competent Authority to acquire relevant information

Points to Address

- Information needed for public consultations are those **concerned with effects on the environment that are expected to be restored** by implementing the technical and financial capability assessed by the Competent Authority.
- The Report on Major Hazards (RMH) shall be submitted to the CA before commencing an oil and gas activity within licensed areas; **it is neither requested, nor even feasible, to present it as a support to grant a license.**

Report on Major Hazards – Artt. 12/13

Key Questions

1. Is the Management of Major Hazards a new issue?
2. Are environmental consequences of a MA never considered before?
3. Should the Operator prepare/update the RMH of a non-production installation?
4. When the RMH and its amended version should be accepted ?
5. Is it intended to modify/upgrade the current authorization processes?

Key Answers

1. No. LL.DD. 81/2008 and 624/96 require that ALL risks are assessed, including MH
2. No. Depending on the level of risk, MH are already mentioned in EIA's
3. No, it shall be directly requested to the rig owner despite, according to the Italian legislation, he can never take the role of Operator.
4. The RMH is accepted within 90 days from submission; the amended version should not require the same time if the risk levels remain unchanged.
5. No. The RMH is prepared after the license has been obtained, and is functional to the operational consent in already licensed areas.

Points to Address

- In conclusion, there is no need to duplicate the authorization process. **Requesting an additional process would de-legitimate the existing ones.**
- The intent of the new legislation is to provide **transparency of information in order to remove authorization barriers.**
- **Authorities who release the consent** to a project realization/operation start-up **also accept the RMH** as an integral part of the authorization process.

Content of the Report on Major Hazards – Artt. 12/13

Key Elements

The RMH shall include:

- Description of the selected design concept in relation to the MH scenarios
- Identification of meteocean limitations to the safe operation
- Description of the safety and environment management system by which the MA risk control measures are to be operational
- Description of the independent verification scheme
- List of safety and environmental critical elements (SCEs and ECEs) and required performance
- Demonstration that the concept contributes to reducing major hazard risk to an acceptable level
- Internal emergency response plan (for production installations)

Points to Address

- A good RMH should tell a story:
 - Facility and environmental sensitivity description
 - HSE Management System: how we organise people to prevent or control accidents
 - Risk Assessment: what could go wrong
 - Risk Control Measures: Safety Critical Elements that prevent or limit the accident
 - Emergency Response: how we respond to limit escalation to a major accident..

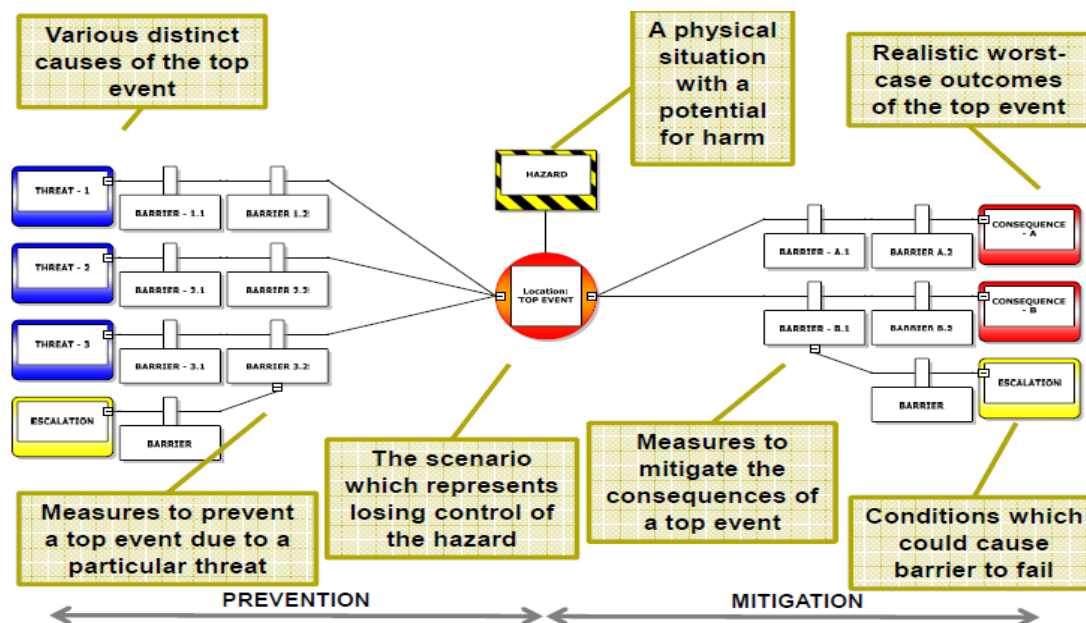
Key Elements

The independent verification:

