A Study of Reporting Trend of Near Miss in Explosive Manufacturing Industry

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Abstract

Near miss reporting stands as a great safety awareness tool, assists identifying risks before evolving into accidents. This study identifies factors contributing to near miss reporting trend within the explosive manufacturing industry and analyze this trend and suggest programs for enhancing near miss reporting submission. This study also considered unsafe act and unsafe conditions reporting as near miss reporting. Conducted on 45 employees using a reliable questionnaire, this descriptive analytical study highlighted varying levels of understanding and barriers in near miss reporting even though number of near miss reporting is on a continuous uptrend with minor fluctuation. Notably, respondents need improvement in terms of their awareness of organizational reporting targets and programs, revealing a need for consistent education on distinguishing near misses from accidents. Barriers to reporting included insufficient knowledge and skills, while the feeling of embarrassment emerged as a minimal obstacle. The study recommends fostering a culture of regular feedback, analysis, and organizational-level actions to encourage reporting and address identified risks. While there is broad agreement on many techniques, more focus on continual improvement via training, guidelines, and corporate commitment is critical to building a good safety culture.

1. Introduction

Near miss reporting is a concept that has been implement in decades and widely used in various industries such as chemical industries, aviation and other industry like construction and manufacturing to prevent a huge accident or a small incident from occurring. A near miss typically describes an incident that may harmed someone seriously such as worker but did not cause any kind of damage. (1)

Manufacturing of explosives is a very high-risk industry where it involves handling explosives materials that could lead to a huge accident or disaster if no proper near miss reporting system in place and further actions being taken after the investigation. There were several incidents could result negative impacts directly endangered human lives, property, and the environment (2) such as accident that has been occurred on August 4, 2020, at 6:07 PM, a non-nuclear explosion of historic scale occurred in Beirut, Lebanon. This tragic incident began 30 minutes prior to when fireworks and an estimated 2750 tonnes of ammonium nitrate were stored unsafely in warehouse in the city of Beirut, Lebanon. A large explosion that caused over 6000 injuries, 200 fatalities, and over 100 missing victims was the consequence of several smaller explosions that came before it. (3) However, there were a most catastrophic chemical incident in Malaysia history occurred on May 7, 1991, at

the Bright Sparklers fireworks factory in Sungai Buloh. The experiment's explosive chemicals split, igniting fires that quickly spread to a nearby pile of big fireworks. 26 people lost their lives and 103 were injured in the incident. (4)

Incidents include near-misses, ensuing learnings may also provide for a very effective proactive strategy to accident prevention Therefore, the creation of a successful near-miss reporting is an advantage for accident prevention and overall safety enhancement. The occurrence of near-misses and accidents with the same root cause can be avoided with proper reporting, analysis, and control measures based on inquiry findings. (5) Near miss reporting is the finest safety awareness technique which assists in identifying risks that could be brought on by tools or behaviors before they result in actual accidents. By reporting incidents and putting appropriate corrective measures to the accidents and near-misses with similar fundamental causes can be kept from happening again. (2) In this study, there were objective constructed to identify the factors that to the trend of near miss reporting to have a better understanding, visuals, and best practices of near miss reporting in return for increased submissions, which help the industry understand possible accidents and prevent them. The issue of occupational accidents and illness at the workplace can be managed and reduced by providing a safe working environment for all employees.

2. Methodology

2.1 Research Design

This study was conducted at an explosives manufacturing plant located in Malaysia to determine the barriers to trend of reporting. Submissions of near miss report to Safety, Health, Environment, (SHE) department are being done monthly by the employee according to their respective department. It uses a system called concern card in order to report the near miss. It contains unsafe acts observed, unsafe conditions observed, immediate corrective action taken, and further action to prevent recurrence. Besides, near miss reporting, identifying the trend of submitting could help reduce incidents from occurring due to proper hazard identification have been done. The study was conducted to suggest recommendations to increase submissions, which allowed the company to access unsafe acts and conditions that contribute to risk. The researcher used quantitative methods, and the cross-sectional design of this study is a literature review, questionnaire, and database of near miss reporting. This research intends to investigate the barriers to near miss reporting among employees in the explosive manufacturing industry in order to help employees recognize the core value of near-misses and increase the submission of reports.

