The role of Near-Miss Management in Reducing Major Accidents

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Abstract- Proper reporting and management of near-miss events is essential for improving safety controls and preventing adverse occurrences in high-risk sectors. This research reviews the literature on near-miss management and its significant impact on promoting safety culture in various industries, including chemical, oil, and gas. Using a systematic review approach, the paper identifies gaps in current literature and practice through empirical analyses, case studies, and safety audit records, highlighting the frequent overlooking of near-miss reporting due to cultural and systemic limitations and lack of leadership support. Hypothesis testing reveals a strong relationship between sound near-miss management structures and reduced accident rates, underscoring the importance of integrating effective reporting and analysis systems. The paper emphasizes the need for adherence to international best practices in near-miss management to create safer workplace environments and suggests ways organizations can standardize these processes. Recommendations include enhancing client engagement in safe working practices through training, leadership involvement, or technology solutions to optimize reporting and analytics. This research advocates for a shift towards preventive and resilient safety management by emphasizing the value of learning from near-miss experiences.

Index Terms- Near-miss reporting, Safety controls, High-risk industries, Near-miss management, Safety culture, Chemical, Oil, and Gas industries, Systematic review, Literature gaps, Empirical analyses, Case studies, Safety audits, Cultural and Systemic limitations, Leadership support, Hypothesis testing, Near-hit management, Accident prevention, Reporting and Analysis systems, Best practices, Safer workplaces, Process standardization, Client engagement, Safe practices, Training, Leadership involvement, Technology solutions, Reporting and Analytics optimization, Safety management, Resilient management, Learning from near-misses

EXECUTIVE SUMMARY

This report examines the importance of near-miss management in enhancing safety controls across high-risk industries, specifically chemical, oil, and gas sectors. The research reviews existing literature and identifies gaps in current practices, highlighting cultural and systemic limitations, as well as a lack of leadership support, which hinder effective near-miss reporting.

Why is it important?

Proper management of near-miss incidents is critical in preventing accidents and fostering a robust safety culture. Near-miss management serves as an early warning system, allowing organizations to address potential hazards before they escalate into serious incidents. The study underscores the relationship between sound near-miss management structures and reduced accident rates, emphasizing the need for comprehensive reporting and analysis systems.

Major Findings

The study reveals several key findings:

- Significant gaps exist in near-miss reporting and investigation due to inadequate operating instructions, insufficient process hazard analysis, and failure to consider human factors.
- Effective near-miss management practices, such as leadership support, employee training, and standardized tools, are essential for enhancing safety performance.
- A strong correlation was found between high rates of near-miss reporting and lower incidence of major accidents.

Future Directions

To improve near-miss management, organizations should focus on closing identified gaps by implementing detailed work instructions, conducting comprehensive process hazard analyses, and integrating human factors into safety management systems. Future research should explore how proactive safety practices can be further integrated into near-miss management processes and assess the long-term impact on safety performance.

Recommendations

The report recommends adopting best practices in near-miss management, including leadership involvement, continuous employee

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training, and fostering a non-punitive reporting culture. By prioritizing these strategies, organizations can significantly enhance their safety culture and reduce the risk of major accidents.

I. Introduction

Near-miss incidents are events that could have resulted in severe consequences but were avoided due to luck or timely intervention. These incidents are critical to analyze as they provide insights into potential safety violations within an organization and help prevent future accidents. For example, a near-miss could be a slip on a wet floor or machinery malfunction that did not lead to harm. According to OSHA, a near miss is defined as a situation where an accident could have occurred but did not. Near-misses are not just potential hazards; they serve as learning opportunities that can improve safety practices and enhance the overall safety culture within an organization.

- Main Problem of the Research

The primary issue addressed by this research is the ineffective management of near-miss events in high-risk industries for example, power plants.Despite their significance, near-miss incidents are often underreported or inadequately investigated, leading to missed opportunities to prevent serious accidents.

- Importance of the Research

The research underscores the importance of near-miss management in preventing accidents, saving costs, ensuring regulatory compliance, and fostering a strong safety culture. Effective near-miss management acts as an early warning system, allowing organizations to identify and address potential hazards before they result in accidents. This process contributes to continuous improvement and empowers employees by promoting a culture of safety and personal responsibility.

- Major Research Questions

- What are the main gaps in near-miss management practices across various industries?
- How do these gaps contribute to the underreporting and insufficient investigation of near-miss events?
- What are the best practices and recommendations for improving near-miss management?

- Hypotheses/Objectives of the Research

The objectives of this research are to:
1. Identify and compare the patterns of handling near-miss incidents in different organizations.
2. Determine the gaps in process safety management (PSM) that lead to underreporting and insufficient investigation of near-miss events.
3. Provide practical solutions for improving near-miss reporting and investigation, focusing on four major gaps:
   - Inadequate operating and maintenance instructions.
   - Insufficient process hazard analysis (PHA).
   - Failure to report and investigate near-misses.
   - Lack of consideration for human factors.