- Gives assurance that SCEs and ECEs, as described in the RMH, and the schedule of examination and testing are suitable
- Gives independent assurance that the well design and well control measures are suitable

The RMH should give evidence to the Safety and Environmental Critical Elements, in order to facilitate the independent verification and assist the CA in the process of RMH acceptance:

Points to Address



Key Elements

The CMHPP :

- Defines the operator's responsibility for control of MA
- Requests the operator to set up an HSE management system
- Requests the operator to prepare and maintain a complete inventory of emergency response equipment pertinent to his operations
- Covers the operator's production installations outside the EU
- States that activities are suspended and measures taken in case of immediate danger to human health or increase of risk of Major Accident.
- Requires the operator to notify these situations to the CA no later than 24 hours after taking these measures.

Circumstances of major accidents in which the operator's subsidiaries are involved outside the EU, shall be reported to the CA

Implications

Reputation of the operators in the European context

Points to Address

- Involve the rig owners in this process, despite in Italy they in no way act as operators
- Align all subsidiaries to the same HSE management system framework

Emergency Response Plans and Transboundary Effects – Artt. 27 to 33

Key Elements

The Internal Emergency Response Plan (IERP) covers:

- Major Accident scenarios or situations where there is immediate risk of a MA
- Equipment and expertise that shall be available at all times
- Consequences of any material change in terms of emergency
- Link with External Emergency Response Plan (EERP)
- Internal and Transboundary Emergency Preparedness

Points to address

- Definition of a national strategy for Major Emergencies management, that includes the **assistance from specialised organisations like OSRL and EMSA** (Agency for European Maritime Safety)
- Focus on **prevention of escalation to MA** via dedicated equipments, like dispersants, booms, capping devices etc.
- Definition of environmental conditions that might influence the efficiency of the response equipment or the overall effectiveness of a response effort, and indications on **the need to either suspend operations or continue** on the basis of a risk assessment.

A Risk Acceptability Approach

**according to the previous
considerations**

Risk Acceptability Matrix: Start from Safety

Risk Acceptability Matrix

Consequence				Increasing Annual Frequency					
Severity	People	Environment	Reputation	0	A	B	C	D	E
				< 10-6 occ/y OR occ/unit OR occ/operation	10-6 to 10-4 occ/y OR occ/unit OR occ/operation	10-4 to 10-3 occ/y OR occ/unit OR occ/operation	10-3 to 10-2 occ/y OR occ/unit OR occ/operation	10-2 to 10-1 occ/y OR occ/unit OR occ/operation	> 10-1 occ/y OR occ/unit OR occ/operation
1	Slight health effect / injury				ALARP Region				
2	Minor health effect / injury								
3	Major health effect / injury				Not Acceptable Risk				
4	fatalities or multiple injuries*								
5	Potential exposure outside fence								



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(*) In case of Large Work Group, the ALARP condition is that the PLL (Potential Loss of Life) can be reduced to an extent that is compatible with costs of reduction.

Risk Acceptability Matrix:
Consider Environmental Sensitivity

Acceptability of the Environmental Risk (IPIECA*): sensitivity

Likely 10 ⁻²	Tolerable	if ALARP			Intolerable
Unlikely 10 ⁻³					
Very unlikely 10 ⁻⁴		★ Fishing area	★ Tourist beach ★ Tourist beach ★ Spawning	★ IBA2 ★ IBA1 ★ IBA2 ★ IBA1	Mangroves
Extremely unlikely 10 ⁻⁵			✗ Tourist beach ✗ Spawning ✗ Tourist beach	✗ IBA1 ✗ IBA2 ✗ IBA1 ✗ IBA2	
Remote 10 ⁻⁶	Broadly acceptable		✗ Spawning		
	Low	Moderate	Major	Catastrophic	Disastrous
★ Blowout 2,000 t/d – 50 d ✗ FPSO 11,000 t – 2 h + FPSO diesel spill 1,300 t – 2 d + Offloading 4,000 t – 1 h ● Subsea leak 100 t – 1 h ◆ Subsea leak 470 t – 12 h					

