

Modified Barrier and Operational Risk Analysis using Bayesian Approach: Towards Bayesian–BORA Methodology

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Abstract

BORA is relatively new approach developed for qualitative and quantitative risk and safety barriers analysis. It combines different methods: a barrier block diagrams, fault trees (FT), and risk influence diagrams in order to analyze the accident scenarios that may occur on oil and gas industries. For BORA applications, frequencies of initiating events, failure data of safety barriers as well as the scores and weights of risk influencing factors (RIFs) on the initiating event (IE) and safety barriers are essential to calculate risk frequencies. However, available failure data (PFD) and initiating frequencies from the industry are sparse and often statistically unreliable.

Therefore, Bayesian estimation using Bayesian Network (BN) seems helpful and adequate to these kinds of studies for different reasons: 1) It can update generic failure data with plant-specific failure data, and compensate for insufficient industry data. 2) The dependent character of sequences of accident between all events and failures of safety barriers which leading to the major accident seems also analyzed by Bayesian approach. 3) The third advantage concern the uncertain character presented in the scoring and weighting of each risk influencing factors (RIFs), the expert's data of scores and weights for RIFs quantification can be updated using Bayesian approach. All these advantages could well be in favor of this approach.

Through this paper we will show another Modified Barrier and Operational Risk Analysis using Bayesian approach, we attempt to respond that Bayesian–BORA methodology can be considered as tool for risk assessment of Risk Analysis. A comparative study will be made between the results of conventional BORA and Bayesian one. For this end, the rest of this paper is structured as follows: Introduction, section 2 describes briefly why use a Bayesian–BORA method? Section 3 and 4 presents Methodology development and the case study including the application of conventional BORA. Then, section 5 and 6 offers the discussion and validations of results.

At last, some perspectives about these difficulties and limitations were presented in order to improve this approach. For that, BORA is applied on an operational process, a combustible gas balloon (G01-VN-45-01) within the unit of gas treatment (UTGA), Sonatrach, Algeria).

Keywords:

Risk analysis, BORA approach, Bayesian approach Fault Tree, Diagram block barrier, safety barrier.