Journal of Advanced Multidisciplinary Studies
JAMS
+62 877-6589-8367
admin@jurnal-jams.or.id
https://jurnal-jams.or.id
Vol. 1, No. 2, Juli 2025 | Page. 241 - 246

THE ROLE OF FIRE EVACUATION AND SIMULATION TRAINING IN INCREASING EMPLOYEE EMERGENCY RESPONSE PREPAREDNESSBIN THE MANUFACTURING INDUSTRY

Hanum Prahasti[1], Ana Firdha A'qila[2], Nur Azizah Situmorang[3], Abdurrozzaq Hasibuan[4]
Occupational Health and Safety Study Program, Faculty of Public Health, State Islamic University of North Sumatra, Indonesia [1-3]
Industrial Engineering Study Program, Faculty of Engineering, Islamic University of North Sumatra, Medan-Indonesia[4]
Email: hanumprahasti.123@gmail.com, anafirdhaaqilaaa@gmail.com, nurazizahsitumorang02@gmail.com, rozzaq@uisu.ac.id

Keywords:

Emergency Preparedness, Manufacturing Industry, Evacuation Training, Occupational Safety, Fire Simulation

Abstrak

Emergency preparedness is an important component in occupational safety management systems, especially in manufacturing industries with high fire risk potential. This study aims to examine the role of evacuation training and fire simulations in enhancing employee readiness for emergency situations. The method used is a literature review of relevant national and international journals from the last 10 years. The results of the study indicate that periodic and systematic evacuation training and fire simulations can improve employees' understanding, skills, and rapid response to emergencies. The practical implication of this research is the importance of company management in designing comprehensive training programs, including the integration of evaluation and feedback after simulations. This research recommends continuous and hands-on training as the main strategy in creating an effective emergency response culture in the workplace.

INTRODUCTION

The manufacturing industry is a sector rife with potential risks of occupational accidents, including fires, explosions, and exposure to hazardous chemicals. According to data from the Ministry of Manpower of the Republic of Indonesia, fires are one of the most frequently occurring incidents in industrial workplaces. Therefore, it is crucial for companies to equip employees with emergency response skills through evacuation training and fire simulations.

Evacuation training is an educational process aimed at equipping workers with self-rescue procedures in emergency situations, while fire simulation is a practical exercise that mimics fire conditions as a trial of the designed emergency response system. The combination of both becomes an important strategy in creating overall employee preparedness. (Muhammad & Susilowati, 2021)

This research aims to analyze how evacuation training and fire simulation can enhance emergency response preparedness among manufacturing industry employees through a comprehensive literature study approach.

METHOD STUDY

This research uses a qualitative approach with a literature study method. Data sources are obtained from published scientific articles in accredited national journals and reputable international journals, as well as occupational safety reports from government agencies and OHS organizations. Inclusion criteria include articles on occupational safety training, fire simulation, and emergency preparedness in the manufacturing sector from 2013 to 2023.

The analysis was conducted by reading, understanding, and synthesizing important information from each source, and then organizing it into a systematic framework to find the relationship between training and readiness improvement.

RESULTS AND DISCUSSION

The research conducted by Santoso and Sari (2025) in the journal titled "Analysis of Emergency Preparedness and Response (EPR) Procedures as an Effort to Control Emergencies in Fire Situations at PT Gold Coin Indonesia" provides important contributions to the development of emergency preparedness systems in the manufacturing industry. This study focuses on evaluating the implementation of the Emergency Preparedness and Response (EPR) system in a livestock feed manufacturing company, particularly in dealing with fire conditions. Researchers emphasize that the integrated EPR system within the Occupational Health and Safety Management System (SMK3) must include evacuation training, emergency simulations, and the availability and maintenance of safety equipment such as fire extinguishers, hydrants, and hose reels. Findings show that training and simulations are conducted regularly; however, there are still shortcomings in terms of the frequency of simulations and the number of portable fire extinguishers (APAR), which can affect the effectiveness of emergency responses.

In the context of your research, this journal serves as a highly relevant reference as it proves that training and simulations play a crucial role in building employee preparedness for emergencies. Additionally, this study highlights the need for improving the quality of training, updating simulation materials, and the importance of involving all employees through the establishment of a structured emergency response team. Another aspect that also supports your research is the collaboration between the company and external parties, such as fire departments and BPBD, in conducting joint training sessions that can enhance responsiveness in real situations.

