PREVENTION OF OCCUPATIONAL INJURIES IN FOUDRIES BY USING EVENT TREE ANALYSIS METHOD

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ABSTRACT

Occupational injuries within foundries pose significant risks to workers' health and safety. Foundry operations involve various hazardous activities such as molten metal handling, heavy machinery operation, exposure to high temperatures, and chemical substances. This abstract highlights strategies and measures aimed at preventing occupational injuries in foundries. Implementation of strict safety protocols is paramount. This includes conducting thorough risk assessments, ensuring compliance with safety standards, and providing personal protective equipment tailored to the specific hazards encountered in foundriesThis abstract delves into strategies aimed at preventing occupational injuries within foundry environments. By examining the inherent risks associated with foundry work, this paper explores a range of proactive measures and best practices.It discusses engineering controls, personal protective equipment training protocols,ergonomic considerations, and the implementation of comprehensive safety programs.Emphasizing a multi-faceted approach, the abstract highlights the importance of collaboration between management, workers,and regulatory bodies to create a safer work environment in foundries.

INTRODUCTION

To develop and implement a comprehensive safety framework advancements, employee training,and interventions aimed at significantly reducing and preventing occupational injuries in foundries.

This project aims to analyze, identify, and address potential hazards, introducing proactive measures to enhance worker safety, health, and overall well-being about within the foundry environments. "Foundries, are essential to various industries, play a pivotal role in manufacturing by shaping raw materials into usable products. However, these environments are inherently hazardous, posing significant risks to workers' safety and health. The prevention of occupational injuries in foundries stands as a critical concern, demanding proactive measures and robust strategies to mitigate these risks. From molten metal hazards to exposure to harmful chemicals and physical strains, safe guarding workers in foundries requires a comprehensive approach encompassing safety protocols, training initiatives, technological advancements, and regulatory compliance. This introduction explores the challenges faced in preventing occupational injuries within foundries and delves into the multifaceted strategies employed to ensure a safer working environment for all personnel involved.The prevention of occupational injuries in foundries is a critical aspect of ensuring workplace safety and protecting the health of workers employed in these environments. Foundries are industrial settings where metals are melted and poured into molds to create various products. However, these settings pose significant risks to workers due to the presence of heavy machinery, extreme temperatures, exposure to hazardous chemicals, and physical strain.

LITERATURE SURVEY

1)In Comparison of the chemical health risk assessment of exposure to metal fumes.

Author Sara Karimi et al.,In Comparison of the chemical health risk assessment of exposure to metal fumes for the furnace operator of a foundry industry using quantitative and semi-quantitative methods.Aossessing the health risk of exposure to metal fumes for furnace operators.Heavy metals effects on the workers' bodies due to their accumulation in the vital organs.The current study aimed to assess the health risk of exposure to metal fumes for furnace operators.

2)Risk analysis and warning rate of hot environment for foundry industry using hybrid MCDM technique.

Author Ilang kumaran et al.,(2015).Risk analysis and warning rate of hot environment for foundry industry using hybrid MCDM technique. Protection of health and safety needs to evaluate the risk and warning rate of hot environment without compromising productivity of the organization. In this paper, a novel hybrid technique was proposed for assessing the work safety in hot environments using multi criteria decision making (MCDM) technique..

3)Job safety hazard identification and risk analysis in the foundry division of a gear manufacturing industry.

Author Rajkumar, K.Subash et al.,(2021) Job safety hazard identification and risk analysis in the foundry division of a gear manufacturing industry. The case assessment is carried out using the risk assessment methods with the combination of JSA analysis method. The effective methodology potential type of incidents is identified by using the Job Safety Hazard Identification and Risk Assessment (JSHIRA) analysis.