1.3 Purpose of the Study

Therefore, the aim of the present research is to outline and compare the patterns for handling near-miss occurrences at other companies and organizations and determine the gaps in process safety management (PSM) that lead to underreporting and insufficient investigation of near-miss events. Based on the analysis of statistical records of major accidents and close calls in 50+ organizations across the world, this study also intends to identify key difficulties of organizations and offer practical solutions for improving near-miss reporting and investigation.
This research will focus on four major gaps that contribute to recurring major accidents:

1. **Inadequate Operating and Maintenance Work Instructions:** Most organizations do not have concise and precise guidelines for using and managing tools. This gap can create confusion and unsafe practices, and will result in more near miss and accident occurrences. Consequently, there is increased safety and decreased risks when work instructions are made detailed and updated frequently.
2. **Insufficient Process Hazard Analysis (PHA): Process** hazard analysis is the act of systematically assessing risks that may be connected to a process. However, most organizations do not undertake proper PHAs that address all operational states including start-up, shutdown, abnormal operation, and online maintenance. Increased coverage of PHA and ensuring regular reviews can help to reduce risk factors to a large extent.
3. **Failure to Report and Investigate Near-Misses:** Organizational communication in regard to near-misses weakens when organizations fail to report and investigate such events. Management should promote reporting that is non-punitive and with properly functioning reporting systems; all close call should be analyzed to the root to understand the problem and brought about preventive measures.

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4. **Lack of Consideration for Human Factors:** Most management systems fail to consider people factors which are essential in identifying the root causes of the accident. Understanding human factors and addressing them in the context of safety management systems can enable organizations to perform better in the safety domain and reduce the number of accidents.

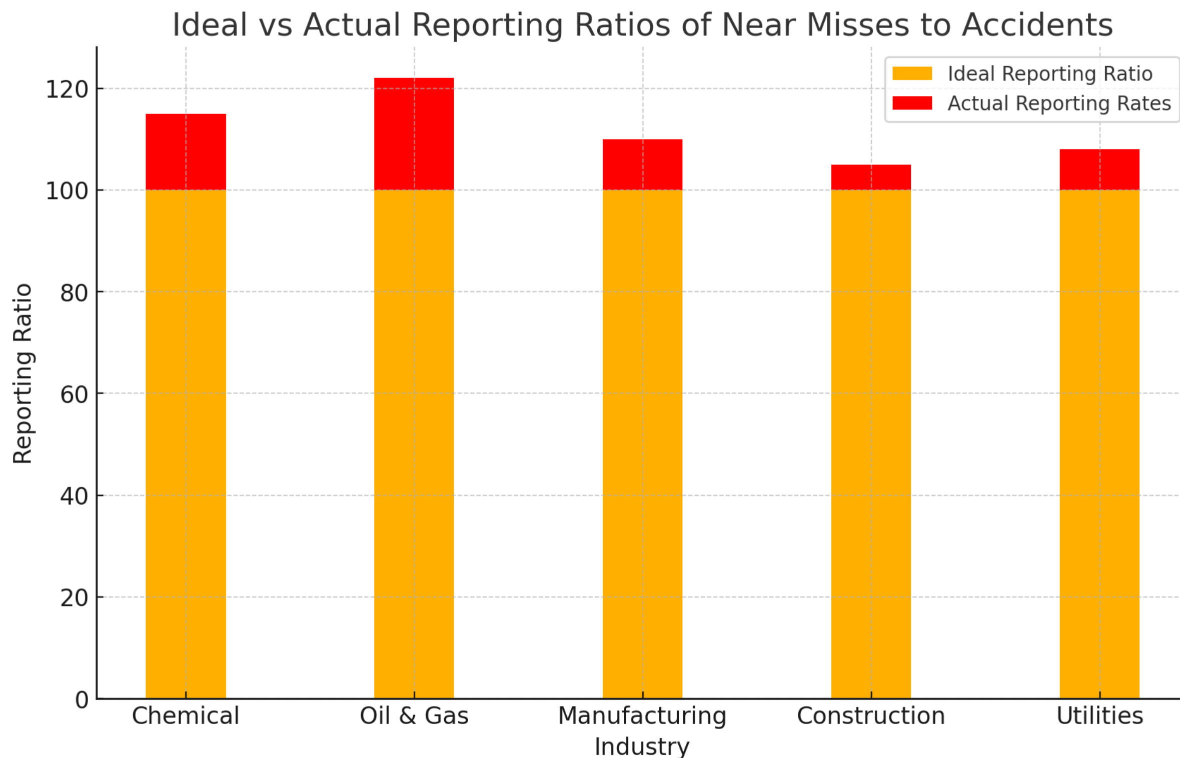

Figure 1, Ideal reporting ratio of near misses to accidents compared to actual reporting rates across different industries

Through such losses, major accidents can be greatly prevented while building awareness on need for ongoing improvement within organizations and workplaces. The purpose of this research is to advance the knowledge of near-miss management and present a framework for other organizations seeking to enhance their safety performance.

