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Evaluation of OHS Hazards and Associated Risk in the Fireworks Industry Using Fuzzy Logic

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Abstract

Working in the fireworks industry leads to many hazardous operations and makes life a tragic part. The fatality rate is always high, and the danger associated with the process also leads to physical and psychological damage. So the analysis of hazard and ranking with the help of fuzzy logic then gives the solution to mitigate the hazard and risk associated with the fireworks industrial process. Hazards are notified with the help of important measuring parameters of exposure timing. Hazard ratings are given with the help of crisp rating, from the ranking of hazards is given by the triangular fuzzy membership function. Subsequently mitigation procedure was also explained for the hazards, which could guideline for the workers in the industries. The proposed fuzzy-based qualitative risk valuation method proves more practical than traditional quantitative approaches, as it incorporates expert judgment under uncertainty. Results indicate that physical and chemical hazards contribute the highest risk ratings (e.g., Physical: 35%, Chemical: 30%). These hazards should be prioritized for control. Recommendations include implementing PESO compliance audits, structured training programs, and integrating fuzzy assessments with conventional quantitative methods for robust decision-making. In this paper, the proposed methodology used for well-being hazard risk valuation may be a generic one. However, the classification of hazards towards risk valuation is really industry-specific. This study contributes a comprehensive well-being hazard risk management approach for with success distinctive hazards, assessing risks and their management measures, which might give pointers to the managers for effective management of hazards and their associated risks for the development of workers' well-being and safety at the geographic point. The limitations of this study were seen as follows. The work reveals a module of qualitative risk valuation in an exceedingly fuzzy context. Numerous hazards were thought-about, like physical, chemical, ergonomic, psychosocial risks and also the corresponding significances, circumstances under which they occurred. The chance was subjectively assessed in terms of the results of exposure, the interval of exposure, and also the chance of exposure. Risk dimensions, sort as the significance of exposure, the amount of exposure, and the likelihood of exposure, are assessed subjectively instead of objectively.

Keywords

Firework hazards, fuzzy logic, and decision making

Biographies

Deepan K S is a student pursuing M.Tech Industrial Safety Engineering currently at Kalasalingam Academy of Research and Education, Krishnankoil, Srivilliputhur, Tamil Nadu. His undergraduate degree is in Electrical and Electronics Engineering at Kongu Engineering College, Perundurai, Tamil Nadu. He also published a paper on an IoT-

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Rajpradeesh T is a faculty member working as an assistant professor in the Department of Mechanical Engineering at Kalasalingam Academy of Research and Education, Krishnankoil, Srivilliputhur, Tamil Nadu. His research domains are Fire Engineering, Human Factors, Ergonomics and Health Care Management System. He published twenty research articles and was indexed in the Scopus database. He completed under studies in Electrical and Electronics Engineering and Post-graduation in Industrial Safety Engineering.