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Article

# Implementation of a Hazard Reporting System for Work Risk Mitigation at MT. Al Daayen

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### ABSTRACT

Work safety is a critical priority in maritime operations, particularly within the high-risk environment of tanker vessels. In accordance with International Maritime Organization (IMO) regulations, hazard reporting constitutes a fundamental pillar of the Safety Management System (SMS), designed to mitigate risks and foster a proactive safety culture. This study investigates the effectiveness of Hazard Report implementation on the MT. Al Daayen, specifically analyzing its impact on accident prevention behaviors and identifying the obstacles impeding consistent crew participation. Adopting a qualitative descriptive approach, this research utilizes Miles and Huberman's interactive model to analyze data gathered through structured interviews, direct field observations, and longitudinal documentation reviews. The results demonstrate that the system has significantly enhanced safety culture, evidenced by heightened crew vigilance, consistent PPE adherence, and a measurable decline in near-miss incidents between 2021 and 2024. However, the study reveals that implementation remains suboptimal due to low participation from ratings. The analysis isolates critical barriers: human factors, including a lack of confidence and psychological fears of assigning blame; methodological constraints caused by lengthy, impractical forms; and environmental pressures, where the fast-paced operational tempo compels crew members to prioritize immediate rectification over formal documentation. The study concludes that simplifying reporting mechanisms is essential for ensuring inclusive safety engagement.

## 1. Introduction

The contemporary maritime industry, particularly regarding high-risk vessels such as the MT. Al Daayen tanker, necessitates rigorous safety protocols to mitigate inherent physical and operational hazards. A pivotal component of effective risk management is the Hazard Reporting System, which facilitates the early identification of unsafe acts and conditions before they escalate into casualties. According to IMO (2020), hazard reporting is a mandatory and integral element of the Safety Management System (SMS). Furthermore, scholarly discourse suggests that active, integrated reporting mechanisms can substantially lower accident rates when accompanied by decisive management intervention (Wróbel, 2021), while the quality of these reports is intrinsically linked to the organization's safety culture and the level of employee engagement (Li et al., 2020).

Despite these established standards, internal data from MT. Al Daayen reveals significant inconsistencies between the annual volume of hazard reports and the frequency of occupational accidents, prompting a critical investigation into the correlation between these two variables. It is posited that a high volume of reports is futile without subsequent evaluation and follow-up, rendering the system ineffective as a mitigation tool (Zhou et al., 2022). Conversely, a paucity of reports may indicate underlying issues, such as a lack of psychological safety or a poor understanding of the system's importance among the crew. Therefore, this research is essential to evaluate whether the current reporting practices are functioning effectively as a preventative measure or if the system is compromised by a lack of tangible action.

To address these discrepancies, this study aims to comprehensively evaluate the implementation of the Hazard Report system on MT. Al Daayen to improve data-driven safety strategies. The specific research objectives are twofold: first, to analyze and describe how the implementation of the reporting program influences the safety culture and accident prevention behaviors among the crew; and second, to identify and detail the primary challenges and impediments that hinder the ship's personnel from reporting potential hazards honestly and promptly.

Therefore, this research is essential to evaluate whether the current reporting practices

are functioning effectively as a preventative measure. From an Occupational Health and Safety (OHS) perspective, this study analyzes the Hazard Report system as a leading indicator—a proactive metric that signals potential risks before they materialize—versus accident rates which serve as lagging indicators (Hasanspahić et al., 2022). By focusing on this relationship, the study aims to: first, analyze how the implementation of the reporting program influences safety culture and accident prevention behaviors through the lens of safety performance indicators; and second, to identify the primary challenges hindering the honest and timely reporting of potential hazards.

## 2. Literature Review

Previous scholarly works have extensively explored maritime safety management, providing a foundational understanding of risk mitigation strategies through various methodological lenses. Notable studies include Taha et al. (2024), who implemented Job Safety Analysis (JSA) to mitigate risks in electrical installations; Saputro (2023), who utilized the Hazard and Operability (HAZOPS) method to assess human error and risks during ship mooring operations; and Hasanspahić et al. (2022), who focused on enhancing safety management through the analysis of near-miss reports on tanker ships. Despite their significant contributions, these studies differ in scope from the current research; specifically, they rely on JSA, operational-specific HAZOPS, or near-miss data rather than evaluating the efficacy of a formal hazard reporting system. Consequently, this study aims to bridge this gap by analyzing the implementation of the Hazard Report system and its correlation with workplace accident frequency specifically aboard the MT. Al Daayen during the 2021–2024 period.

### 2.1 Definition of Hazard and Risk

A hazard is fundamentally defined as any source of potential danger capable of causing injury, equipment damage, environmental loss, or disruption to operational activities (Taha et al., 2024). According to the International Maritime Organization (IMO), a hazard is specifically characterized as a condition or situation with the potential to result in an incident. Conversely, risk is conceptualized as the combination of the probability of a hazard occurring and the

severity of its consequences or impact on human life, the environment, and assets (Saputro, 2023).