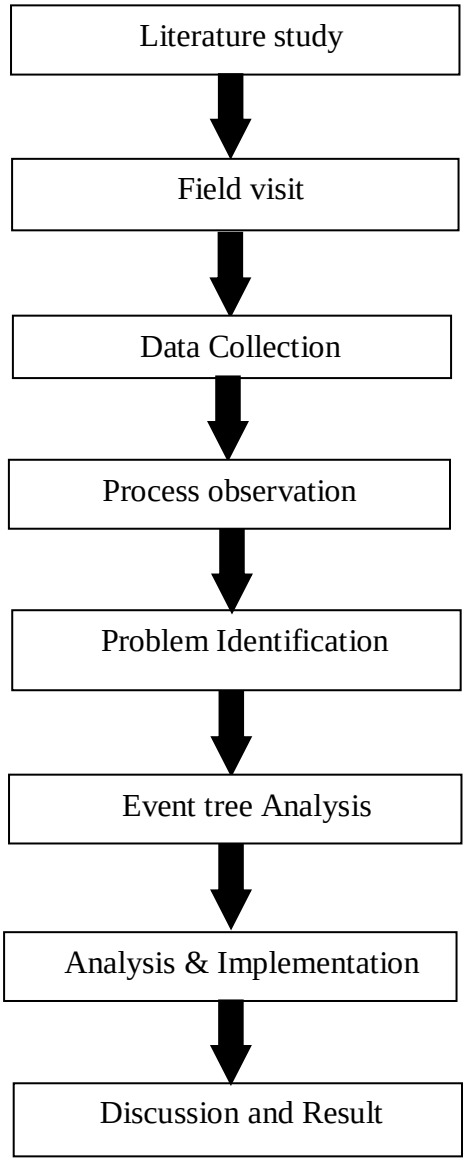
4)Ensuring safe working conditions during the operation of foundry equipment.

Author V Ya Manokhin,EI Golovina,(2020).Ensuring safe working conditions during the operation of foundry equipment.Prevention of occupational diseases and reduction of the concentration of pollutants. in the atmospheric air of the working area.The aim of the study is to assess the elemental and dispersed composition of dust,which determines the hygienic state of the working area of the foundry.

5)Workplace respirable dust monitoring and risk factor assessment in foundry process.

Author Somnath Sen, Jogattappa Narayana (2016).Workplace respirable dust monitoring and risk factor assessment in foundry process.Assessing occupational exposure to ambient respiratory dust in their work environment and rates of risk factors.A study was carried out among iron foundry workers to assess occupational exposure to ambient respiratory dust in their work environment and rates of risk factors in each process by using Bayesian decision analysis.

METHODOLOGY



PROBLEM IDENTIFICATION

Occupational injuries are a relevant research and practical issue. However, intervention studies evaluating the effectiveness of workplace injury prevention programs are seldom performed. Occupational injuries are still very common and have strong and serious consequences for workers, employers and companies, and at large According to the International Labour Organization, 317 million accidents occur worldwide on the job annually; every 15 s 153 workers have a work-related accident and 1 worker dies from a work-related accident or disease.

Identifying problems in the prevention of occupational injuries in foundries involves recognizing key challenges. Issues may include, insufficient use of personal protective equipment, inadequate lighting lack of effective hazard communication, poor ergonomic practices, and outdated machinery .Additionally, factors like high noise levels ,exposure to harmful substances, and heat stress can contribute to occupational risks. Addressing these problems requires a comprehensive assessment of work processes and a commitment to implementing and enforcing safety measures.

MAJOR HAZARD

1. Scrap loading hazard
2. Molten metal transferring hazard
3. Splash hazard
4. Converter hazard
5. EOT Crane hazard

INITIATING EVENTS :

1. Leakage in press pour area
2. Overload during the convertor operation
3. Tapping metal from the holding furnace

INITIATING EVENT PROBABILITY RATE PER YEAR

Leakage in press pour area = 1×10^{-4}

Overload during the convertor operation = 1×10^{-3}

Tapping metal from the holding furnace = 1×10^{-2}

Risk Assessment and Management:

Conduct regular risk assessments to identify potential hazards in the foundry. Implement a comprehensive risk management plan to mitigate identified risks. Prioritize hazards based on severity and likelihood of occurrence. Regularly review and update risk assessments to account for changes in processes or equipment.

Corrective action for EOT crane hazard:

Implementing anti-collision devices in the EOT cranes, the cranes working in the same bay to prevent collision. Implementing sound alarm for the Safe Working Load when exceeds the capacity of crane.

Corrective action for Converter operation:

•Use automation:

Employ automated systems for tasks such as charging, tapping, and slag removal to reduce manual intervention and minimize worker exposure to hazards.

•Implement safety systems:

Install safety features such as emergency shut-off valves, pressure relief devices, and temperature monitoring systems to prevent overpressure and overheating.

•Monitor refractory conditions:

Regularly assess the condition of refractory linings to ensure they remain intact and can withstand the high temperatures and corrosive environments inside the converter.

Prevention of hearing problems in the Foundries :

Administrative Controls:

•Job Rotation:

Rotate workers through different tasks to reduce prolonged exposure to high noise levels.