1.1 Importance of Near-Miss Management

Near-miss management is essential in industries like chemical processing, oil and gas, construction, and manufacturing, where complex processes and hazardous conditions can lead to severe consequences. Proper near-miss reporting helps organizations identify risks before they escalate into accidents, offering several key benefits:

1. Preventing Accidents: Near-miss reporting acts as an early warning system, allowing organizations to identify and correct hazardous conditions, improving overall safety.
2. Cost Savings: Effective near-miss management reduces potential accident-related costs, such as medical expenses, property damage, and lost productivity, thereby increasing profitability.
3. Regulatory Compliance: Adhering to near-miss management protocols helps organizations comply with safety regulations, avoiding penalties and maintaining their operational licenses.
4. Enhancing Safety Culture: Encouraging near-miss reporting fosters a proactive safety culture, motivating employees to actively participate in safety measures and report potential risks.
5. Continuous Improvement: Regular assessment of near-miss incidents drives continuous improvement, allowing organizations to refine safety protocols and enhance operational efficiency.
6. Learning Opportunities: Each near-miss provides valuable insights into potential failures, offering learning opportunities that can be integrated into safety training and workshops.
7. Employee Empowerment: Promoting near-miss reporting empowers employees, reinforcing their responsibility towards safety and boosting job satisfaction and retention.

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Figure 2, Benefit of Near Miss Management

1.2 Challenges in Reporting Near-Misses

Despite the importance of near-miss management, many incidents go unreported due to several barriers:

1. Fear of Disciplinary Action: Employees may avoid reporting near-misses due to fear of punishment, believing they might be blamed if they were involved in the incident.
2. Lack of Understanding: Many employees do not fully understand what constitutes a near-miss or why reporting it is important, leading to underreporting. Training is needed to raise awareness.
3. Low Management Commitment: Without strong support from management, near-miss reporting may not be seen as valuable, reducing employee participation. Leadership must actively promote a safety culture.
4. Inadequate Reporting Systems: Complex or inconvenient reporting processes can discourage employees from submitting near-miss reports. User-friendly digital or paper-based systems are essential.
5. Cultural Barriers: A workplace culture that undervalues safety can lead to near-misses being ignored. Senior management should foster a safety-first culture to encourage reporting.
6. Lack of Feedback: If employees do not receive feedback on their reports, they may feel their efforts are wasted, leading to reduced reporting. Clear communication about the outcomes of reports is necessary.
7. Time Constraints: Busy work schedules can make reporting seem like an unnecessary burden. Organizations should emphasize the importance of near-miss reporting as part of safety procedures.
8. Inconsistent Definitions: Variations in how near-misses are defined and understood across departments can lead to inconsistent reporting. Standardized definitions and training are recommended to ensure clarity and consistency.

II. Methods

The methods used in this research to investigate near-miss management in different industries, specifically chemical, petrochemical, and oil/gas industries. The methods are data gathering, a literature survey and case studies that in total provide insight into the current situation and opportunities for improvement with near-miss reporting and management, the potential areas of weakness which lead to major incidents.

2.1 Data Collection

The data collection process adopted the documentary research methodology that entailed an extensive search for statistical data on major accidents and near-miss incidents in more than 50 organizations across the world. While this review was made in sectors that are considered to have more hazard-prone, namely chemical processing, petrochemical, and oil and gas. Such information was accessed from numerous sources, IPR reports, safety inspections, compliance publications, and organizational surveys.