## 2.2 Hazard Report System

The Hazard Reporting System serves as a formal organizational mechanism designed to systematically detect, record, evaluate, and mitigate conditions or actions that possess the potential to cause accidents or operational losses (Taha et al., 2024). As a critical component of a proactive Safety Management System (SMS), this framework is instrumental in fostering a robust safety culture by shifting the operational focus towards preventive risk identification rather than reactive measures (Hasanspahić et al., 2022). Structurally, the system typically encompasses standardized hazard report forms, rigorous procedures for identification and evaluation, established protocols for follow-up and corrective actions, and comprehensive documentation to ensure accountability among relevant stakeholders.

## 2.3 The Role of Hazard Reports in Risk Mitigation

Risk mitigation constitutes a systematic process aimed at diminishing the probability and associated consequences of identified hazards (Taha et al., 2024). Within this framework, hazard reporting systems function as a critical preemptive tool, facilitating the early detection of unsafe conditions and enabling the implementation of corrective interventions prior to the escalation of risks into actual workplace accidents (Saputro, 2023). Furthermore, the consistent utilization of these reports significantly enhances the overall efficacy of the Safety Management System (SMS) by fostering heightened crew awareness regarding operational safety and providing a robust dataset necessary for longitudinal trend analysis and strategic prevention planning (Hasanspahić et al., 2022).

## 2.4 Safety Equipment

The Standard Operating Procedure (SOP) for Hazard Reporting functions as a structured framework designed to ensure that the reporting, mitigation, investigation, and follow-up processes regarding potential maritime hazards are executed in a consistent, documented, and effective manner. Furthermore, this table serves as a critical observational benchmark for the current study, outlining essential protocols such

as the requirement for crew members to actively identify unsafe acts or conditions during routine inspections while strictly prohibiting the negligence of even minor potential hazards.

## 2.5 Relevant Regulations and Standards

The implementation of hazard reporting systems is fundamentally anchored in the International Safety Management (ISM) Code, a regulatory framework established by the International Maritime Organization (IMO) to ensure maritime safety and pollution prevention. A pivotal requirement of the ISM Code is the development and maintenance of an effective Safety Management System (SMS) by shipping companies. This includes establishing rigorous procedures for reporting near-misses and unsafe conditions, conducting thorough investigations to identify causal factors, and utilizing the resulting data to drive continuous improvement in safety protocols and crew training.

Complementing these technical standards, the Maritime Labour Convention (MLC) 2006, established by the International Labour Organization (ILO), focuses on safeguarding seafarers' rights and ensuring decent working conditions. The convention mandates a safe and hygienic working environment, requiring vessels to provide adequate facilities and risk-related training. Significantly, the MLC 2006 fosters a proactive safety culture by guaranteeing seafarers the right to report health and safety concerns without fear of retaliation, a process further validated through mandatory periodic audits and inspections to ensure compliance.

Finally, Chapter IX of the International Convention for the Safety of Life at Sea (SOLAS) reinforces the imperative for structured safety management. This regulation mandates the operation of a comprehensive SMS that clearly defines safety policies, procedural guidelines, and crew responsibilities. It is designed to systematically identify, evaluate, and control operational risks, including emergency response protocols. Furthermore, SOLAS Chapter IX emphasizes the necessity of rigorous documentation and record-keeping regarding SMS implementation and incident investigations to maintain high standards of transparency and accountability within maritime operations.

## 2.6 Related Studies

Previous empirical studies have demonstrated that active hazard reporting significantly mitigates the frequency of workplace accidents within the maritime sector. Notably, research attributed to Smith et al. (2018) indicates that shipping companies implementing consistent hazard reporting systems experienced a 35% reduction in accidents over a two-year period. This evidence underscores the critical function of hazard reporting, establishing it not merely as a mechanism for administrative documentation, but as a vital instrument for operational control and the enhancement of safety management systems (Hasanspahić et al., 2022).

## 2.7 Characteristics of the MT. Al Daayen

The MT. Al Daayen operates as a gas carrier, a vessel classification associated with distinct and elevated operational risks due to the volatile nature of its cargo. The specific operational environment of this tanker introduces critical hazards, ranging from the potential for flammable cargo spills and hazardous gas exposure to physical risks such as slippery deck surfaces and the manipulation of high-pressure pump and valve systems. The management of these inherent risks is consistent with broader safety challenges identified in tanker ship operations, which require rigorous safety management protocols (Hasanspahić et al., 2022).