NOTE: sensitivity indexes of habitats and socio-economic factors are site-specific and may vary according to the area characterization. Examples:

- ☐ presence of rare and protected species
- ☐ natural park
- ☐ area interesting for science
- ☐ fish farms and similar

Sensitivity Index

Based on:

- Type of coast (sand, stones, etc.)
- Tidal exposure (repaired zone etc.)
- Productivity and biological sensitivity



Index 9/10 = Very High Sensitivity: sensitive areas, like swamps and coastal vegetation
(consequences: disastrous)



Index 8 = High Sensitivity: sheltered coastline, important bird areas (**NOTE**)
(consequences: catastrophic)



Index 7 = Average Sensitivity: exposed coastline, tourist areas, spawning areas (**NOTE**)
(consequences: major)



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(*) 1.Sensitivity Mapping for Oil Spill Response. 2. Oil Spill Response Joint Industry Project

Risk Acceptability Matrix

Consequence				Increasing Annual Frequency					
Severity	People	Environment	Reputation	0	A	B	C	D	E
				< 10-6 occ/y OR occ/unit OR occ/operation	10-6 to 10-4 occ/y OR occ/unit OR occ/operation	10-4 to 10-3 occ/y OR occ/unit OR occ/operation	10-3 to 10-2 occ/y OR occ/unit OR occ/operation	10-2 to 10-1 occ/y OR occ/unit OR occ/operation	> 10-1 occ/y OR occ/unit OR occ/operation
1		<u>Slight impact</u> : temporary impact on the habitat		ALARP Region					
2		<u>Minor impact</u> : 1 year for remediation; easy to remove							
3		<u>Local impact</u> : 2 years for remediation to beached oil							
4		<u>Major effect</u> : 5 years for remediation to beached oil; area sensitivity ≤ 8		Major Accident Hazard Region					
5		<u>Extensive effect</u> : 5 years for remediation to beached oil; area sensitivity > 8							
				Not Acceptable Risk					



Risk Acceptability Matrix:
Focus on Safety and Environmental Critical Elements

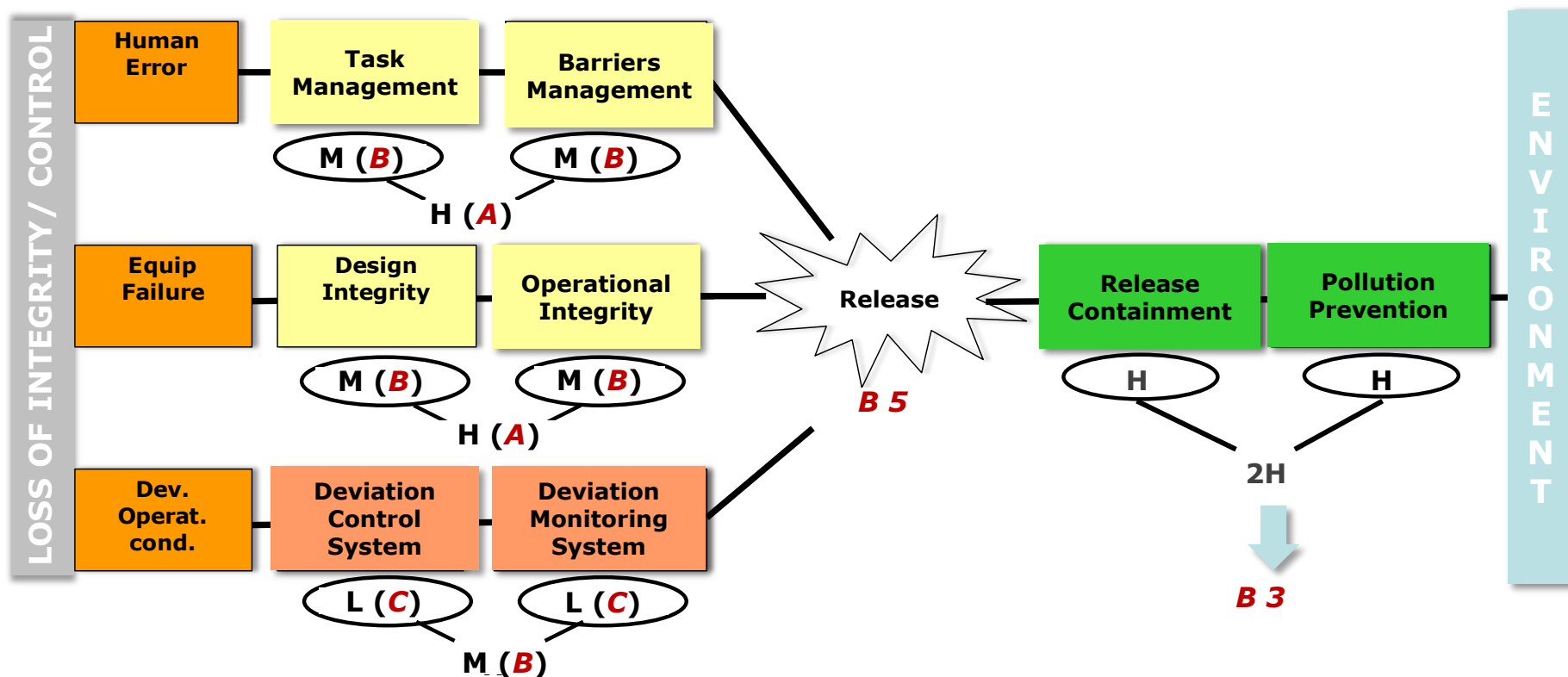
Working on barriers (1) - Safety/Environmentally Critical Elements