The research began with a review of the literature by looking for information based on near miss reporting and the barriers by reading, reviewing, analysing the journal, and pass researchers research papers. The second stage is determining the problem and generating objectives. Then follow up with collecting data from the company's database on the near miss reporting submission to identify the trends. The next stage is analysing the barriers by forming a set of questionnaires to analyse the barriers in the submission of near miss reporting. The next step is to distribute the questionnaire and collect data. The collected data were analysed using Statistical Package for the social sciences (SPSS) version 29, and the final stage will be the discussion, conclusion, and recommendation of the data collection result.

2.2 Data Collection Method.

The data analysis method for this study is to be conducted using SPSS version 29 to analyse quantitative methods for this study. A total of 45 samples have been collected through a distributed questionnaire. There 2 analyses conducted for this study which is demographic of respondent's analysis, knowledge, barriers and improvements of near miss reporting, the analysis of section A will be focused on the respondent's information and background from the questionnaire. For the second section, which is section B to D, will be the knowledge, barriers and improvements in the questionnaire which involved the Likert scale and nominal scale. The data was measured using frequency, percentage, mean score and interpretation level.

3. Results and Discussion

3.1 Trend of reporting near miss

According to Figure 1, a trendline was created to identify the trend of near miss reporting submissions in this company. Submissions of near miss reports will be done monthly to SHE departments by the respective departments. This data was collected from the company's database from the year 2016 to 2023. Data from the company was transformed into a bar chart and created a trendline to indicate the trend of submission. The analyst trendline data from the year 2016 to 2023 submissions of the near miss report demonstrates an uptrend with minor fluctuations, presenting a pattern that is consistent over time. A minor fluctuation has been noticed

in the year 2022, these fluctuations can be due to many factors such as a unusual event affecting that year. Emphasize the importance of understanding these minor fluctuations to improve the research methodology and data collection procedures. The study intends to improve the value of its submissions by addressing and possibly reducing these fluctuations by developing measures and acknowledging their impact by conducting a questionnaire to identify the barriers to near miss report submission. This proactive method provides a deeper analysis, supporting the study's credibility and raising the possibility of a beneficial conclusion and improvement. The main objective of this study is to analyse the trend of near miss reporting. According to Figure 1, a trendline has been created and analyzed, which shows an uptrend with minor fluctuations in submissions. It can be concluded that the objective has been achieved.
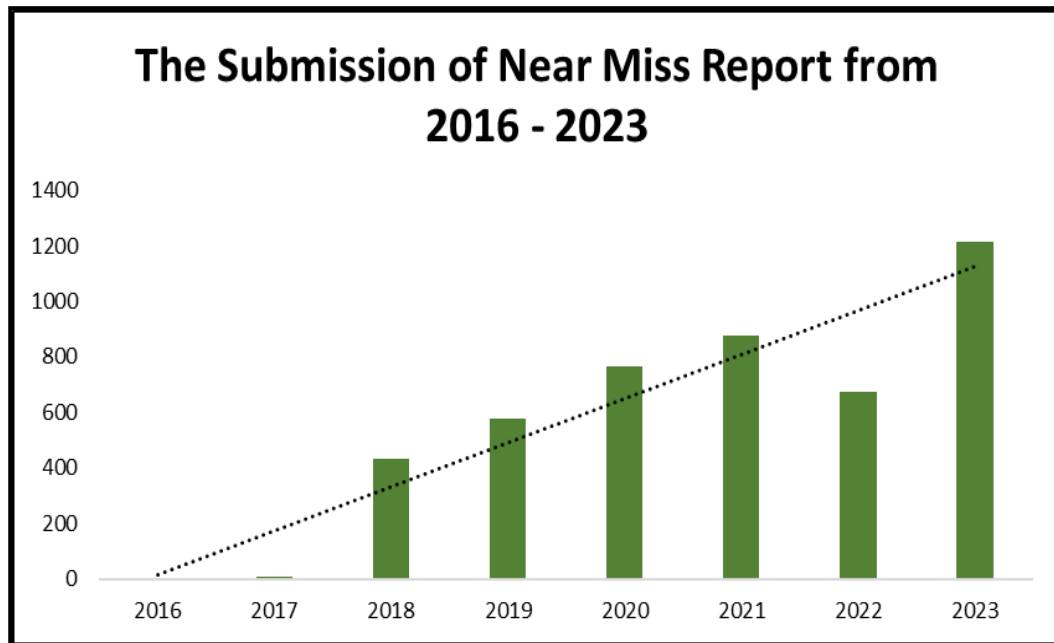