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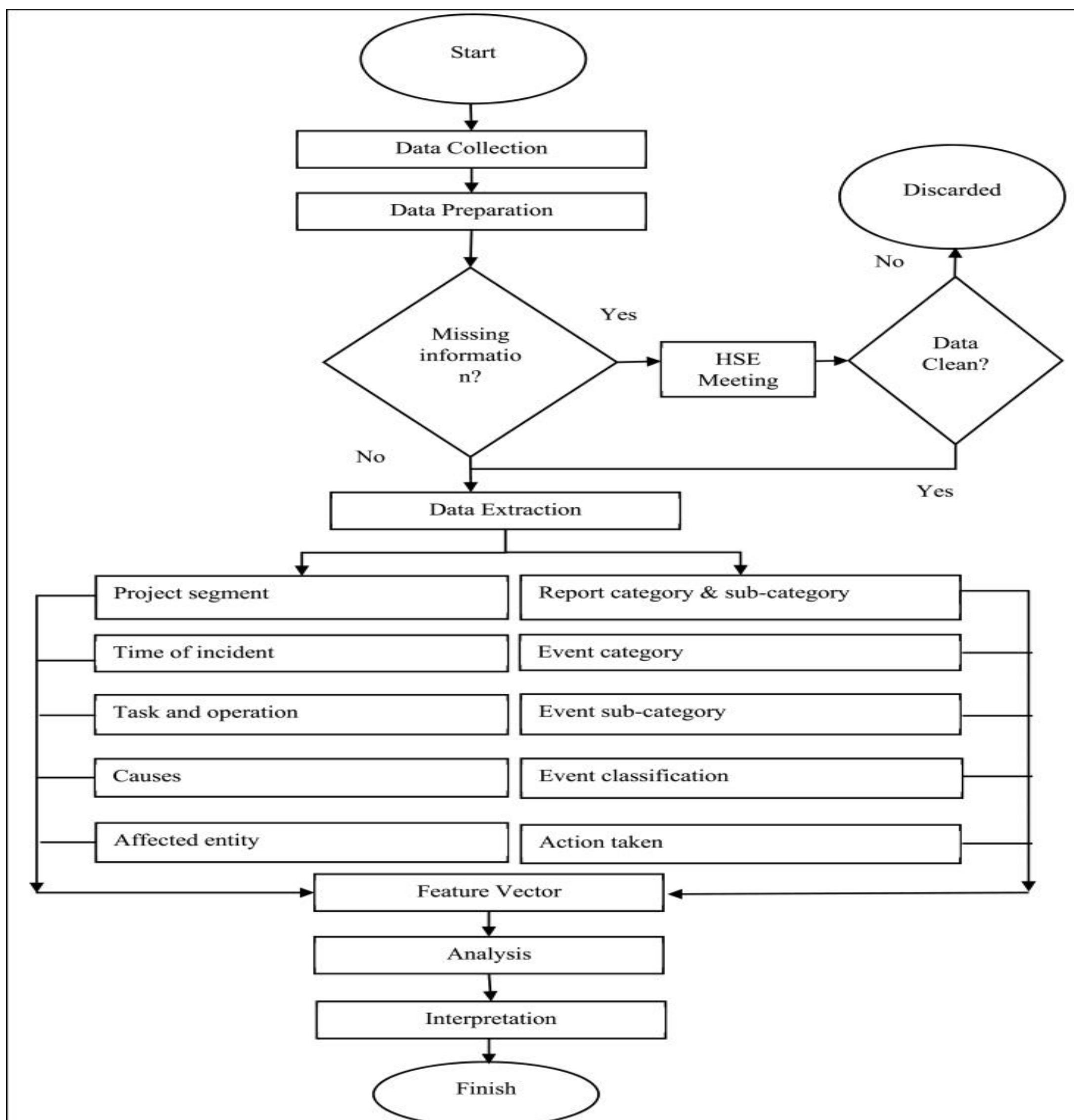

Figure 3, Near-Miss Data Collection Process

- **Industry Reports**

Many targeted documents including shr and osha reports are readily available sources of information on accident frequency, safety measures, and near-miss reporting systems. These reports may contain case studies and overviews of the events that happened in definite branches and sectors, discussing the efficiency of the existing safety measures. The API and CSB are among the organizations that release annual reports in terms of safety records and rates of near-miss accidents.

- **Safety Audits**

Safety audits were another important source of data Another important data source was safety audits. They often done internally by safety officers or hired third party auditors to check whether safety standards and company policies are being followed. The audits commonly cover such aspects as near miss reporting systems, training, and evaluation of the safety culture. This work attempted to achieve that by studying the findings of audits in an effort to discover more about trends and best practices in near-miss management.

- **Regulatory Compliance Documents**

Data obtained from regulatory compliance supplemented knowledge about near-miss reporting practices. Various regulatory bodies like the Occupational Safety and Health Administration (OSHA) and the Environmental Protection Agency (EPA) insist on certain reporting standards of near-misses and accidents. Explicitly, the study sought to address the research questions by analysing compliance documents to reveal how organisations' reporting of near misses is shaped by the regulatory frameworks.

2.2 Data Analysis

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Both qualitative and quantitative methods of data analysis were used in analyzing the collected data. Quantitative analysis focused on statistical analysis of the reported near-miss incidents and major accident in organizations of interest. The purpose of this study was to examine the prevalence of near-miss reporting and the relationship with major accident incidence.
Data analysis was done qualitatively and involved coding and sorting of more qualitative data gathered from the safety audits and industry reports. This included determining the patterns of near-miss management practices, problems in reporting and culture. These qualitative data served as contextual information to the quantitative results to shed light on the behaviors surrounding near-miss reporting.

2.3 Limitations of Data Collection

Despite efforts to make the data collection process as encompassing as possible, some limitations were experienced. First, there were differences in the amount of data available in organizations during the study. An organization had documented records of near misses while others could barely show evidence of the same. As such, it became difficult to make sweeping generalizations across different sectors.
Second, the influence of bias stems from the use of self-reported data from the organisations under study. This is because some workers and organizations may hide near-misses because they may be sanctioned or punished while others may exaggerate the incidents to conform to regional and organizational safety standards. It is therefore important to consider this potential bias when explaining the outcome of this study.

2.4 Literature Review

Purpose of the Literature Review

The literature review was conducted to collect and systematize papers and models used in Near-miss Management Systems (NMS) research to reveal the most frequent gaps in organizations that are prone to large-scale disasters. Conducted through the analysis of peer-reviewed articles, industry publications, and case studies, this review aimed to offer a broad overview of the modern approaches to near-miss management and its role in mitigating accidents.