		No. of Barriers ^{/1/}		
		3	2	1
Reliability ^{/2/} of Barriers	High	0	0	A
	Medium	0	A	B
	Low	A	B	C

1. Barriers are of hardware and operational nature. Example of HW barrier for well ops.: pipe rams; example of Operational Barriers: wellbore fluid volume monitoring...
2. Reliability is a function of the barrier's nature; a barrier is highly reliable if:
 - a) the probability to fail on demand is low;
 - b) is covered by functional requirements/standards;
 - c) is fit for purpose or based on competence;
 - d) is properly maintained/testedHW barriers shall meet (a) to (d). Operational barriers meeting just (b),(c) and (d) or (a), (b), (c) have medium reliability (procedure-based performance). Operational barriers meeting (c) and (d) only have low reliability (risk-based performance)



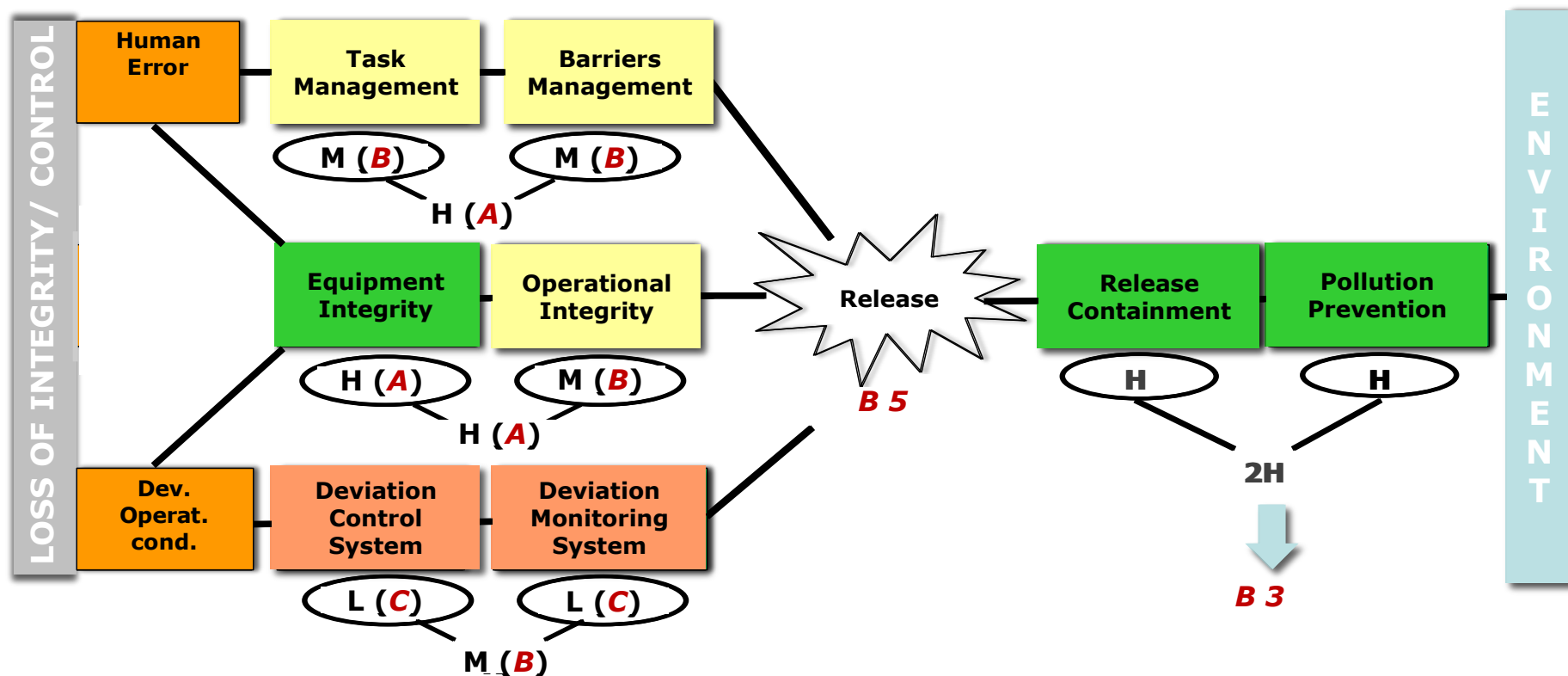
Working on barriers(2) - Safety/Environmentally Critical Elements



Bow Tie Diagram



Working on barriers(2) - Safety/Environmentally Critical Elements



Bow Tie Diagram



Risk Acceptability Matrix:
Financial Capability as an Acceptability Criteria

How the “Financial Capability” should work

OPOL UK (*) : pilot study

Scenario: capping device in place within 30 days			
Scenario	Max beached oil volume (m3)	Total cost in m€ for clean-up and compensation	Minimum cost in m€
A	65.000	250	
B	65.000	205	132
C	16.500	103	88
D	5.500	96	88
Scenario: relief well within 90 days			
Scenario	Max beached oil volume (m3)	Total cost in m€ for clean-up and compensation	Minimum cost in m€
A		650	310
B		618	353
C		323	265
D		353	280

- Ready to pay 250 m€ to recover and compensate some beached volume of oil (max 65,000 tons in the UK pilot study)
- Comparative clean-up costs per ton of oil spilled from tanker incidents are herewith listed (in USD**):

Italy	7,210.43
UK	3,398.21
United States	28,235.30

Being the ratio Italy vs UK = 2.15, we can assume that 250 m€ covers about 30,000 tons of beached oil.

- This figure can be assumed as a borderline between “design based scenario” (“what is possible to demonstrably consider as a reasonable technical & financial capability”) and a “major accident hazard”.
- All scenarios in excess of the “design based one” are “residual” and can be accepted only if they have a frequency not exceeding 10-3 in an environment with less/equal than 8 sensitivity index, and 10-4 if the index is >8.



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(*) Voluntary Oil Pollution Compensation Scheme (Offshore Pollution Liability Association – UK)

