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Implementation Of Occupational Safety And Health (OSH) As An Effort To Prevent Work Accidents In The Production Process At PT XX

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Abstract
Occupational Safety and Health (OSH) is an essential aspect of industrial activities that contributes to the creation of a safe, healthy, and productive work environment. The high risk of workplace accidents in production processes requires companies to implement effective OSH programs to minimize potential hazards that may cause losses to both workers and the company. This study aims to analyze the implementation of Occupational Safety and Health (OSH) as an effort to prevent workplace accidents in the production process at PT XX. The research employed a descriptive qualitative method, with data collected through field observations, interviews, and document reviews. The results indicate that PT XX has implemented various OSH programs, including the use of personal protective equipment (PPE), occupational safety training, installation of safety signs, and routine inspections of production areas and work equipment. However, several challenges were still identified, such as suboptimal worker compliance with PPE usage and limited awareness of potential hazards in the workplace. The consistent implementation of OSH practices has been proven to reduce the risk of workplace accidents and support the continuity of production activities. Therefore, continuous improvement in supervision, employee guidance, and the strengthening of a safety culture are necessary to enhance the effectiveness of OSH implementation within the company.

Keywords: Occupational Safety And Health (OSH), Workplace Accidents, Production Process, Accident Prevention, Industry.

1. Introduction

Occupational Safety and Health (OSH) is a crucial aspect of industrial activities, particularly in industries with high-risk operations such as the textile industry. Production processes in the textile industry generally involve the use of chemicals, high-temperature operations, moving machinery, and complex production systems that may expose workers to various occupational hazards. According to the International Labour Organization (ILO), workplace accidents and occupational diseases continue to pose significant challenges worldwide, resulting in economic losses, reduced productivity, and adverse impacts on worker well-being. Therefore, the implementation of effective OSH programs is essential to protect workers, maintain operational continuity, and support sustainable industrial development(Fithri et al., 2020).

The textile industry is characterized by various potential hazards arising from production activities, including exposure to hazardous chemicals, mechanical hazards from machinery, excessive noise, high temperatures, and ergonomic risks. Improper handling of chemicals, inadequate machine guarding, and unsafe work practices may increase the likelihood of workplace accidents and occupational health problems. Consequently, companies are required to establish comprehensive safety management systems that can effectively identify hazards, assess risks, and implement appropriate control measures to minimize accident occurrence (Ivascu et al., 2021).

PT XX, as a company operating in the textile sector, faces various occupational safety and health challenges throughout its production process. The use of chemicals in dyeing and finishing operations, the operation of production equipment, and worker interaction with industrial machinery create potential risks that require continuous monitoring and control. In addition to technical hazards, human factors such as lack of safety awareness, non-compliance with safety procedures, inadequate training, and improper use of Personal Protective Equipment (PPE) may contribute to workplace incidents. These conditions highlight the importance of strengthening OSH implementation to ensure a safe working environment and prevent occupational accidents (Rr Safina Febriyanti & Noeroel Widajati, 2025).

Although numerous studies have discussed OSH implementation in manufacturing industries, limited studies have specifically evaluated workplace safety performance and equipment failure risks in textile production processes using Failure Mode and Effects Analysis (FMEA). The application of FMEA enables companies to identify critical failure modes, evaluate their potential impacts, and prioritize corrective actions based on risk levels. Therefore, this approach can provide more effective recommendations for accident prevention and operational safety improvement(Ali & Zulkaple, 2023).

Based on these considerations, this study aims to evaluate the implementation of Occupational Safety and Health (OSH), analyze workplace safety performance, determine the Risk Priority Number (RPN) using Failure Mode and Effects Analysis (FMEA), and propose corrective actions to reduce workplace accident risks in the production process at PT XX. The findings of this study are expected to contribute to the improvement of workplace safety performance, enhance worker awareness of occupational hazards, and support the development of a safer and more effective production system(Ivascu & Cioca, 2019).

2. Research Methods

2.1 Research Design and Object

This study employed a descriptive research design integrating qualitative observations and semi-quantitative risk assessment methods. The research was conducted at PT XX, a company operating in the textile industry sector, where production activities involve various occupational hazards associated with machinery operation, chemical handling, and continuous manufacturing processes. The study aimed to evaluate the implementation of Occupational Safety and Health (OSH) practices and identify potential workplace hazards that may contribute to occupational accidents(Ivascu & Cioca, 2019).