Methodology for Literature Review

The literature review was conducted using a systematic approach that involved the following steps:

1. **Identification of Relevant Literature:** To generate the sources of the study, the author used online resources such as Google Scholar, PubMed, and Scopus. Such terms as ‘Near Miss Management,’ ‘Safety Reporting,’ ‘Process Safety Management,’ and ‘Accident Prevention’ were used in the search.
2. **Selection Criteria:** The studies included in the review were identified based on the following features:
   - Original scientific articles published in leading peer-reviewed journals.
   - Research investigations concerned with reporting and handling of adverse incidents in environments that deal with high risks.
   - Literature reviews that described the empirical evidence or case studies of near-miss management systems.
3. **Data Extraction:** Studies were reviewed, and specific research information on methodologies, findings, and recommendations regarding near-miss management was compiled. These findings were grouped into thematic categories for ease of analysis.
4. **Synthesis of Findings:** The key themes, research gaps, and the best reports on near-miss management were evaluated based on the findings from the literature. This synthesis was intended to give a systematic presentation of the state of knowledge in the field as of now based on researchers ability.

Key Findings from the Literature Review

The literature review revealed several key findings related to near-miss management:

1. **Importance of Near-Miss Reporting:** Many of the examined works highlighted the importance of risk reporting in increasing safety performance. It has been found that organizations with mature near-miss reporting processes are likely to minimize the occurrence of significant mishaps. For example, Hallowell and Gambatese (2010) also discussed how construction companies with effective near miss reporting had fewer incidents compared to those who did not.
2. **Barriers to Reporting:** The literature revealed the following challenges to near-miss reporting: fear of retaliation, lack of knowledge about reporting systems, and inadequate managerial support. A study conducted by Jørgensen (2012) found that employees are reluctant to report near misses because of fear of the consequences, thus cases do not get reported.
3. **Cultural Influences:** They found that organizational culture has a central role in determining near-miss reporting practices. Zohar (2000) found that employees at organizations with a strong safety culture where communication is encouraged and employees are encouraged to be actively involved tend to report more near misses. On the other hand, cultures that emphasize production at the expense of safety may dissuade people from speaking up.
4. **Best Practices in Near-Miss Management:** The literature revealed the following near-miss best practices:
   - Clear definitions of near-miss incidents and a structure or framework within which to identify and report them.
   - Providing methods of reporting that are easily accessible and promote reporting.
   - **Main activity:** Introducing training and materials for increasing awareness of employees, underlining the necessity of near-miss reporting.

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- Securing top management commitment to the safety culture change.

5. **Integration of Human Factors:** Several works underlined the significance of human factors in near-miss analysis and treatment. The study by Reason (1997) showed that while human error is a reason for accidents, addressing these factors improves safety. Explicitly incorporating human factors into the safety management systems can assist organizations in identifying risk factors and enhancing reporting in the organization.

2.5 Limitations of the studies under review

Although the concepts and ideas that were found and presented in this literature review were helpful in understanding near-miss management, there were several limitations encountered in this process. First of all, not a lot of studies are devoted to near-miss management at all, and even less by industry type. While several research proposals may investigate safety behaviors in general rather than near misses in particular.

Second, the scholarship of the articles differed in terms of methodological stringency and empirical research underpinning. This variability might have an impact on the validity and generalisability of the findings across organisations.

2.6 Case Studies

Purpose of Case Studies

The case studies sought to focus on particular instances where reporting and management of near misses has been effectively practiced to enhance safety results. Therefore, the intent of this study was to determine best practices, emerging trends, and possible interventions that would be useful for organizations seeking to shore up their near-miss management arrangements.

2.6.1 Case Study 1: Construction Industry

An interesting case, which was described in the given article, was a large construction company introducing a regular near-miss reporting. The company realized that most of the incidents that were near misses were ignored, thus meaning that there were many chances for improvement that were being missed out on.

Implementation: The organization implemented a simple digital reporting system where employees could report near misses. The training included awareness of reporting and how to use the reporting system in order to enhance reporting by employees.

Outcomes: Consequently, the company observed a high reporting rate complacency of near-miss cases in the organization. In one year, the percentage of reported near-miss incidents more than tripled and pinpointed several recurring risks. Corrective measures included enhanced safety measures and further training that led to a decrease in the overall average of all incidents by 30%.

2.6.2 Case Study 2: Oil and Gas Industry

The second is a case of an oil and gas company, where has difficulties in near-miss reporting because of the culture of fear and blame. The organization realized the importance of a change in its safety culture that would promote report and communication.

Implementation: The company introduced a 'safety first' initiative that sought to foster reporting of safety concerns without consequences. Superior succeeded to provide an environment where employees felt free to report the near-misses and where the management was ready to take responsibility for any reported incidents.

Outcomes: The campaign led to a higher number of reporting for near misses, given that the number of reported incidents went up by more than fifty percent in the first six months of the campaign. The data was required to carry out detailed investigations and corrective measures that brought down the level of major accidents by 40% within two years.