Figure 1. Submission of near miss report from 2016 to 2023

3.2 Knowledge of near miss reporting

According to Figure 2, which shows the overall questions on knowledge of near miss reporting among respondents, the overall question of knowledge of near miss reporting shows that 67% of them have basic knowledge or familiarity with near miss reporting; however, only 33% shows need knowledge improvement on near-miss reporting. The majority of respondents, which contained 39 individuals (81%), informed us that they reported every near miss that they observed, according to Table 4.8. This shows that there are still barriers to reporting, as the result shows there are still a portion of respondents (6 individuals or 19%) didn't report every near misses they observed (including unsafe acts and unsafe conditions) which was one of the barriers to near miss reporting, which shows the similarity (5) research result where this minority group of employees have an attitude or blame culture on willingness to report the near miss that has been observed. As shown in Table 4.8, most respondents are not awarded for reporting near misses, which has also been proven in the literature review (2) that near miss reporting was not awarded by the company. Finally, 51% and 53% of respondents said that they were not aware of the companies near miss reporting targets and programmes. This indicates the need to improve communication among employees and employers in delivering the company's goals for near miss reporting. This can be one of the barriers to reporting.
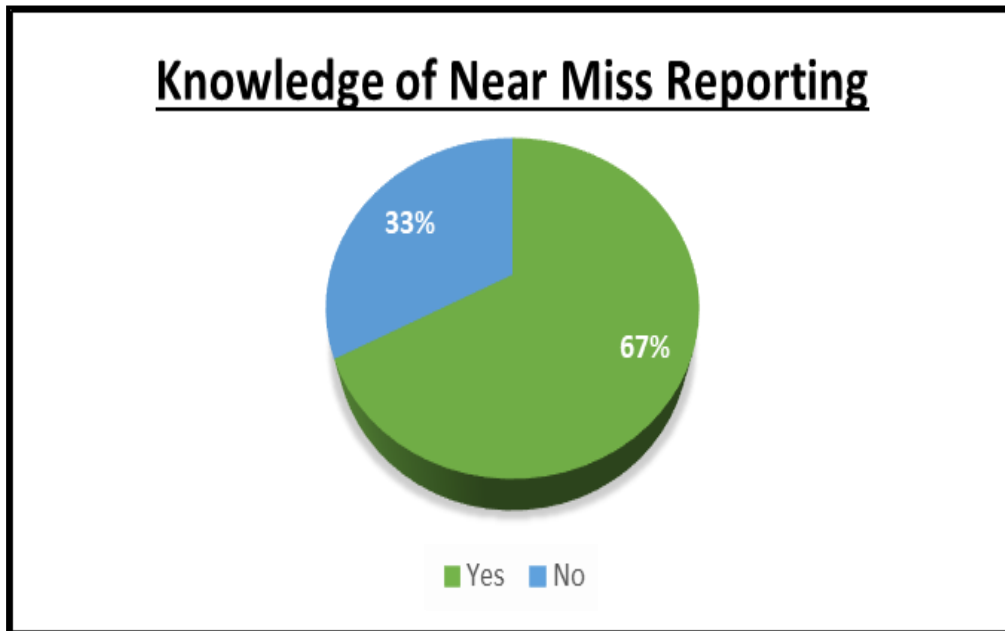
Figure 2. Overall knowledge of near miss reporting