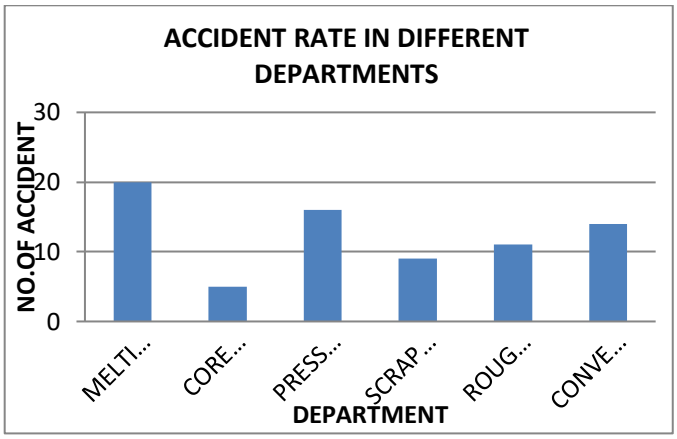
•Limit Exposure Time:

Limit the duration of exposure to noisy areas through scheduling and break rotations.

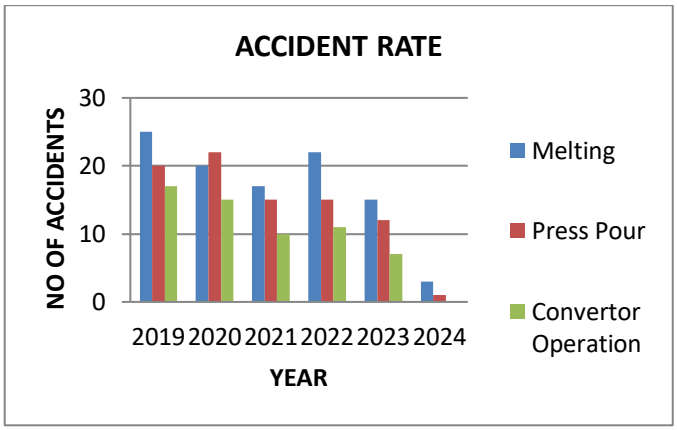
IMPLEMENTATION OF SAFETY MEASURES

Identifying problems in the prevention of occupational injuries in foundries involves recognizing key challenges. Issues may include, insufficient use of personal protective equipment, inadequate lighting lack of effective hazard communication, poor ergonomic practices, and outdated machinery. Additionally, factors like high noise levels, exposure to harmful substances, and heat stress can contribute to occupational risks. Addressing these problems requires a comprehensive assessment of work processes and a commitment to implementing and enforcing safety measures.

ACCIDENT RATE IN DIFFERENT DEPARTMENTS



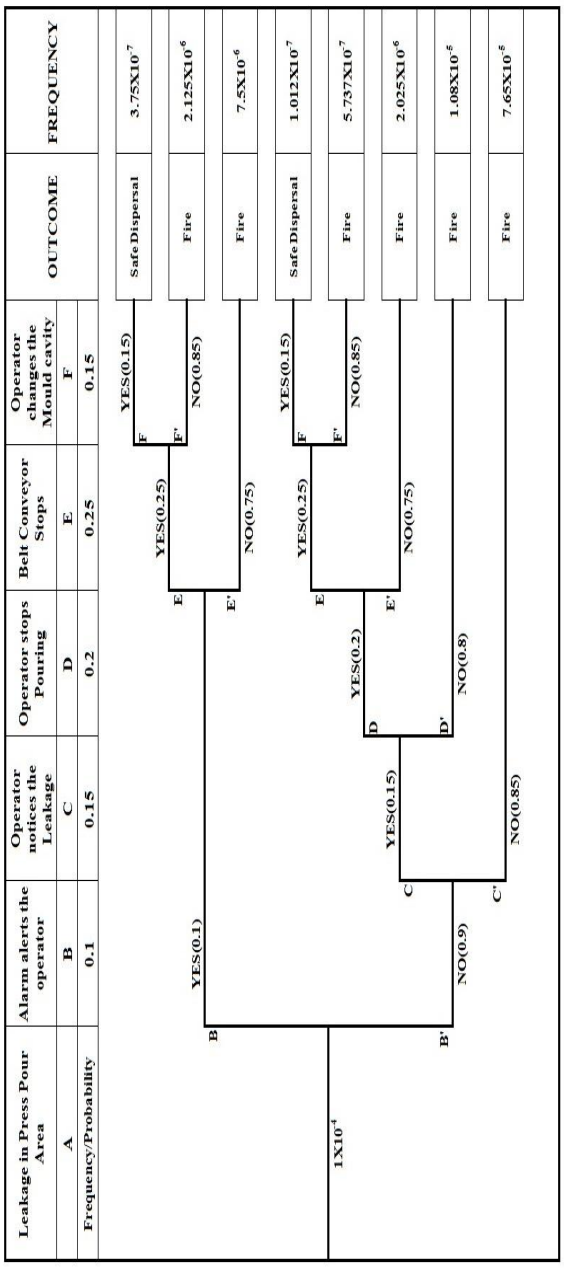
ACCIDENT RATE FROM 2019 TO 2024



RESULTS AND DISCUSSION:

PROCESS-1

Leakage in press pour area



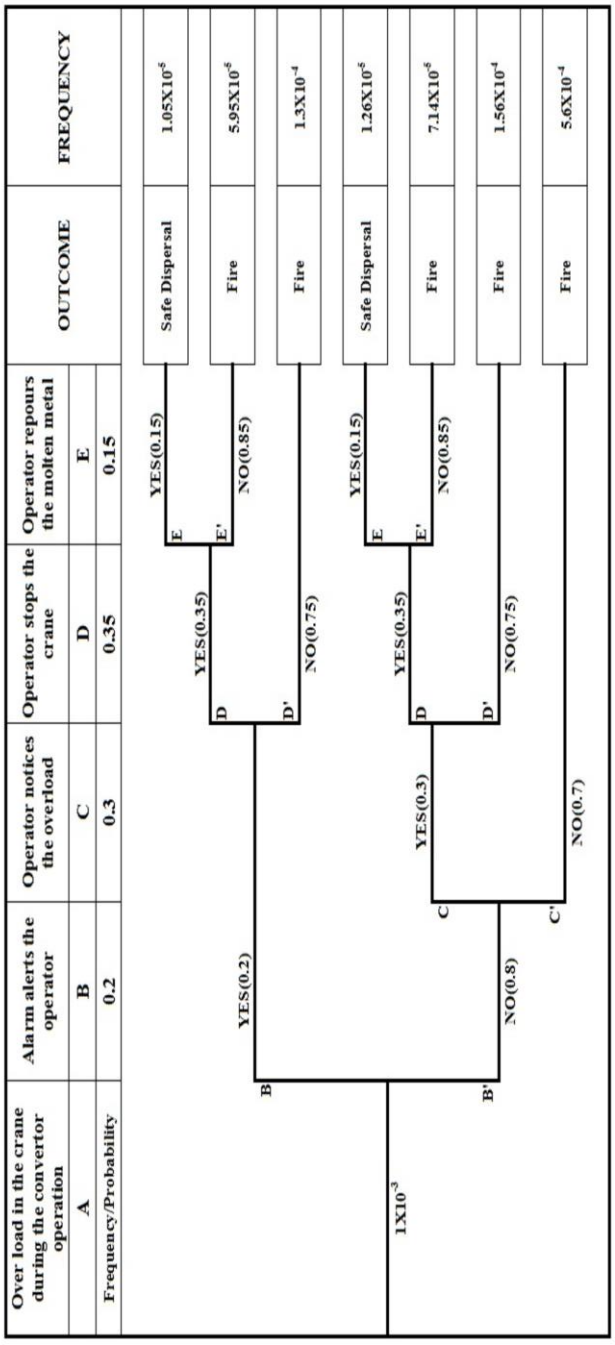
Sequence leading to outcome :

