

## **Identifying and Addressing Risk: The exercise of judgement in goal-setting regulatory models**

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Hazard identification and risk analysis are considered the core of a safety assessment structure. For the offshore oil & gas industry, the methods chosen should heavily depend on the stage of the project's life cycle and on the complexity of the assessed system. The method may also depend on the level of maturity of the operator's risk management system.

For instance, during the conceptual design, the risk assessors might opt for a method called HAZID (Hazard identification) in order to scan more external hazards (e.g. due to the location). At this stage, there is no reason to choose HAZOP (Hazard and Operability Analysis) or PSA (Probabilistic Safety Analysis), as risk assessors do not have enough details of the piping and instrumentation design or the equipment's specification and reliability.

The operators who are more mature in terms of risk management often combine analytical techniques to increase their knowledge and to understand specific scenarios, such as the ones above risk tolerance criteria.

Safety regulators are mainly concerned about suitability or fitness for purpose of the risk assessment methods, including the verification of how risks are addressed after being identified and assessed. In other words, in the demonstration that risks are controlled. One reason for this is the dependency of a decision-maker (usually a manager) to decide whether to implement the risk reduction measures proposed by risk assessors.

In objectives-based regulatory regimes, the oil & gas companies (the 'risk owners') are responsible for the management of the risk according to some risk tolerance criteria. Therefore, it is up to the companies to demonstrate that their risk reduction measures are backed up by good engineering practices (e.g. standards and codes) and that their risks are reduced to a level that is as low as reasonably practicable (ALARP). On the other hand, the role of the safety regulators is to make sure that the assessed risk is being properly managed.

In summary, regulators *will simply verify* whether oil & gas companies identified and assessed major risks, and reduced them to a level that is ALARP.

However, this is not as trivial as it seems to be. The goal-setting model allows risk owners to develop their own safety system, structure and safeguards while enabling regulators to challenge companies to improve their systems rather than being prescriptive. Despite these advantages, the goal-setting model demands the exercise of judgement by all involved.

For example, regulators may find it concerning if, in their view, there is evidence of:

- a manager systematically rejecting or changing risk reduction measures, or dismissing/altering/adapting them with no compelling technical foundation;
- successive postponement of the implementation of risk reduction measures, incompatible with the risk of the associated scenarios;
- critical safeguards being approved but not implemented in the installation;

- degraded critical safeguards (e.g. due to poor maintenance or quality control), with no mitigation measures in place;
- safeguards identified that are not compatible with the analysed risk scenarios;
- failure of risk communication, which may lead to a lack of commitment to risk reduction measures by operational personnel;
- the risk tolerance level used by the company (if not stated by the regulator) fluctuating or being dismissed over time and by convenience;
- failure of risk classification due to underestimated severity or likelihood of the scenario;
- hazard identification and risk analysis failing to consider recent incidents or changes implemented at the facility;
- Substitution of risk reduction 'hard barriers' (e.g. equipment) with 'soft barriers' (e.g. procedures and training) without properly re-assessing the risk (e.g. through a human reliability assessment).
- Misalignment between hazard identification and risk analysis application and the operator's safety philosophy or guidelines.

Depending on the country regulation, such evidence can result in non-conformities, fines and even operation halts for the oil & gas companies.

For instance, the Brazilian oil & gas regulator has halted the operations of 6.3% of the total offshore installations audited between 2010 and 2018, due to evidence of non-operational safeguards or the lack of implementation of risk reduction measures from risk assessments. From a sample of those installations<sup>1</sup>, it was observed that:

- *The recommendations proposed by risk assessors for scenarios considered 'Intolerable' showed the highest rate of rejection by the decision-makers. In contrast to what is expected of a risk-based management approach, for the 'lighter consequence scenarios' there was an emphatic acceptance of proposed corrective actions.*
- *Risk study recommendations are more frequently implemented during the design phase than during the operational phase. This data is evidence of the good practice which states that the earlier the hazard is identified the more cost-effectively it can be eliminated or managed.*
- *The majority of safety studies were hazard identification methods, with no further step to classify the risk. It corroborates that the implementation of recommendations proposed were not being prioritised according to fundamental risk-based criteria. Furthermore, it is suggested that the enforcement of the regulation plays an important role in the risk criteria used by the oil companies – as the industry gets to know what is acceptable by regulators and adapts to meet this expectation.*

Once the regulator finds evidence about the lack of implementation of recommended risk measures linked to scenarios above the risk tolerance criteria, the oil & gas company is urged to implement them as soon as possible. However, there are cases when oil & gas companies are unable to immediately implement the measures suggested by risk assessors, and thus propose contingency measures to the regulator. These interactions can lead to several loops until a final solution is accepted.

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<sup>1</sup> C. Morais, E. Correia, A. Bravim & N. Ferreira Criteria for implementation of risk analysis recommendations in oil and gas offshore production installations – In proceedings of ESREL 2016 (Glasgow, Scotland, 25-29 September 2016). CRC Press.

Reaching a common understanding regarding what is *reasonably practicable* can be even more challenging when decisions are based on qualitative risk assessment, as the oil & gas companies might be unable to fully demonstrate that temporary measures are equivalent to the originally proposed ones.

Although in the great majority of cases there is a common understanding of the ALARP concept, the evidence above suggests that the level of implementation of risk studies and the way companies are weighting risks and evaluating risk reduction measures may lead to some differences in technical judgement between risk owners and regulators. This might indicate some communication asymmetries in good engineering practices and assessment techniques, which should be gradually reduced in order to balance expectations regarding an effective offshore major risks control strategy.

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