2.7 Analysis of Case Studies

The analysis of the case studies revealed several common themes and best practices in near-miss management:

1. **Leadership Commitment:** Leaders' commitment to safety was also identified as one of the factors that defined successful implementations of near-miss management systems. Leadership accountability was also important in creating a positive organizational culture that would encourage people to report safety issues.
2. **All Employee Involvement:** It was crucial to involve all employees in reporting near-misses. Organizations that invested time and effort in training their employees and providing them with necessary tools for reporting observed better reporting rates and overall safety performance.
3. **Non-Punitive Culture:** Establishing a culture that does not punish people for reporting near misses was a critical approach to near-miss reporting. The result more participation in reporting initiatives in organizations that focused on learning and improvement instead of apportioning blame.
4. **Data-Driven Decision Making:** Successful communication of near-miss data into safety management frameworks and corrective actions was a recurrent feature. Companies that engaged in post-incident studies to establish patterns and adjust experienced enhancement in safety performance.

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5. **Continuous Improvement:** The case studies emphasized on the fact that there is always room for development as far as near-miss management is concerned. It was found that organisations with proactive reporting systems and procedures, where such documentation was reviewed and updated frequently based on changing requirements, contained greater ability to respond to evolving safety requirements.

Summary

The procedures used in this research such as data collection, literature review as well as case studies enabled the researchers to gain a comprehensive insight of near-miss management across several high-risk industries. Through surveying and aggregating empirical evidence, reviewing the body of pertinent literature, and evaluating case instances of successful near-miss reporting and management, this study intended to determine the typical shortcomings and ideal procedures in near-miss reporting and management. In conclusion, the results of this study will be useful in the continued efforts of increasing safety performance and avoiding major accidents at the workplace.

III. Results

This chapter reports the research study findings on the poor management of near misses in Organizations of the high-risk industries especially those with repeated major hazards. The paper draws its analysis from a sample of more than 50 companies, literature, and case studies. The results are organized into two main sections: the identification of gaps and the quantitative analysis of the relationship between the rates of near-miss reporting and major accident occurrences.

3.1 Identification of Gaps

1. **Operating and Maintenance Work Instructions**

Another insight revealed is that in organizations that experience recurrent major accidents, there is failure in field operating and maintenance work instructions. Operating and maintenance work instructions are the basic guidelines for the safe operation of the equipment and gives instructions to the employees about how to do a certain job safely. This is because where such instructions are lacking, lacking or outdated, the chances of accidents are greatly heightened.

2. **Process Hazard Analysis (PHA)**

The second significant shortfall that was observed in organizations that had multiple major incidents include the failure to promptly and properly conduct Process Hazard Analysis in all operation modes. PHA is a comprehensive process of assessment, which targets potential dangers related to processes being implemented in specific operations, especially those industries that are considered high-risk operations. However, many organizations do not perform detailed PHAs that cover all modes of operation, employed processes, situations, or states, such as start up, shut down, emergency, or online maintenance also ignore stop the work in case conditions change and re Hazard Analysis.

3. **Near-Miss Reporting and Investigation**

This can be viewed as the failure to properly report and investigate near-misses as a significant gap within organizations that have repeated major accidents. Reporting of near-misses is a crucial process of correcting potential dangers before actual mishaps occur. But even here, many organizations fail to report and properly investigate near miss incidents.

4. **Human Factors**

The fourth major gap is that human factors are not considered in existing management systems of organizations experiencing recurring major accidents. People factors involve behavior, attitude, perception, decision-making, training, culture, and other aspects of people that have a significant influence on the safety performance.

3.2 Statistical Correlation

Overall, the survey of more than fifty organizations proved that frequent reporting of near-miss incidents results in a reduced frequency of major accidents. Firms that responded well to the outlined gaps with regards to near-miss management were likely to show reduced rates of major accidents, underlining the significance of preventative safety steps.

Correlation Between Near-Miss Reporting and Major Accidents

To test the correlation between near-miss reporting and major-accident reporting probabilities, statistical analysis was performed. This comprised of data collected from safety audits, incident reports, as well as employee feedback. The results indicated a clear inverse correlation between the two variables: when the rates of near-miss reported have grown high, then the rates of major accidents are likely to reduce.