However, Santoso and Sari's (2025) research still has limitations because it has not explicitly measured the impact of training on behavioral changes or the readiness of individual employees quantitatively. Here lies the opportunity for your research to fill this gap, by investigating the direct relationship between the intensity of training and simulation on the level of employee readiness. Moreover, your research can expand the

study with an evaluative approach involving readiness measurement instruments, either through questionnaires, interviews, or performance observations during the simulation. Thus, this journal can serve as a strong foundation in developing a conceptual and methodological framework to delve into the role of training and simulation in enhancing emergency preparedness in manufacturing industry environments. (Studi et al., 2025)

The research conducted by Andreas Suhendi "Analysis of Altman Z-Score in Automotive Sub-Sector Manufacturing Companies Listed on the Indonesia Stock Exchange" indicates that the main focus of the study is to analyze the financial performance of automotive manufacturing companies through the Altman Z-Score model to predict potential bankruptcy. This journal highlights the importance of maintaining liquidity, debt restructuring, and enhancing profitability and operational efficiency as efforts to minimize the risk of financial distress. Moreover, the discussion in the journal also explains that the risk of bankruptcy does not solely stem from internal factors such as financial problems, but also from external factors, such as supply chain disruptions and unexpected natural disasters.

The connection between this journal lies in the aspect of risk management in manufacturing companies. Suhendi's journal emphasizes that external risks, including disasters such as fires, can disrupt production processes and threaten business continuity. Therefore, the company's preparedness in facing emergencies becomes a crucial factor in maintaining operational and financial stability. Evacuation training and fire simulation are part of the external risk mitigation strategy that is highly relevant for implementation in the manufacturing industry. These efforts not only protect the safety of employees and company assets but also contribute to operational sustainability and prevent significant losses that could impact the company's financial condition.

By integrating the findings from Suhendi's journal, your research can highlight that emergency response preparedness through fire training and simulation is a non-financial investment that supports the health and sustainability of companies. This is in line with the journal's recommendation that companies not only focus on financial aspects, but also pay attention to external factors that can trigger a crisis. Therefore, your research can enrich the literature by adding the emergency preparedness dimension as one of the important factors in the risk management of manufacturing companies, which can ultimately help companies reduce potential losses and minimize the risk of financial distress. (Suhendi, 2015)

Research conducted by Setyawan et al. (2024) in a journal entitled "Fire Disaster Mitigation Program in the Karanganyar Animal Feed Processing Industry" shows that the implementation of fire disaster mitigation programs, which include early warning, fire suppression simulations, and disaster evacuation, is able to increase workers' knowledge about fire preparedness. Although the results of the statistical test (p-value = 0.053) showed a statistically significant increase, there was a positive trend in the workers' knowledge score from pre-test to post-test. These findings align with the focus of your research, which focuses on the role of evacuation training and fire simulation as key strategies in building employee preparedness for emergencies.

Both have similarities in approach, namely applying practice-based training (simulation) and the use of knowledge evaluation instruments (pre-test and post-test). However, Setyawan et al.'s research is more oriented towards community service activities with a practical approach, while your research has the potential to expand its scope academically with a focus on a systematic evaluation of the relationship between

training intensity and preparedness effectiveness. The advantage of the journal Setyawan et al. is the existence of comprehensive field implementation documentation, such as the installation of fire extinguishers, alarms, and evacuation signs, as well as technical training on the use of fire extinguishers. It provides a concrete example of how training and support tools can be integrated to build collective preparedness in the workplace.

In contrast, a shortcoming in the study is the lack of direct behavioral measurements during simulations and the lack of real-time evaluation of changes in attitudes or readiness to act. Therefore, this study can strengthen the scientific contribution by evaluating not only the increase in knowledge, but also the change in attitudes and practical responses of employees in the face of fire simulations. In conclusion, the journal Setyawan et al. provides a solid foundation for the development of your research, while also opening up space for a more in-depth study of the effectiveness of evacuation and simulation training in improving emergency preparedness in the manufacturing industry sector. (Karanganyar et al., 2024)

Research conducted by Kuntoro, K., Lestantyo, D., & Ekawati, E. "Preparedness of Plate Work Unit (PPL) Employees Against the Risk of Fire Hazard at PT. INKA (Persero)" This study highlights the importance of employee preparedness in dealing with fire risks in the manufacturing environment, especially in units that have high potential hazards due to activities such as welding and grinding. In an effort to increase the preparedness, PT. INKA (Persero) has implemented several strategies, such as the implementation of safety talks on a regular basis, providing training and simulation of fire emergency response every six months, and socialization of emergency response procedures to all employees.

Interestingly, the results of this study show that there is a significant relationship between the implementation of safety talk and employee preparedness, but no significant relationship was found between training and working period and preparedness level. This indicates that even though training has been carried out regularly, the effectiveness of training in improving preparedness still needs to be evaluated, especially related to the equitable distribution and quality of training implementation in all work units. This study also recommends that training be carried out evenly and periodically to all employees, as well as the need for evaluation and innovation in training methods to be more effective in shaping preparedness behavior.

