

## **Identification and Prioritization of Risk Factors in Electrical Generator Based on Hybrid FMEA Framework**

### **ABSTRACT**

The oil and gas industry is looking for ways to accurately identify and prioritize the failure modes (FMs) of the equipment. Failure mode and effect analysis (FMEA) is the most important tool used in the maintenance approach for the prevention of malfunctioning of the equipment. Current developments in the FMEA technique are mainly focused on addressing the drawbacks of the conventional risk priority number calculations, but the group effects and interrelationships of FMs on other measurements are neglected. In the present study, a hybrid distribution risk assessment framework was proposed to fill these gaps based on the combination of modified linguistic FMEA (LFMEA), Analytic Network Process (ANP), and Decision Making Trial and Evaluation Laboratory (DEMATEL) techniques. The hybrid framework of FMEA was conducted in a hazardous environment at a power generation unit in an oil and gas plant located in Yemen. The results show that mechanical and gas leakage FM in electrical generators posed a greater risk, which critically affects other FMs within the plant. It was observed that the suggested framework produced a precise ranking of FMs, with a clear relationship among FMs. Also, the comparisons of the proposed framework with previous studies demonstrated the multidisciplinary applications of the present framework.

**Keywords:** Analytic Network Process (ANP); Decision Making Trial and Evaluation (DEMATE); electrical generators; failure modes; linguistic FMEA; oil and gas industry