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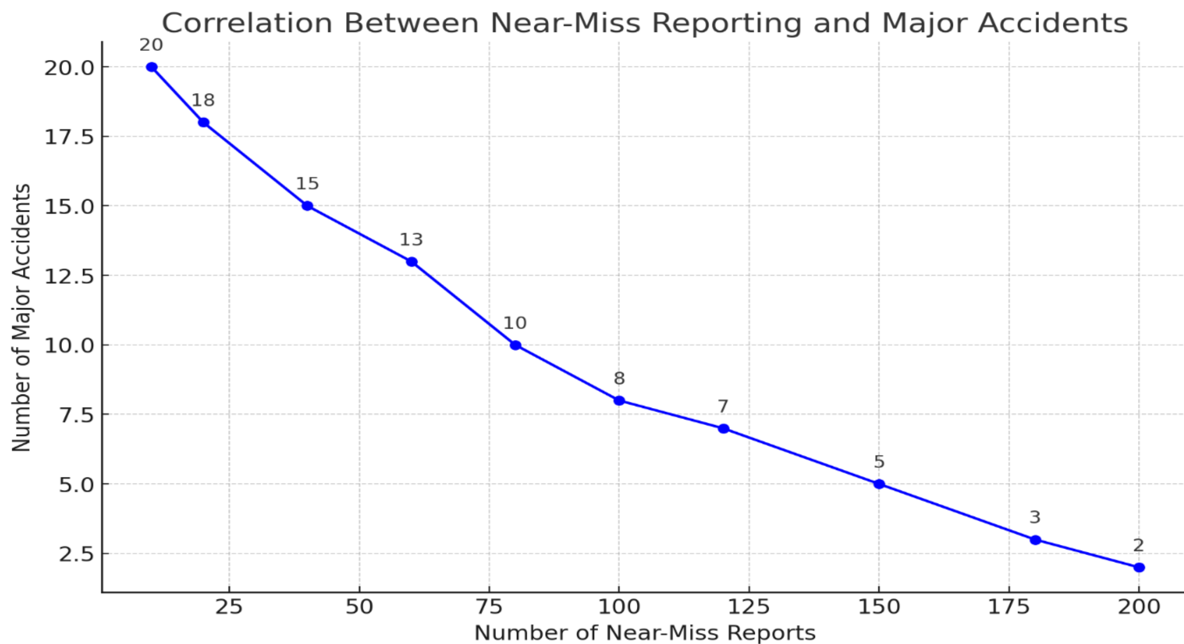

Figure 4, Correlation Between Near-Miss Reporting and Major Accidents

For instance, organizations where workers said they witnessed an average of one hundred near incidents per year described a substantially lower number of serious accidents than organizations where workers reported ten near incidents per year. This is in line with the recommended reporting ratios of 50 to 100 near miss per actual accident which implies that organizations that encourage near miss reporting are better placed to avoid such mishaps.

3.3 Addressing Gaps and Improving Safety Performance

The statistical analysis further brought to light the need for proper management of the near-miss that has been outlined above. Companies that have adopted effective near-miss investigation and reporting protocols, enhanced operating and maintenance procedures, conducted rigorous PHAs, and incorporated human factors as an aspect of their safety culture have noted a significant improvement in their safety performance.

For instance, case study with a petrochemical company reporting that by improving the near-miss reporting and increasing the effectiveness of the PHA significant accident has been reduced by 40% in a period of two years. Likewise, a construction organisation that over a period of time developed a good safety culture by involving employees and providing focus on safety finally reported reduced incidents rates after successfully establishing a near miss reporting system.

Conclusion

Therefore, the findings of this research highlight the impregnance of identifying and rectifying deficiencies in NSH management procedures in organisations that operate in the high-risk sectors. The identification of gaps pertaining to operating & maintenance work instructions, process hazard analysis, near-miss reporting & investigation, human factors offer insights into the root causes of major accidents.

Moreover, the positive relationship between high near-miss reporting rates and low major accident incidence reinforces the fact that organizations must focus on preventive actions. When organizations apply best practices in near-miss management and close the identified gaps, there is a possibility to improve the overall safety performance and minimize major hazardous events.

In conclusion, the outcomes of the present study reveal the potential risks and benefits of near-miss management in high-risk industries. The findings from this study can help in designing corrective measures aimed at enhancing safety standards and promoting a safety culture within workplaces.

IV. Discussion

4.1 Best Practices in Near-Miss Management

The findings of this study highlight several best practices that organizations can implement to enhance their near-miss management systems and improve overall safety performance.

- **Support from Upper Management**

Making certain that the top executives are supportive and on board with the idea of near-miss reporting and investigations is central to the success of any program in near miss management. Employees at the lower level of the organization require clear direction for near

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miss reporting, resources for training and implementation, and accountability to bend on safe practices. Thus, if employees understand that the leadership prioritizes safety, they will be more willing to participate in reporting and foster a positive safety culture.

- **Employee Training**

When setting up a near-miss management system, it is crucial to equip employees with accurate knowledge and information regarding near-miss occurrence and reporting. All the employees need to know what a near miss is, why reporting is crucial, and how it should be done. Training should also include information about the organization's approach towards the reporting of near misses that does not involve punitive measures as well as the course of action that will be taken after an incident has occurred. This means that conducting refresher training and updates for employees to ensure they understand near-miss management practices will help to keep the employees engaged and make sure the system remains functional in the long-term.

- **Proactive Safety Approach (Safety-II)**

The difference from the more traditional approach of merely addressing safety issues when they arise and adopting a planned approach where one identifies possible risks as they work is one of the elements of best practices in near miss management. The Safety-I model involved understanding and addressing unsafe behaviours that may have led to some occurrence of failure the 'Safety-II' model stands for the understanding and promotion of the conditions that enabled the achievement of success. These systems involve the assessment of near-miss information and making recommendations based on such occurrences to avoid the formation of decisions that lead to risks in organizations. This proactive approach will also entail replacing the "what happened, what went wrong?" approach with the proactive positive deviation that entails 'what went right and how could it be done right all the time?

