

Criticality analysis of petrochemical assets using risk based maintenance and the fuzzy inference system

ABSTRACT

Assets failure is widely considered as one of the main causes of major accidents in chemical industries such as fires, explosions, and toxic gas releases. Assets criticality analysis is vital to prevent such accidents. Risk-based maintenance (RBM) is among the most advanced comprehensive risk assessment methodologies for the criticality analysis of assets. The present study applies both traditional RBM and Fuzzy RBM (FRBM) methods for the risk analysis of petrochemical assets failure. Four consequence factors comprising operational impact, operational flexibility, maintenance cost, and impact on safety and environment are considered for the risk evaluation of assets failure. Moreover, frequency and risk factor scales are localized for both traditional RBM and Fuzzy RBM methods using an expert panel. The results of the case study show suitability of the FRBM model. Fuzzy numbers show that out of 107 assets, 10 are at the semi-critical level, and the remaining 97 are at the non-critical level. The highest fuzzy risk numbers were obtained for two blowers, where the assets failure value was 99.145. The criticality evaluation results show that the plant in the case study is at the semi-critical level. Given this, it is recommended that risk managers of the plant should customize and prioritise their maintenance planning according to the FRBM value for each asset failure. To this end, maintenance-related recommendations are offered to facilitate and assist decision-makers.

Keyword: Criticality analysis; Decision making; Fuzzy inference system; Risk based maintenance; Petrochemical company; Assets failures