Safe dispersal : ABEF+AB'CDEF = 4.762×10^{-7}

Fire : ABEF'+ABE'+AB'CDEF'+AB'CDE'+ AB'CD'+AB'C' = 9.952×10^{-5}

PROCESS – 2

Overload during the convertor operation



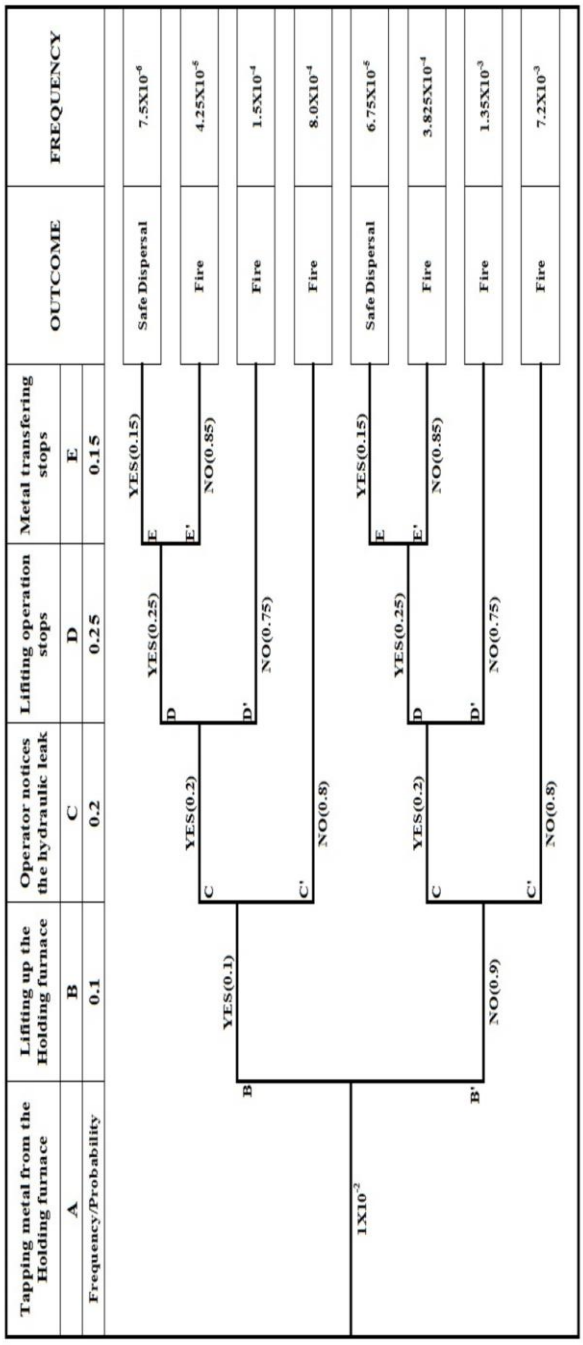
Sequence leading to outcome :

Safe dispersal : ABDE+AB'CDE = 2.31 x 10^{-5}

Fire : ABDE'+ABD'+AB'CDE'+AB'CD'
+AB'C' = 9.769x 10^{-4}

PROCESS - 3

Tapping metal from the holding furnace



Sequence leading to outcome :

Safe dispersal : ABCDE+AB'CDE = 7.5 x 10^{-5}

Fire : ABCDE'+ABCD'+ABC' +AB'CDE'+
AB'CD'+AB'C' = 9.925 x 10^{-3}

1.Implementation of Personal Protective Equipment (PPE): Results: The provision of PPE such as helmets, gloves, goggles, and heat-resistant clothing significantly reduced the incidence of injuries in foundry workers.

Discussion: Proper implementation and adherence to PPE protocols are crucial for safeguarding workers from heat, molten metal splashes, and chemical exposures inherent in foundry environments. Regular training and enforcement enhance compliance and efficiency.

2. Engineering Controls and Automation:
Results: Introduction of automated systems and engineering controls, like robotic pouring and automated material handling, led to a decrease in direct worker exposure to hazardous tasks.
Discussion: Automation not only reduces manual labor but also minimizes the risk of injuries associated with heavy lifting, repetitive motions, and direct contact with hazardous materials. Continuous improvements in technology enhance safety standards.

3. Worksite Ergonomics:
Results: Implementation of ergonomic principles, such as adjustable workstations and tools, reduced musculoskeletal injuries and improved worker comfort.
Discussion: Ergonomic interventions mitigate the strain caused by repetitive motions, prolonged standing, and awkward postures inherent in foundry work.

Worker involvement in the design and evaluation of ergonomic solutions promotes acceptance and effectiveness.

4. Training and Education:
Results: Comprehensive training programs on safety protocols, hazard recognition, and emergency response significantly decreased the rate of accidents.
Discussion: Continuous education fosters a safety culture where employees are empowered to identify and address risks proactively. Regular drills and feedback mechanisms reinforce knowledge retention and promote a vigilant mindset towards safety.

5. Hazard Identification and Risk Assessment:
Results: Regular hazard assessments and safety audits facilitated the identification of potential risks and the implementation of preventive measures.
Discussion: Systematic risk assessment ensures the continuous improvement of safety standards by addressing emerging hazards and adapting control measures accordingly. Collaboration between management, workers, and safety professionals enhances the efficacy of risk mitigation strategies.

6. Health Surveillance Programs:
Results: Implementation of health surveillance programs for early detection of occupational diseases and injuries improved intervention outcomes.
Discussion: Regular health monitoring enables early detection of work-related health issues, allowing for timely intervention and prevention of long-term health complications. Integration of medical surveillance with occupational health services ensures holistic support for worker well-being.

Conclusion:

Preventing occupational injuries in foundries requires a multifaceted approach encompassing engineering controls, administrative measures, training, and continuous evaluation. By prioritizing worker safety through proactive interventions and fostering a culture of collaboration and accountability, foundries can mitigate risks and promote a safer work environment for all employees.

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