The research participants consisted of employees, supervisors, and safety personnel directly involved in production activities and workplace safety management. Respondents were selected using a purposive sampling technique to ensure that participants possessed sufficient knowledge and experience regarding operational processes and safety practices within the company. This approach enabled the collection of comprehensive information regarding workplace conditions, hazard sources, and existing safety control measures(Pedrosa et al., 2025).

2.2 Data Collection and Instrumentation

Data used in this study consisted of primary and secondary data. Primary data were collected through direct workplace observations and semi-structured interviews with selected respondents. Observations were conducted to evaluate working conditions, employee behavior, machine operation practices, housekeeping conditions, and the availability and proper use of Personal Protective Equipment (PPE). Semi-structured interviews were performed to obtain information regarding workers' perceptions of workplace hazards, safety awareness, compliance with safety procedures, and accident prevention practices(Fithri et al., 2020).

Secondary data were obtained from company documents, including Occupational Safety and Health policies, Standard Operating Procedures (SOPs), accident and incident reports, safety inspection records, safety training documentation, and other relevant reports. Document reviews were conducted to support the findings obtained through observations and interviews. Data triangulation was applied to improve the validity and reliability of the research findings by comparing information obtained from different sources and methods(Ivascu et al., 2021).

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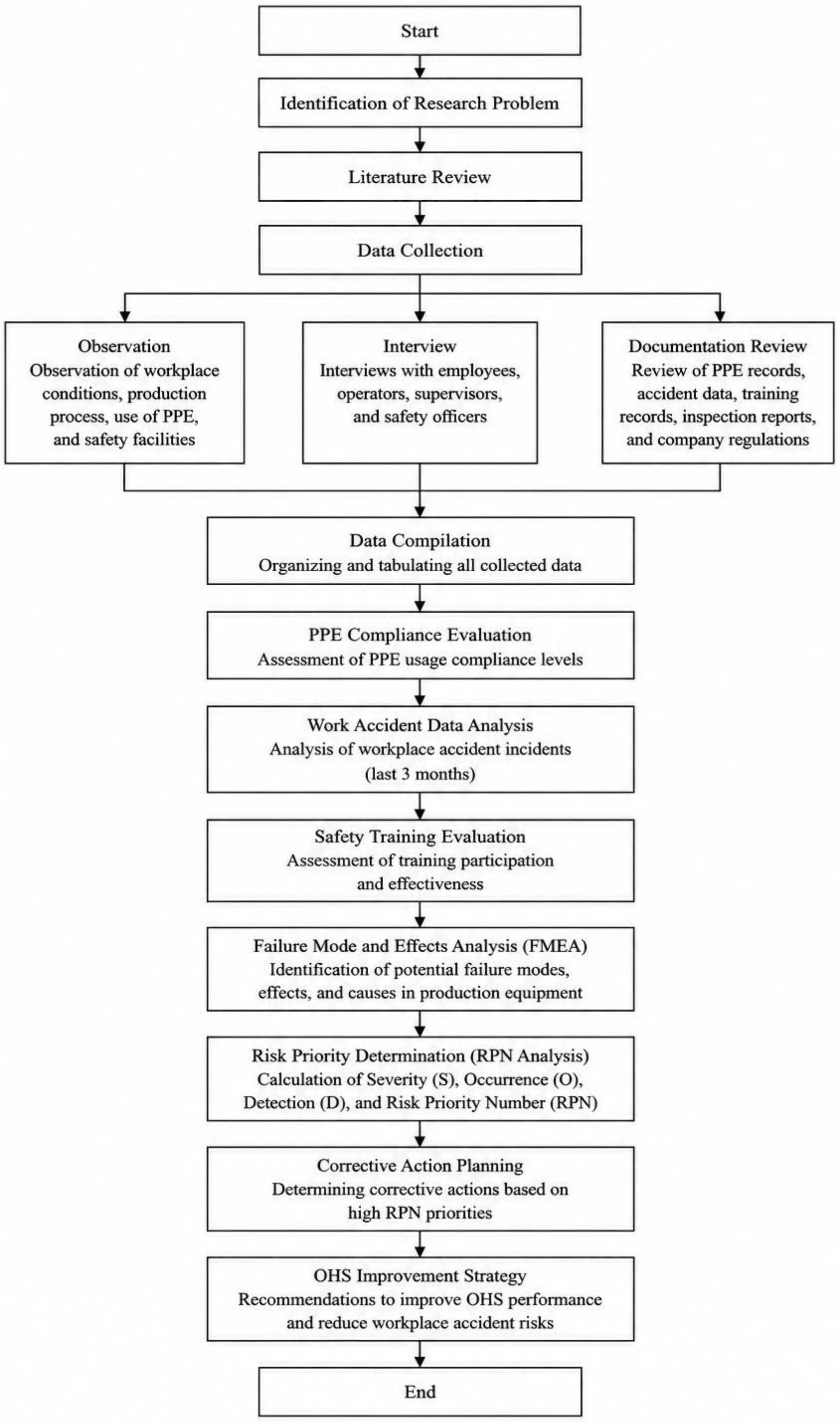