3.3 Familiarization of near miss reporting

According to Figure 3, familiarization with near miss reporting is one of the parts of evaluating knowledge of near miss reporting among respondents. There were four scenarios that respondents needed to identify as near miss or accidents. There were 3 scenarios that were near miss incidents, which are showcased in Figure 4.12. Based on this figure, the majority of respondents, which represent 71%, answered near miss for the three scenarios given, and only 29% of respondents answered as an accident. This shows that the minority of 29% still has a high number, which could lead to barriers to near miss reporting due to a lack of knowledge in identifying or differentiating the terms near miss and accidents. Based on the objective of this study, which aims to identify the barriers to near miss reporting, this familiarity with near miss reporting analysis shows that a significant number of respondents still need training or knowledge on the differences between the terms near miss and accident, which also could lead to barriers to reporting. Barries to near miss reporting
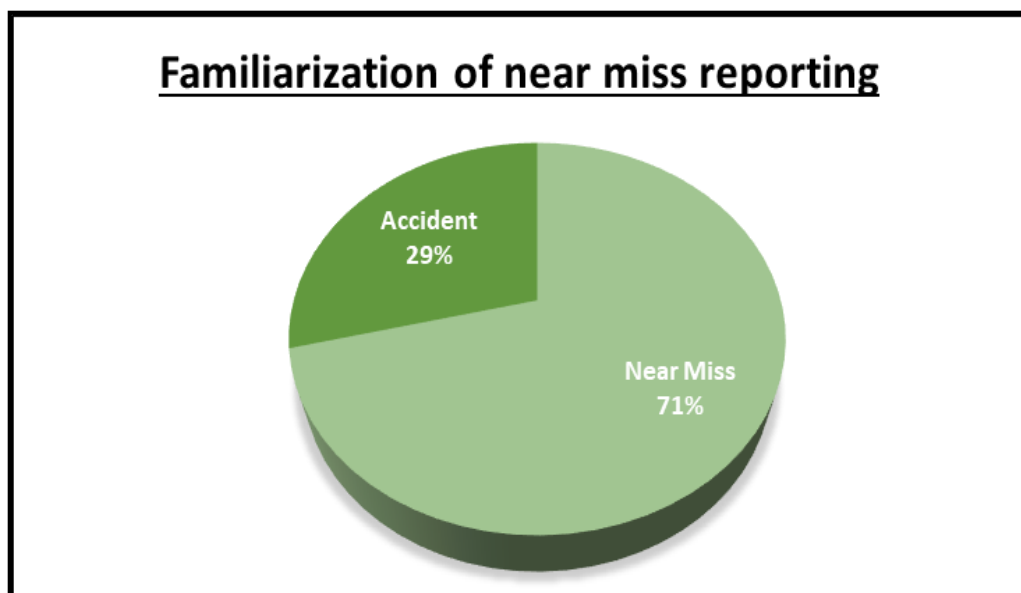

Figure 3 : Familiarization of near miss reporting

3.4 Barriers of near miss reporting

Table 1 Interpretation level and mean score of barriers to near miss reporting

No	Item	Mean	Interpretation
1	Near-miss reporting is just additional paperwork, and that near-miss reporting should be avoided?	3.18	Medium (M)
2	I didn't know what to report	2.62	Medium (M)
3	I feel embarrassment once reporting a near-miss?	2.13	Low (L)
4	I think that I might get someone into trouble if I report a near-miss?	2.47	Medium (M)
5	I think that I will be blamed if I report a near-miss?	2.33	Low (L)
6	I feel that reputation of my department will be ruined if I report?	2.18	Low (L)
7	I think that someone else should report it?	3.24	Medium (M)
8	Insufficient knowledge and skills related to near miss reporting	3.27	Medium (M)
9	I don't see how it may be beneficial	2.82	Medium (M)
10	Near misses have been reported repeatedly, but nothing has changed.	3.22	Medium (M)

According to Table 4.1. item has been analysis about respondents' interpretation of barriers that led to near miss reporting. Based on the result the highest mean score (m=3.27) are item number 8 which is insufficient knowledge and skills related to near miss reporting. Respondents to the survey estimate a moderate level of insufficiency in their knowledge and proficiency in reporting near-miss incidents. This score indicates that although the respondents might already have some knowledge and skills, they generally believe that they could benefit from additional training, education, or information regarding reporting near misses.