## 3. Research Methodology

This study employs a qualitative descriptive approach, a research design intended to investigate the natural conditions of a subject in depth to describe and explain specific phenomena (Roosinda et al., 2021). The primary objective is to analyze the correlation between the implementation of the hazard reporting system and risk mitigation efforts aboard the MT. Al Daayen, utilizing data from 2021 to 2024 to evaluate the system's effectiveness in enhancing occupational safety. The research was conducted on the LNG Carrier MT. Al Daayen from May 15 to November 21, 2024, a location selected specifically due to its active implementation of a hazard report-based safety management system.

Data acquisition involves both primary sources, gathered directly through field interaction, and secondary sources obtained via intermediaries (Sulung & Muspawi, 2024). To

ensure data reliability, the study utilizes structured interviews to elicit specific technical responses (Fadhallah, 2021), alongside documentation techniques to capture relevant records such as hazard forms and audit reports (Audrilia & Budiman, 2020). Additionally, structured observation is employed to monitor safety behaviors in real-time without researcher interference (Wani et al., 2024). The selection of informants follows a tiered structure—ranging from Key Informants like the Master to Supporting Informants among the crew—to provide comprehensive insight into the researched phenomena (Heryana, 2018).

To guarantee data integrity, the researcher applies triangulation methods to validate findings by cross-referencing different sources and techniques (Mekarisce, 2020; Nurfajriani et al., 2024; Sidiq & Miftachul Choiri, 2019). The subsequent data analysis adopts the interactive model by Miles and Huberman, which proceeds through three continuous stages: data reduction, data display, and conclusion drawing (Kase et al., 2023). This analytical framework allows for the condensation of raw field data into relevant themes and the verification of conclusions to ensure they accurately reflect the operational reality of safety management on board.

## 4. Results and Discussion

### 4.1 Observation

#### 1) Observational Findings on Safety Implementation

The observational study conducted aboard the MT. Al Daayen indicates a robust adherence to the Hazard Reporting Standard Operating Procedures (SOP), where crew members, particularly senior staff, consistently identify and mitigate risks ranging from engine room machinery abnormalities to physical hazards on the main deck. This proactive behavior aligns with the vessel's safety protocols, which explicitly mandate that crew members must identify unsafe acts or conditions during routine inspections and strictly prohibit the negligence of potential hazards. To sustain this culture, the management employs structural mechanisms such as HSEQ meetings and competency-based drills, ensuring that risk mitigation is not only a physical intervention—such as the immediate installation of safety cones—but also a result of enhanced crew understanding regarding safety equipment and enclosed space procedures.

To report a Hazard at Project Site:

Complete a copy of this form and submit manually to the site HSE representative, or report via project site specific reporting tool.

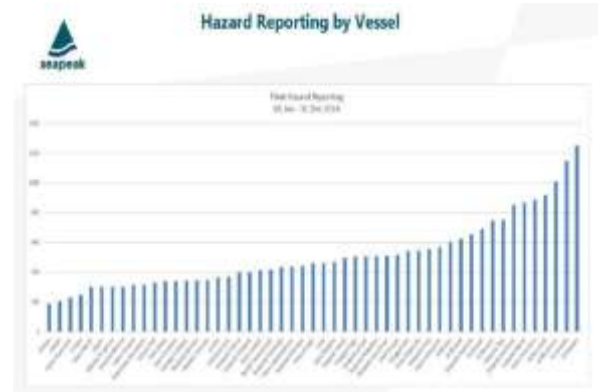
Refer to: [Project Hazard Report Procedure \(SP3200P\)](#)

General Information	
Project Name	
Name / Title of Reporter	
Hazard Reported Date (dd/mm/yyyy)	
Hazard Reported Time (hh-mm)	
Shipyards / Site / Vessel Name	
Vessel Name / Location	
Detailed Location	
Details of Hazard	
Comprehensive Description (What Happened)	
Immediate Action(s)	
Attachments	

**Figure 1.** Form Hazard Report

## 2) Investigation Protocols and Operational Gaps

The vessel's internal investigation process is systematically executed by the Safety Officer, who validates reports through physical walk-throughs and photographic evidence to determine appropriate corrective actions, which are monitored until full resolution. However, the observation highlighted specific deficiencies, including a noticeable psychological hesitation among newer crew members to report minor hazards and an administrative gap where reporters frequently do not receive final feedback notifications regarding the status of their submissions. Additionally, while digital data storage is effectively utilized for safety evaluations, the physical archiving system remains disorganized, which occasionally hinders the efficient retrieval and verification of historical documents.



**Figure 2.** Hazard Report by Vessel Graphics for 2024

## 3) Quantitative Analysis of Safety Performance (2021–2024)

**Table 1.** Comparison of Total Hazard Reports (2021–2024)

Year	Total Hazard Reports	Remarks
2021	45	Hazard report program newly implemented.
2022	58	An increase in crew awareness occurred.
2023	62	An increase in near-miss reports was observed.
2024	97 (Highest)	Crew awareness is very high & reporting increased significantly.