Figure 1. Research Flow Diagram

2.3. Failure Mode and Effects Analysis (FMEA)

Failure Mode and Effects Analysis (FMEA) was applied to identify potential failure modes in production equipment and operational processes that could affect workplace safety and production continuity at PT XX. This method was used to evaluate possible equipment failures, determine their causes and effects, and prioritize corrective actions based on risk levels. Each failure mode was assessed using three parameters: Severity (S), Occurrence (O), and Detection (D). Severity represents the seriousness of the consequences resulting from a failure, Occurrence indicates the probability of the failure occurring, and Detection reflects the ability of existing controls to identify the failure before it causes adverse effects(Rr Safina Febriyanti & Noeroel Widajati, 2025).

The Risk Priority Number (RPN) was calculated using the following equation:

$$\mathbf{RPN = S \times O \times D}$$

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The calculated RPN values were used to rank the identified failure modes according to their level of risk. Components with higher RPN values were considered critical and prioritized for corrective actions, preventive maintenance, and operational improvements(Al-Hourani & Hassanlou, 2025).

2.4. Data Analysis Procedure

The research was conducted through several stages. First, workplace observations, interviews, and document reviews were carried out to collect data regarding Occupational Safety and Health (OSH) implementation at PT XX. Second, the collected data were analyzed to evaluate PPE compliance, workplace accident records, and safety training programs(Jalil Al-Bayati et al., 2023). Third, Failure Mode and Effects Analysis (FMEA) was applied to identify critical equipment failures and determine Risk Priority Number (RPN) values. Fourth, components with the highest RPN values were prioritized for corrective actions and preventive measures. Finally, recommendations were developed to improve Occupational Safety and Health (OSH) implementation and reduce workplace accident risks in the production process at PT XX(Grafkina et al., 2023).

3. Results and Discussions

3.1 Results

The results of this study were obtained through workplace observations, interviews, document reviews, and Failure Mode and Effects Analysis (FMEA) conducted at PT XX. The collected data were analyzed to evaluate the implementation of Occupational Safety and Health (OSH) practices, including the use of Personal Protective Equipment (PPE), workplace accident records, safety training programs, and potential equipment failures that may affect operational safety. The findings provide an overview of the current safety performance and identify areas requiring improvement to enhance workplace accident prevention efforts(Wachter & Yorio, 2014).

3.1.1 Personal Protective Equipment (PPE) Usage

The assessment of Personal Protective Equipment (PPE) usage was conducted among all 309 workers at PT XX across various production departments. The results presented in Table 1 indicate different levels of compliance depending on the type of PPE used. Safety shoes achieved the highest compliance rate, with all workers consistently wearing the required footwear during operational activities. Similarly, mask usage was relatively high, with 250 workers complying with company regulations. In contrast, the use of safety helmets and gloves was considerably lower, with only 159 workers wearing helmets and 100 workers using gloves during their work activities(Alferdaws & Ramadan, 2020).

The variation in compliance levels suggests that workers may perceive certain types of PPE as more important or more comfortable to use than others. Safety shoes are generally considered essential because they are worn continuously throughout the work shift and provide direct protection against falling objects, sharp materials, and slipping hazards. On the other hand, gloves and helmets may sometimes be viewed as inconvenient or restrictive, particularly during tasks that require precision and flexibility. Low compliance with glove usage is particularly concerning because workers in textile manufacturing are frequently exposed to chemicals, hot surfaces, and mechanical hazards that can cause injuries to the hands. These findings indicate that stronger supervision, regular inspections, and continuous awareness campaigns are necessary to improve PPE compliance and reduce the risk of occupational accidents(Achumie et al., 2022).