(**) Impact Assessment accompanying the Proposal for a Regulation of EU...2011

Risk Acceptability Matrix: Conclusive Considerations

Proposal: step-by-step approach for Environmental Risk

1. Use a risk-based approach to assess, case by case, what is the potential amount of oil spilled in the worst credible scenario (e.g. in the case of a blow-out)
2. Calculate the amount of oil that might beach or disperse once all the recovery measures (capping, booms, dispersants etc.) have been implemented
3. Calculate the expected time for beach cleaning and obtain expertise support (OSRL?) to calculate, according to the oil features, time for environmental remediation
4. Having all these information in hand, check if the scenario above can be tackled with an insured cost of 250 m\$. If this is the case, use such a scenario to demonstrate technical and financial capabilities in the course of licensing, public consultation and EIA process
5. Assess, in terms of QRA (probability vs severity of consequences) the residual risk, taking into account the coastal habitat and the special protection areas. Include the assessment into the Report on Major Hazards, describing all preventive and recovery barriers (SCE and ECE) that enable to keep risks into the ALARP region
6. Whenever additional measures need to be implemented to further reduce the risk (according to the ALARP process) or to neutralize the beached oil volume in excess of 30,000 tons and 10-3 occurrences per asset/operation, these shall be included in the Report as well and, if the EIA application requires to do so, notified to the Environmental Agency. This may imply an increase of the insured costs for the Operator.