Evacuation and fire simulation training is one of the main interventions to improve emergency response preparedness in the manufacturing industry. Research can take lessons from this journal findings, for example by reviewing more in factors that influence the effectiveness of training and simulation, and how the training can be integrated with safety communication (safety talk) so that the impact on employee preparedness becomes more optimal. Thus, your research can be the development of this study, especially in evaluating the quality, frequency, and the most effective method of training and simulation of fure to form emergency response behavior among employess of the manufacturing industry.

Based on the study of the literature that has been done, the evacuation training and fire simulation has been proven to have a significant role in increasing employee preparedness to face an emergency in the manufacturing industry. A number of studies have shown that training carried out routinely, structured, and-based experience is directly able to increase knowledge, skills, and rapid response to workers when facing fire conditions. (Suryawan Murtiadi, Didi S. Agustawijaya, Akmaluddin, Ngudiyono &

Kencanawati, 2023)

Journal of Setyawan et al. (2024) confirms that the implementation of disaster mitigation programs such as the installation of early warning systems, fire outage training using APAR, and evacuation of fire through socialization and the installation of evacuation routes contributed positively to the increase achieved has not been statistically significant, there is a positive tendency that indicates the importance of this training as part of risk management.

In addition, research by Santoso and Sari (2025) underlined the importance of the integration of the Emergency Preparedness and Response (EPR) system with evacuation and simulation training as part of the K3 management system. The implementation of the EPR which includes training, simulation, and provision of emergency response aquipment susch as APAR and Hydrant is an important strategy to minimize risk when a fire occurs.

The Kuntoro et al study. (2020) emphasizes the importance of strengthening the quality of training and safety communication, such as safety talk, because training is less evenly distributed and not standardlized does not necessarily produce optimal preparedness in all work units.

Overall, findings from various journals support the hypothesis that evacuation and fire simulation training is an important instrument in increasing employee preparedness. However, the effectiveness is greatly influenced by the frequency, quality of delivery, and training integration, with work safety culture in the company.

SUGGESTION

Evacuation training and fire simulation are key strategies in improving employee emergency response preparedness in the manufacturing industry. Based on the results of the literature review, a structured training program that is carried out regularly is able to increase the knowledge and readiness of employees in dealing with fires, although in some cases the increase is not statistically significant. Factors such as the quality of training, management involvement, and the provision of safety facilities and infrastructure also influence the success of this program.

The overall findings reinforce the urgency of companies not only providing formal training, but also evaluating and innovating training methods to achieve more optimal results. This training not only has an impact on work safety, but also contributes to the sustainability of the company's operations by reducing potential losses due to fire incidents. Therefore, this study suggests the need for continuous, risk-based, and integrated fire evacuation and simulation training in the company's occupational safety management system.

BIBLIOGRAPHY

Karanganyar, P. T., Setyawan, H., Qadrijati, I., Fajariani, R., Wardani, T. L., Ismayenti, L., Ditya, H., Nugroho, E., Rinawati, S., Atmojo, T. B., Sari, I. Y., Putri, P. W., Utami, P. A., Studi, P., Keselamatan, D., Universitas, K., & Maret, S. (2024). *Fire Disaster Mitigation Program at The Animal Feed Processing Industry in Karanganyar*. *11*(September), 209–219.

Muhammad, I., & Susilowati, I. H. (2021). Analisa Manajemen Risiko K3 Dalam Industri Manufaktur Di Indonesia: Literature Review. *PREPOTIF : Jurnal Kesehatan Masyarakat*, *5*(1), 335–343. https://doi.org/10.31004/prepotif.v5i1.1635

Studi, P., Industri, T., Teknik, F., Pembangunan, U., Veteran, N., Timur, J., Madya, J. R., & Anyar, G. (2025). *Analysis of Emergency Preparedness and Response Procedures in The State on Fire at PT Gold Coin Indonesia*. *9*(1), 157–164.

Suhendi, A. (2015). Analisis Altman Z-Core pada Perusahaan Manufaktur Sub Sektor Otomotif yang Terdaftar di Bursa Efek Indonesia. *GEMA : Jurnal Gentiaras Manajemen Dan Akuntansi*, *13*(2), 135–148. https://doi.org/10.47768/gema.v13i2.240

Suryawan Murtiadi, Didi S. Agustawijaya, Akmaluddin, Ngudiyono, N. N., & Kencanawati. (2023). Pelatihan Rekayasa Bangunan Dan Jalur Evakuasi Menghadapi Bahaya Kebakaran Untuk Praktisi Muda Di Kota Mataram. *Jurnal Pepadu*, *Vol. 4*(2715–9574), 1–23.