Table 1. Personal Protective Equipment (PPE) Usage at PT XX

No	Type of PPE	Total Workers	Using PPE	Not Using PPE
1	Safety Helmet	309	159	150
2	Gloves	309	100	209
3	Mask	309	250	59
4	Safety Shoes	309	309	-

To provide a clearer visualization of worker compliance with personal protective equipment requirements, the PPE compliance rates are presented in Figure 2.

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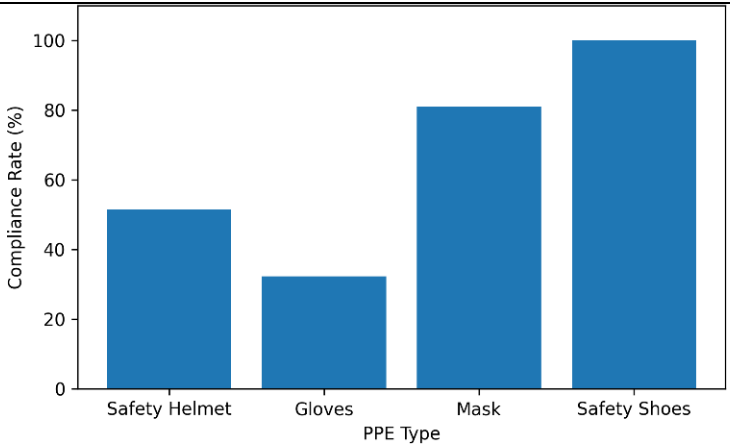

Figure 2. PPE Compliance Rate at PT XX

As illustrated in Figure 2, safety shoes achieved the highest compliance rate at 100%, followed by masks at 80.91%. In contrast, safety helmet and glove compliance rates were significantly lower at 51.46% and 32.36%, respectively. These findings indicate that additional efforts are required to improve worker compliance, particularly regarding the use of gloves and safety helmets(Adade-Boateng et al., 2021).

3.1.2 Work Accident Data (Last 3 Months)

Workplace accident records were reviewed for the period from January to March, and the results are presented in Table 2. During the observation period, three workplace accidents were recorded in January, consisting primarily of minor injuries and cases of skin irritation. No accidents were reported during February and March. Although the total number of incidents was relatively low compared to the total workforce, the occurrence of these accidents demonstrates that occupational hazards remain present within the production environment(Zhang et al., 2020).

The incidents recorded in January may be associated with worker exposure to chemicals, unsafe work practices, or inadequate use of personal protective equipment. Skin irritation, for example, is commonly linked to direct contact with chemicals used in dyeing and finishing operations(Melnikova et al., 2015). While the absence of accidents in February and March may indicate improvements in safety performance and hazard control measures, it should not lead to complacency. Workplace accidents often occur due to a combination of unsafe conditions and unsafe behaviors, and therefore continuous monitoring, incident reporting, and preventive actions remain necessary. The company should also conduct periodic evaluations to identify the root causes of previous incidents and implement corrective measures to prevent similar events from occurring in the future.

Table 2. Work Accident Data (Last 3 Months) at PT XX

No	Month	Number of Accidents	Type of Accidents
1	January	3	Minor injuries, irritation
2	February	-	-
3	March	-	-

3.1.3 Work Safety Training Data

Safety training is one of the fundamental components of an effective Occupational Health and Safety (OHS) management system. As shown in Table 3, PT XX has implemented several training programs covering various aspects of workplace safety, including PPE usage, machine safety, chemical handling, emergency response, firefighting, and workplace ergonomics. The data indicate that PPE Usage Training, Emergency Response Training, and Firefighting Training achieved attendance rates of 100%, demonstrating strong management commitment to ensuring that workers possess basic safety knowledge and emergency preparedness skills(Rahman et al., 2022).

Despite these positive results, participation rates varied among the different training programs. Machine Safety Training achieved an attendance rate of only 60%, while Work Ergonomics Training recorded the lowest participation rate at 50%. Chemical Handling Training achieved a moderate attendance rate of 75%. These findings suggest that not all workers have received comprehensive training related to the hazards they may encounter during daily operations. Low participation in machine safety training is particularly concerning because machinery-related accidents often result in severe injuries. Similarly, insufficient ergonomics training may increase the likelihood of musculoskeletal disorders, which can negatively affect worker health and productivity over the long term. Therefore, increasing training participation and ensuring that all employees receive regular refresher training should be considered a priority(Ruttenberg et al., 2020).