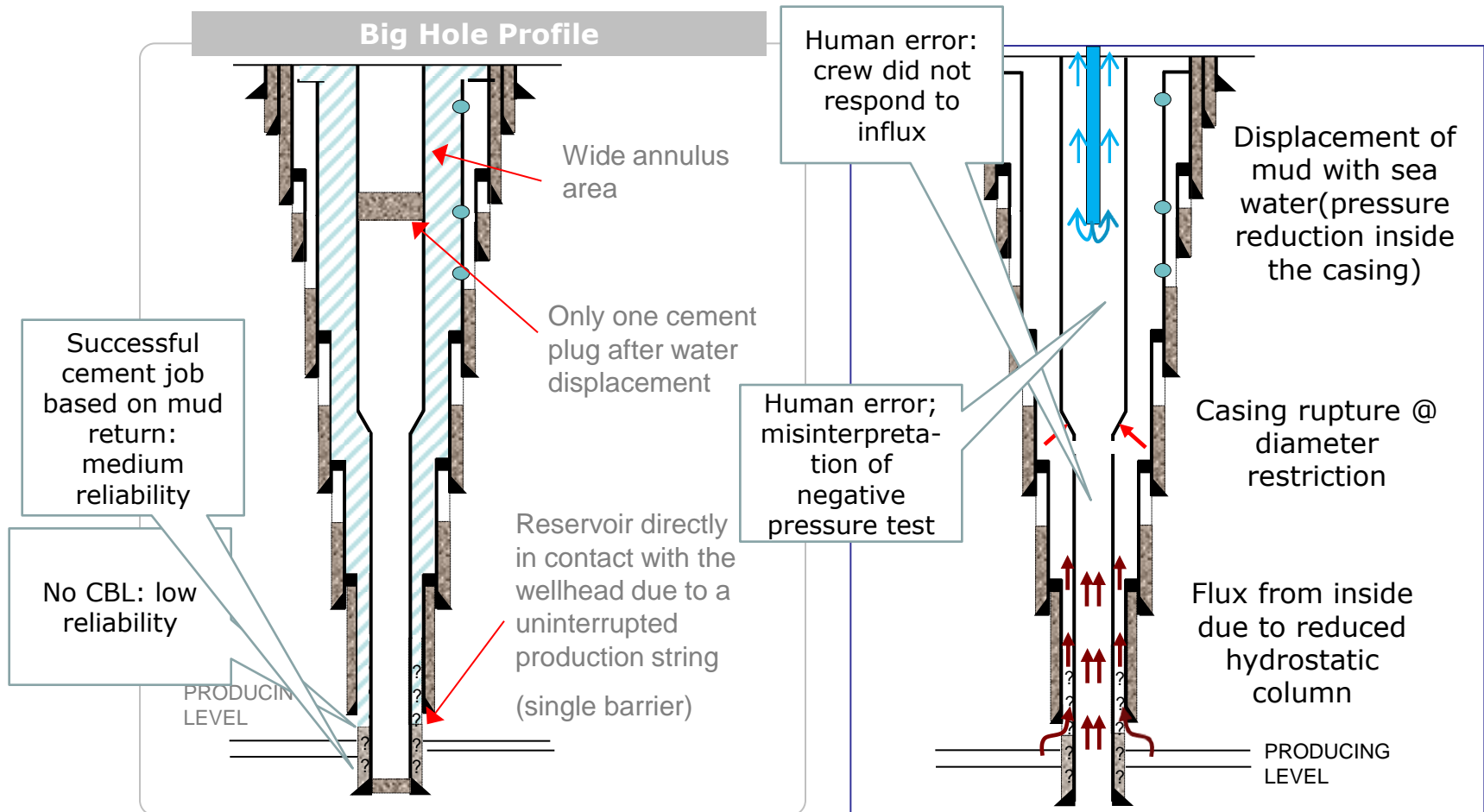


Example

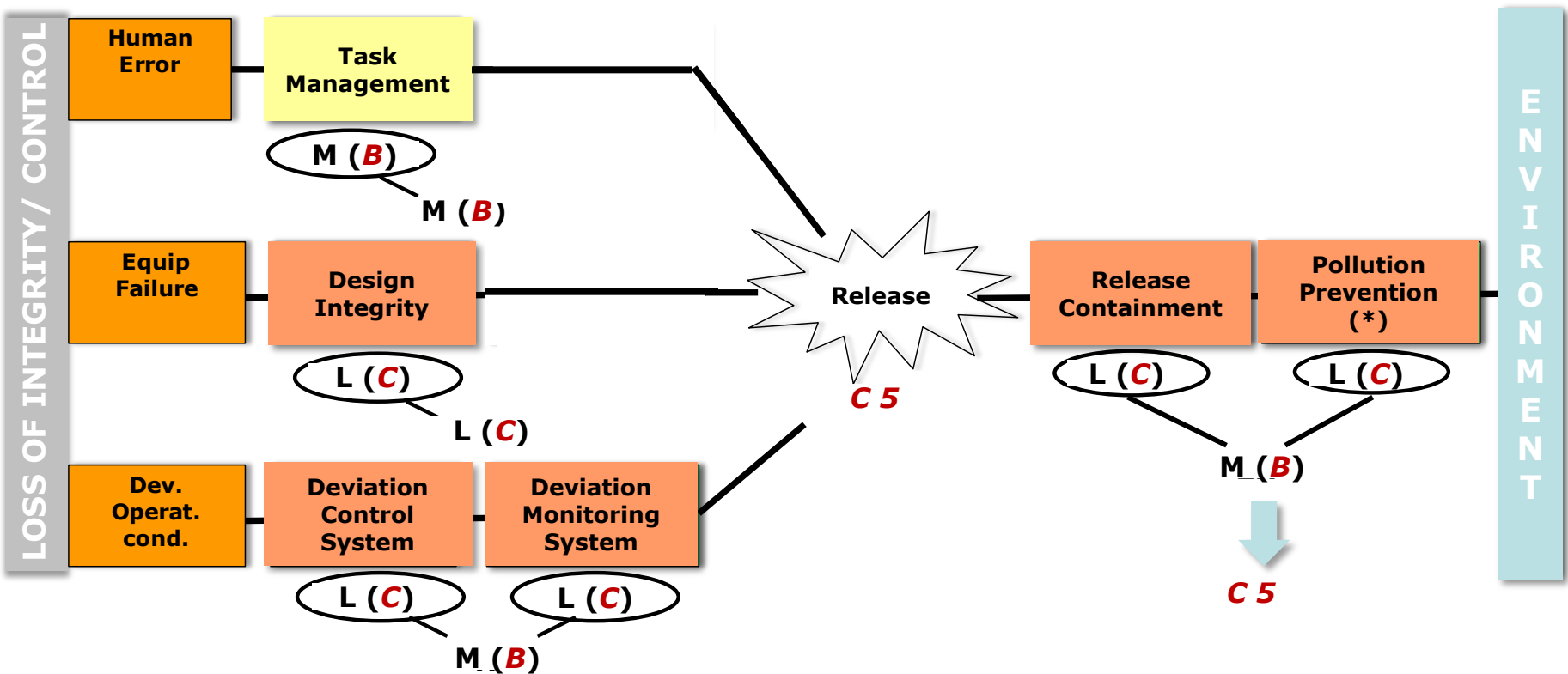
Macondo



Barriers' management in Macondo (1)



Barriers' management in Macondo (2)



Bow Tie Diagram



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(*) At Macondo, about 300,000 tons of oil had beached. Active clean-up in charge of BP has been declared as completed last April, totalizing 4 years. Costs have been amounted to 42 b\$.