Secondly, respondents' belief that someone else should report near miss reporting with the mean score (m=3.24) shows that respondents indicate this item as moderate. There is a moderate willingness among survey respondents to delegate responsibilities to report near misses to others. It indicates that there is a common belief among respondents that reporting near-misses may not be their main duty and that other people may be more qualified or required to do so.

The third highest item (m=3.22) is near misses, has been reported repeatedly, but no action has been taken. In attempting this question, the respondents have been briefed that unsafe act and unsafe conditions reporting were also part of the near misses reporting. The respondents may not have been informed of the actions taken or the speed of the closure of the concern reporting is not up to their expectations may cause these to be a barrier of reporting.

A mean score of 3.18 displaying an assumption that near miss reporting is considered extra effort and should be avoided indicates that respondents had a moderate level of unwillingness or resistance to the near miss reporting method. The results of this survey indicated a moderate number of workers having mindset that reporting near misses is burdensome, regarded as simply adding to administrative work with no additional benefit, leading to the belief that avoiding such reporting could be preferred.

Next item are respondent don't see any beneficial reporting near miss (m-2.82). This item shows a moderate opinion about the benefits or use of reporting. A portion of respondents are unable to see a major value or benefit in reporting near misses, which leads to a lack of interest or understanding regarding how reporting these events can help improve safety or prevent similar incidents.

Subsequently, a medium level of interpretation refers to item number 2 which demonstrates unsure what to report with the mean score of 2.62. This score shows that a portion of respondents have a considerable lack of clarity or understanding regarding the particular events or conditions that should be recorded as near misses.

Concerns about potentially causing problems for someone by reporting a near miss indicate a moderate level of fear or worry among respondents (m = 2.47), while a minor portion of respondents also have fear of being blamed for reporting a near miss (m = 2.33), which indicates a low level. This shows that only a minority of workers think that reporting near misses may result in the blame being placed on those involved and themselves, resulting in respondents' unwillingness to report incidents due to fears of adverse impacts for themselves or their coworkers.

A mean score of 2.18, reflecting concern about the department's reputation being affected if a near miss is reported, indicates a low level of worry among respondents. This demonstrates that reporting may have adverse effects on the department's reputation, creating fear of reporting problems due to worries about the effects on the department's reputation within the organization.

Finally, respondents indicate the lowest level of interpretation about respondents feeling embarrassed if reporting a near-miss. It means that an insignificant number of respondents think that reporting near misses can trigger emotions of embarrassment, leading to postponing or delay in reporting incidents that result from awkwardness linked with the reporting technique.

3.5 Recommendations by respondents for the improvement of near miss reporting.

Table 2. Interpretation level and mean score of improvements near miss reporting

No	Item	Mean	Interpretations
1	Better training and knowledge will improve near miss reporting	4.09	High (H)
2	Establishing a guideline for a quality near-miss report	4.16	High (H)
3	Organisations should examine these near misses on a regular basis and act on an organisational level to rectify risks through feedback and actions that remedy the hazards	4.18	High (H)
4	Providing worker feedback on near miss reporting that has been reported	4.22	High (H)
5	Creating a formal committee dealing with near miss reporting	3.89	High (H)
6	Do you think that near-miss reporting should be awarded?	4.20	High (H)

Table 2. explained about suggestion of improvement of near miss reporting to increase the submission of near miss reporting. The highest mean score (m=4.22) indicated providing feedback to worker on the report near miss reporting. Giving feedback to employees who report near misses is seen as extremely important or beneficial inside the company. It shows an understanding of the need to appreciate and react to employees' efforts in reporting accidents, as well as promoting a culture of communication and involvement in safety measures. This will generally improve the impression of the workers towards action taken by the orgnisation after an unsafe act or unsafe condition being reported.