Table 3. Work Safety Training Data at PT XX

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No	Type of Training	Participants	Freq. (times/year)	Attendance (%)	Description
1	PPE Usage	309	4	100%	Mandatory for all workers
2	Machine Safety	75	3	60%	Machine operators
3	Chemical Handling	129	2	75%	Production & laboratory
4	Emergency Response	309	2	100%	All employees
5	Firefighting	309	2	100%	Field simulation
6	Work Ergonomics	50	1	50%	Finishing department

3.1.4 Failure Mode and Effects Analysis (FMEA)

Failure Mode and Effects Analysis (FMEA) was conducted to identify potential equipment failures that could affect operational safety and production continuity. Based on the analysis, the Circulation Pump obtained the highest Risk Priority Number (RPN) value of 112, indicating that this component represents the most critical failure mode within the production system. The Operator Monitoring system followed with an RPN value of 105, while several other components, including the Heater, Alarm System, and Heat Exchanger, obtained RPN values of 96.

The high RPN values indicate that failures in these components could significantly disrupt production operations and potentially increase safety risks for workers. For example, failure of the Circulation Pump may result in uneven process conditions, reduced product quality, and increased operational instability. Similarly, deficiencies in operator monitoring systems may delay the identification of abnormal operating conditions, increasing the likelihood of process deviations and equipment damage. These findings highlight the importance of preventive maintenance programs, equipment inspections, calibration activities, and the implementation of backup systems to reduce the probability of critical equipment failures. Regular review of FMEA results is also necessary to ensure that corrective actions remain effective and aligned with changing operational conditions(Gomaa, 2025).

Table 4. FMEA Analysis for Production Equipment at PT XX

No	Component	Function	Failure Mode	Cause	Effect	S	O	D	RPN	Recommendation
1	Heater	Heating dye solution	Heater overheating	Temperature control failure	Unstable fabric color	8	3	4	96	Calibrate temperature control system
2	Circulation Pump	Circulating dye solution	Pump stops working	Motor failure	Uneven dye distribution	7	4	4	112	Routine maintenance and backup pump
3	Dyeing Machine	Fabric dyeing process	Machine stops	Mechanical damage	Production stops	8	3	3	72	Regular machine inspection
4	Cooling System	Reducing process temperature	Cooling failure	Cooling water stops	Process overheating	7	3	4	84	Install backup cooling system
5	Temperature Sensor	Measuring temperature	Sensor failure	Poor calibration	Temperature undetected	6	3	5	90	Install redundant sensors
6	Pressure Sensor	Monitoring system pressure	Sensor malfunction	Instrument damage	Pressure unmonitored	6	3	5	90	Backup sensors and calibration
7	Control System	Controlling parameters	System failure	Software error	Unstable process	7	2	4	56	Software update and interlock
8	Inlet Valve	Regulating water flow	Valve stuck open	Mechanical damage	Excess water enters	6	3	4	72	Regular valve inspection
9	Pressure Relief Valve	Reducing pressure	Valve fails to open	Valve stuck	Pressure increases	9	2	4	72	Routine valve maintenance
10	Heat Exchanger	Regulating temperature	Fouling in exchanger	Dirt accumulation	Heating efficiency drops	6	4	4	96	Periodic cleaning
11	Alarm System	Providing hazard warning	Alarm inactive	Electrical failure	Operator unaware of danger	8	3	4	96	Redundant alarm system

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12	Operator Monitoring	Supervising production	Delayed response	Lack of training	Problems not handled quickly	7	3	5	105	Operator training and clear SOP

3.2 Research Limitations

This study was limited to a single textile manufacturing company and a relatively short observation period. Therefore, the findings may not fully represent Occupational Safety and Health (OSH) conditions in other industrial sectors. In addition, the analysis was based on available workplace accident records, PPE compliance data, safety training data, and Failure Mode and Effects Analysis (FMEA) results obtained during the study period. Future research is recommended to involve multiple companies, longer observation periods, and additional risk assessment methods to provide a more comprehensive evaluation of workplace safety performance(Sanni-Anibire et al., 2020).

3.3 Practical Implications

The findings of this study provide practical guidance for industrial managers and safety practitioners in improving Occupational Safety and Health (OSH) performance. The identified issues related to PPE compliance, worker participation in safety training, and equipment reliability can be addressed through stricter supervision, continuous safety awareness programs, and preventive maintenance activities. Furthermore, the FMEA results can assist management in prioritizing corrective actions for critical equipment, thereby reducing workplace accident risks and supporting the continuity of production operations(Tortorella et al., 2020).