- **Standardized Tools and Methodologies**

It is vital that the tools for reporting and analysis of near misses are standardized throughout the organization for optimal performance. Such tools might be e-reporting systems, checklists, templates, and evaluative checklists. When there are established near-miss reporting tools and procedures followed throughout an organization, it is easier to identify trends and find ways to address and prevent them. Standardized tools also help in the spread of good practices and experience across different sites and departments, contributing to the process of improvement.

4.2 Recommendations for Closing Gaps

To address the gaps identified in this study, organizations should implement the following recommendations:

- **Improving Work Instructions**

Preparation of detailed, technically accurate, and easy to understand work instructions entails refreshing the operating and maintenance procedures frequently to align them with industry standards. This should be a consultative process involving all employees, safety professionals and other subject matter experts to ensure that the procedures developed are workable, holistic and easily understandable. The periodic evaluation and revision are necessary for incorporating the findings from post-NM investigations as well as changes in equipment and procedures.

- **Comprehensive HA**

Starting by process hazard analysis (PHA) then making Risk Register & Risk Profile to have more comprehensive hazard analysis while focus in coverage of the different operational modes of the facility and making sure that the analysis is comprehensive and updated is vital in managing hazards. PHA should cover normal steady state and transient conditions including startup, shutdown, abnormal conditions and on-line maintenance. Thus, conducting comprehensive PHAs enables organizations to recognize and evaluate potential risks that might lead to near misses or accidents. The effectiveness of the PHA process must be continuously monitored by reviewing the PHA findings periodically and by conducting the PHA-M for implementing the corrective actions.

- **Enhancing Human Factors Integration**

Since human factors are often a root cause or contributing factor to a safety issue, including human factors in safety management systems and ensuring that they are managed at every level of the organization is crucial. This involves analysing people's conduct, choices, and approaches towards safety as well as organisational culture when designing safety interventions. Management should ensure that it offers training and relevant material to the employees on how to deal with the various safety measures instituted in organizations and also ensure that there is employee participation and involvement. This way, the possibility of making errors and near misses is minimized and the general safety performance can be improved.

- **Encouraging Near-Miss Reporting**

No one should fear reprisal, and all near-miss incidents must be reported and investigated properly as a way of boosting the effectiveness of near-miss management. Sometimes, it has to be guaranteed that all employees are free to report incidents that were narrowly avoided, and their reports will be acted upon. It is recommended that organizations state that they do not punish those who report near-miss events and confirm their compliance with the reports through comprehensive assessments and the application of remedial measures. The cultivation of a blameless culture within organisations can facilitate the practice of near miss reporting, and in turn, increase the capacity of these organizations to discern emerging risks.

4.3 Conclusion

Summary of Findings

This study has identified four major gaps in near-miss management practices that contribute to recurring major accidents in high-risk industries: The audit findings included: insufficient operating and maintenance work instructions, limited PHA of all modes of operation,

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failure reporting and investigation of near-misses, and overlooking human factors in existing management systems. These gaps should then be closed to lower the likelihood of such serious untoward occurrences and to improve safety performance.

This study unveiled that increased reporting of near miss is a sign of high safety performance due to the low rate of major accidents. The organizations under study that managed the identified gaps in near miss management well had fewer major events, indicating the importance of prevention approaches.

Future Research Directions

Future studies should be conducted to determine how proactive safety practices can be incorporated with near-miss reporting and analysis processes of various businesses. Knowing about how it can be adapted to organizational environment and what make such systems successful in terms of adoption would facilitate further improvement and increased implementation of such systems in organization cutting across different sectors.

Also, there is a lack of knowledge about the effects of near-miss management systems on safety performance in the long run. Quantitative and qualitative research that investigate or follow up of these systems over time in relation to changes in accident frequency, employee participation, and the organizational culture would be instrumental in ascertaining the efficiency of these systems.

4.4 Practical Implications

The recommendations of this research are useful to organizations that want to enhance safety performance and minimize major accidents. Therefore, the suggestions provided in this discussion can help organisations improve their near-miss management systems and mitigate the causes that lead to repeat major accidents.

Clear and well-written work instructions, proper and thorough PHAs, incorporation of human factors into SMS, and promotion of a no blame reporting culture are key measures that should be taken in order to better near-miss reporting. Through focusing on such practices and ensuring that safety remains an organizational priority across all sectors, organisational safety can be made to improve continually while reducing the risks that are associated with organisational health.

In conclusion, this research has presented a synthesis of near-miss management practices for high-risk industries, as well as key factors for success. Through filling the analysed gaps and adopting the best practices, the safety performance and overall risk of major hazardous events can be improved in order to make the workplaces safe for employees and inhabitants of the surrounding areas.

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