Secondly, an opinion that near-miss reporting should be rewarded suggests an overwhelming majority among those answered (m=4.20) . This score indicates a widespread belief within the company that inspiring or rewarding near-miss reporting is extremely valuable. The respondents are likely to view rewards or recognition as important motivators that motivate others to actively report near misses. This strategy contributes to the development of a culture that prioritizes safety measures, encourages reporting, and emphasizes the importance of near-miss reporting in preventing accidents and improving workplace safety.

The next mean score (m = 4.18), which has a significant majority among respondents, conveys that organizations should analyze near misses on a regular basis and take organizational-level efforts to fix risks through feedback and preventive actions. Actively monitoring and correcting near misses at the organizational level is extremely beneficial and critical for improving workplace safety. Respondents are likely to believe that

this strategy is critical for detecting systemic risks, offering feedback, adopting mitigation measures to minimize hazards, and establishing a proactive safety culture inside the company.

The value of establishing a guideline for a quality near-miss report indicates a high interpretation (m=4.16) among respondents. It is extremely beneficial and necessary for the company to have clear and complete criteria for developing great near-miss reports. Respondents are likely to understand the need of consistent reporting methods in assuring consistency, accuracy, and effectiveness in obtaining critical information related to near misses, allowing for better evaluation and proactive hazard control.

Mean score of (m=4.09) indicates an opinion among respondents that better training and knowledge will improve near-miss reporting. The impression inside the company is enhanced training and understanding about near-miss reporting is extremely helpful and necessary. Respondents are likely to recognize that better training and education will enable individuals to better observe, report, and understand the importance of near misses, contributing to a stronger safety mindset.

The least item in improvements of near miss reporting is creating a formal committee dealing with near miss reporting which indicate mean score 3.89. The creation of a formal committee to deal with near-miss reports" indicates a generally positive opinion among respondents. This score suggests that respondents generally observed the value in forming a specialized committee that was only dedicated to monitoring near-miss reporting. However, it is worth noting that this score is lower than some of the higher- rated improvement methods indicating that, while its potential advantages are recognized, it may not be as highly supported as other methods. Overall, respondents are likely to see a dedicated committee as a beneficial way to centralize and expedite the near miss reporting process, presenting formal monitoring, and promoting workplace safety improvements.

4. Conclusion

Near miss reporting is the finest safety awareness technique, which assists in identifying risks that could be brought on by tools or behaviors before they result in actual accidents. By reporting incidents and taking appropriate corrective measures, accidents and near-misses with similar fundamental causes can be prevented from happening again. In conclusion, this study was conducted with the aim of identifying the reporting trend and the barriers in the explosive manufacturing industry and creating an objective to resolve the problems. To achieve the research objective, steps were taken to identify the trend of the reporting database, determine the barriers to near miss reporting, and recommend suitable programmes to improve the reporting. The results of this survey part illuminate a number of noteworthy discoveries. Respondents believe they have a moderate lack of knowledge and abilities for reporting near misses, suggesting a need for extra training or education. There is also a moderate trend among respondents to pass on near-miss reporting, considering it someone else's responsibility and dissatisfaction among respondents due to a perceived lack of action done after frequent near-miss reported which leads to a sense of ineffectiveness. Near-miss reporting is viewed as extra work that should be avoided, which also leads to a lack of motivation or knowledge for safety improvement. Other than that, concerns that causes trouble or blame, ruining department's reputation, and embarrassed to limit the reporting process, resulting in delaying the reporting incidents. These findings illustrate the several barriers that must be overcome in order to build a successful near miss reporting culture, from insufficient knowledge to emotional and organizational issues. Finally, it can be concluded that a second objective has been achieved.

5. Acknowledgement

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