4. Conclusion

Based on the findings of this study, it can be concluded that the implementation of Occupational Safety and Health (OSH) at PT XX has generally been carried out through the provision of Personal Protective Equipment (PPE), workplace safety training programs, routine inspections, and safety management practices. However, several areas still require improvement to enhance the overall effectiveness of workplace accident prevention. The PPE compliance evaluation showed that safety shoes and masks achieved relatively high compliance rates, while the use of safety helmets and gloves remained relatively low. These findings indicate the need for stronger supervision, increased worker awareness, and stricter enforcement of PPE regulations. In addition, the workplace accident records demonstrated that although the number of incidents was relatively low, potential occupational hazards still exist and require continuous monitoring and preventive measures(Obianuju Ozobu et al., 2025).

The results of the safety training assessment revealed varying participation levels among workers. While emergency response, firefighting, and PPE training achieved full participation, machine safety and ergonomics training showed lower attendance rates, indicating the need for broader training coverage and more consistent employee involvement. Furthermore, the FMEA analysis identified the Circulation Pump and Operator Monitoring system as the most critical components, with Risk Priority Number (RPN) values of 112 and 105, respectively. These components should be prioritized for corrective actions through preventive maintenance programs, enhanced monitoring systems, and additional operator training. Overall, the study demonstrates that strengthening PPE compliance, expanding safety training participation, and implementing corrective actions based on FMEA findings are essential to reducing workplace accident risks and improving Occupational Safety and Health performance at PT XX(Hardianty et al., 2025).

Reference

Achumie, G. O., Oyegbade, I. K., Igwe, A. N., Ofodile, O. C., & Azubuike, C. (2022). A Conceptual Model for Reducing Occupational Exposure Risks in High-Risk Manufacturing and Petrochemical Industries through Industrial Hygiene Practices. *International Journal of Social Science Exceptional Research*, *1*(1), 26–37. https://doi.org/10.54660/ijsser.2022.1.1.26-37

Adade-Boateng, A. O., Fugar, F., & Adinyira, E. (2021). Framework to Improve the Attitudes of Construction Workers towards Safety Helmets. *Journal of Construction in Developing Countries*, *26*(2), 65–86. https://doi.org/10.21315/jcdc2021.26.2.4

Al-Hourani, S., & Hassanlou, A. (2025). An Enhanced RPN Model Incorporating Maintainability Complexity for Risk-Based Maintenance Planning in the Pharmaceutical Industry. *Processes*, *13*(10). https://doi.org/10.3390/pr13103153

Alferdaws, F. F., & Ramadan, M. Z. (2020). Effects of lifting method, safety shoe type, and lifting frequency on maximum acceptable weight of lift, physiological responses, and safety shoes discomfort rating. *International Journal of Environmental Research and Public Health*, *17*(9). https://doi.org/10.3390/ijerph17093012

Ali, N. F., & Zulkaple, R. (2023). Occupational Safety and Health (OSH) Knowledge, Practices and Injury Patterns among Solvent Manufacturing Workers: A Cross-sectional Study. *Malaysian Journal of Medicine and Health Sciences*, *19*, 47–55. https://doi.org/10.47836/mjmhs.19.s14.6

Fithri, P., Nofriyanti, Hasan, A., & Kurnia, I. (2020). Risk Analysis for Occupational Safety and Health in Manufacturing Company Using FMEA and FTA Methods: A Case Study. *IOP Conference Series: Materials Science and Engineering*, *1003*(1). https://doi.org/10.1088/1757-899X/1003/1/012073

Gomaa, H. A. (2025). Enhancing Failure Mode and Effects Analysis with Industry 4.0 (FMEA 4.0): A Comprehensive Review and Strategic Framework. *International Journal of Darshan Institute on Engineering Research and Emerging Technologies*, *Vol 14*(2), 01–12. https://doi.org/10.32692/IJDI-ERET/14.2.2025.2504

Grafkina, M. V., Sviridova, E. Y., & Goryacheva, E. V. (2023). Reducing Occupational Risks in Industrial Processes: Analysis and Recommendations for Improving Safety in Production Equipment and Facilities. *International Journal of Safety and Security Engineering*, *13*(5), 781–788. https://doi.org/10.18280/ijsse.130502

