CISAP 8 – International Conference on Safety & Environment in Process & Power Industry
Milano, 12-14 Settembre 2018

"OFFSHORE DIRECTIVE" ON MAJOR ACCIDENTS: A BARRIER BASED SAFETY MANAGEMENT SYSTEM BUILT ON SHARED ONTOLOGIES AND TAXONOMIES. REAL APPLICATIONS IN ITALY.

Luca Fiorentini [a], Giovanni Pinetti [a], Rosario Sicari [a], Marta Farinella [a], Luca Marmo [b]

[a] *TECSA S.r.l.*
[b] *Politecnico di Torino*

ABSTRACT

According to EU "Offshore" Directive by the next July, 19th safety cases (Relazioni Grandi Rischi - RGR, Major Accidents Report) should be submitted to the Authorities Having Jurisdiction (AHJ) in order to maintain the license to operate.

By the preparation of RGRs the Owner should identify all the hazards connected with the installation, assess all the major risks, identify the acceptable/tolerable risks against a defined ALARP criterion for human life and environment.

RGR is a document based on four different pillars of information: identification and description of the installation, safety management system in place, safety level and emergency management. According to the guidelines given by the AHJ safety level should be identified via a specific quantitative risk assessment that evaluates: safety criteria adopted during the design phase, historical experience, risk assessment, performance standards and identification of critical elements for safety and environment. Risk assessment is a crucial issue of the workflow.

According to the official guidelines, assessment should be conducted with different levels of detail (simplified, average, detailed). Simplified and average assessments result in a risk matrix application while the detailed assessment results in the evaluation of the IRPA index.

All of them move from an initial preliminary hazard analysis (PHA) based on HAZID and, differently from the risk assessment requirements for Seveso III onshore installations, fault tree and event tree assessments are replaced by a single method known as "Bow-Tie" (BT). BT is referenced both in ISO 31000, ISO 31010, ISO 13702 and in ISO 17776 international standards and is the official method of the IADC guidelines (such as the "Health, Safety, Environment Case Guideline for Mobile Offshore Drilling Units") by the most important drilling operators, in which the BT is the key element of the structured hazard identification and control process (SHIDAC).

Accordingly to the specific requirements of the guidelines BT risk assessment has been improved in order to:

- obtain a quantification of threats and consequences;
- incorporate a measure of the "human factor".

Each technical element / escalation factor and conditional modifier in the BT diagrams has been quantified using the AIChE-CCPA approach to Layers Of Protection Analysis (LOPA) while "human factor" related components have been quantified via a specific human reliability assessment (HRA) conducted via the Spar-H method by the U.S. Nuclear Regulatory Commission (Doc. N. NUREG/CR – 6883, 2005).

Present paper intends to highlight:

- the importance of a coherent assessment framework based on rule sets to manage all the information gathered during the various stages (also to facilitate the assessment conducted by the AHJ and the selected independent third-party inspector);
- the advantage coming from the use of a collector cloud based IT system to manage data during assessment and to update them in the future leveraging the MOC process (also enforced as a specific requirement of the directive) across several installations and assets with a barrier based management system.

Rule-sets have played a crucial role in each stage of the assessment, in particular to establish a common language based on several taxonomies to make the approach uniform and guarantee the consistency of the data in the future (where a specific process safety management system, PSMsys, will guarantee the continuous update of documents, information towards a live 'risk register' of major accidents).

A specific example will be made for SECE (Safety and Environment Critical Elements) to be divided into specific categories (preventing hazards, controlling hazards, mitigating hazards and elements related with evacuation and escape routes); those have been coupled with the taxonomy used by ISO 13702 in order to build a specific ontology related with systems able to control and mitigate fires and explosions and they have been described in terms of functionality, availability, reliability, survivability and independence.

The activity conducted showed a lot of benefits and demonstrated how to manage all the requirements coming from the application of several regulations and standars in complex installations. As anticipated all the workflow has been supported by a cloud-based IT specific platform.

Application of the BBMS resulted also in the possibility to collect information's, data, documents, performance indicators results to support the EU Directive requirements, to take better informed decisions, to real-time demonstrate to all the stakeholders the activities in place, the design intent with the intended results and the path to achieve those.

The possibility to employ an information technology systems allows to measure maturity levels of the barriers and underline (installation by installation) the quality of them with specific and shared taxonomies and ontologies.