Hardianty, H., Sari, S. N., & Deviyanti, A. Y. (2025). The Influence of Occupational Safety Training on Compliance With The Use of PPE in Health Facilities. *Oshada*, *2*(5), 46–56. https://doi.org/10.62872/yxpwc009

Ivascu, L., & Cioca, L. I. (2019). Occupational accidents assessment by field of activity and investigation model for prevention and control. *Safety*, *5*(1). https://doi.org/10.3390/safety5010012

Ivascu, L., Sarfraz, M., Mohsin, M., Naseem, S., & Ozturk, I. (2021). The causes of occupational accidents and injuries in romanian firms: An application of the johansen cointegration and granger causality test. *International Journal of Environmental Research and Public Health*, *18*(14). https://doi.org/10.3390/ijerph18147634

Jalil Al-Bayati, A., Rener, A. T., Listello, M. P., & Mohamed, M. (2023). PPE non-compliance among construction workers: An assessment of contributing factors utilizing fuzzy theory. *Journal of Safety Research*, *85*, 242–253. https://doi.org/10.1016/j.jsr.2023.02.008

Melnikova, N., Wu, J., & Orr, M. F. (2015). Public health response to acute chemical incidents—Hazardous Substances Emergency Events Surveillance, nine states, 1999-2008. *Morbidity and Mortality Weekly Report. Surveillance Summaries (Washington, D.C. : 2002)*, *64*(2), 25–31.

Obianuju Ozobu, C., Emmanuel Adikwu, F., Odujobi, O., Othuke Onyeke, F., & Onyinye Nwulu, E. (2025). Developing an AI-Powered Occupational Health Surveillance System for Real-Time Detection and Management of Workplace Health Hazards. *World Journal of Innovation and Modern Technology E*, *9*(1), 156–185. https://doi.org/10.56201/wjimt.v9.no1.2025.pg156.185

Pedrosa, M. H., Salazar, A. K., Cardoso, C., & Guedes, J. C. (2025). Study on Safety Culture Following the Implementation of a Near-Miss Management System in the Traditional Manufacturing Industry. *Safety*, *11*(1). https://doi.org/10.3390/safety11010023

Rahman, F. A., Arifin, K., Abas, A., Mahfudz, M., Cyio, M. B., Khairil, M., Ali, M. N., Lampe, I., & Samad, M. A. (2022). Sustainable Safety Management: A Safety Competencies Systematic Literature Review. *Sustainability (Switzerland)*, *14*(11). https://doi.org/10.3390/su14116885

Rr Safina Febriyanti, & Noeroel Widajati. (2025). Factors influencing compliance with personal protective equipment use among manufacturing workers: A literature review. *World Journal of Advanced Research and Reviews*, *25*(3), 1334–1338. https://doi.org/10.30574/wjarr.2025.25.3.0874

Ruttenberg, R., Raynor, P. C., Tobey, S., & Rice, C. (2020). Perception of Impact of Frequent Short Training as an Enhancement of Annual Refresher Training. *New Solutions*, *30*(2), 102–110. https://doi.org/10.1177/1048291120920553

Sanni-Anibire, M. O., Mahmoud, A. S., Hassanain, M. A., & Salami, B. A. (2020). A risk assessment approach for enhancing construction safety performance. *Safety Science*, *121*, 15–29. https://doi.org/10.1016/j.ssci.2019.08.044

Tortorella, G., Cómbita-Niño, J., Monsalvo-Buelvas, J., Vidal-Pacheco, L., & Herrera-Fontalvo, Z. (2020). Design of a methodology to incorporate lean manufacturing tools in risk management, to reduce work accidents at service companies. *Procedia Computer Science*, *177*, 276–283. https://doi.org/10.1016/j.procs.2020.10.038

Wachter, J. K., & Yorio, P. L. (2014). A system of safety management practices and worker engagement for reducing and preventing accidents: An empirical and theoretical investigation. *Accident Analysis and Prevention*, *68*, 117–130. https://doi.org/10.1016/j.aap.2013.07.029

Zhang, J., Fu, J., Hao, H., Fu, G., Nie, F., & Zhang, W. (2020). Root causes of coal mine accidents: Characteristics of safety culture deficiencies based on accident statistics. *Process Safety and Environmental Protection*, *136*, 78–91. https://doi.org/10.1016/j.psep.2020.01.024

DOI: https://doi.org/10.69693/ijmst.v4i2.9824