A review of historical data from 2021 to 2024 corroborates the observational findings, demonstrating a strong inverse correlation between proactive reporting and incident frequency. The volume of hazard reports increased significantly over the four-year period, rising from 45 reports in 2021 to a peak of 97 in 2024, a figure that establishes the MT. Al Daayen as the highest reporting vessel within the SeaPeak fleet. Conversely, this heightened awareness contributed to a consistent decline in operational incidents; near-misses dropped from 12 in 2021 to just 5 in 2024, while recorded accidents decreased from 4 to a single minor occurrence in the final year. This data confirms that the hazard reporting system effectively functions as a preventive mechanism, directly reducing operational risk through early detection.

**Table 2.** Near Miss and Accident Data (2021–2024)

Year	Near Miss	Accident	Remarks
2021	12	4	Mostly related to deck work.
2022	10	3	Declining trend.
2023	8	3	Incidents decreased as hazard reports increased.
2024	5	1	Lowest frequency in four years.

## 4.2 Interviews

### 1) Management Perspective on Safety Culture

The interview with the Key Informant, the Chief Officer, indicates that the hazard reporting system has been successfully integrated into the operational safety culture of the MT. Al Daayen. The protocol mandates universal crew participation, with every submitted report undergoing rigorous review during Safety Meetings to formulate necessary corrective actions. While the Chief Officer reported a significant correlation between active reporting and the reduction of near-misses and incidents, he acknowledged that new crew members occasionally exhibit hesitation due to unfamiliarity or a fear of making errors. To potentialize this, management actively encourages reporting through appreciation, thereby reinforcing positive safety attitudes.

### 2) Operational Barriers and Technical Recommendations

From the operational perspective, the Able Seaman (Main Informant) highlighted specific logistical and psychological obstacles hindering the reporting process. High workload intensity and time constraints were identified as primary factors leading to the postponement of reporting minor hazards. Furthermore, a distinct psychological barrier exists among junior personnel, who fear that reporting might be perceived as assigning blame to colleagues. To address these inefficiencies, the informant recommended modernizing the submission mechanism using simplified digital tools, such as QR codes, and emphasized the necessity of enhancing communication channels between the deck and engine departments to ensure swifter follow-ups.

### 3) Leadership Influence and Motivation Strategies

The Boatswain (Supporting Informant) emphasized the critical role of leadership and visible outcomes in sustaining crew motivation. He asserted that crew participation rates increase when they observe that their reports lead to immediate and tangible follow-up actions. The Boatswain argued that safety leadership must be demonstrative; when senior officers and the Master actively engage in reporting, it reinforces the perception of safety as a shared collective obligation rather than merely a subordinate duty. To further incentivize this behavior, he proposed the implementation of non-monetary recognition, such as certificates or acknowledgments on Safety Notice Boards, alongside routine joint safety meetings to align standards across all departments.

### 4.3 Documentation

The photographic documentation evidences the vessel's systemic approach to safety through both structural evaluations and competency development. The records of Safety (HSEQ) Meetings demonstrate their pivotal role as a forum for reviewing hazard reports and corrective actions, a process that has significantly heightened crew awareness and fortified the onboard safety culture. This administrative rigor is complemented by field-based preventive measures, such as the strict enforcement of enclosed space entry protocols—including gas checks and equipment verification—and the implementation of competency-based drills for new crew members. These training initiatives are identified as critical factors in mitigating risks associated with procedural ignorance, directly contributing to the positive trend of declining accidents observed over the past four years.



**Figure 3.** Safety Meeting

Operational evidence further substantiates the effectiveness of the vessel's rapid response mechanisms and communication channels. Documentation from the engine room illustrates the crew's capacity for immediate hazard mitigation, specifically regarding boiler systems, where swift interventions prevent technical deviations from escalating into near-miss incidents. Furthermore, the established practice of reporting hazards directly to Senior Officers ensures that potential dangers are addressed with immediacy. This pattern of direct communication and prompt physical mitigation not only explains the statistical increase in hazard reports but also serves as the fundamental operational control that has successfully reduced the frequency of actual near-misses and accidents aboard the MT. Al Daayen.

#### 4.4 Data Analysis

##### 1) Data Analysis and Validation Strategy

To ensure the reliability of the research findings, the study employed a rigorous triangulation process, cross-referencing data from multiple informants and collection techniques including interviews, observations, and documentation. The source triangulation reveals a consensus among the Chief Officer, Bosun, and Able Seaman that the Hazard Report system is implemented effectively and serves as a fundamental component of the vessel's safety culture. This is corroborated by technique triangulation; observational data confirms that officers actively populate hazard reports and crew members adhere to safety procedures, while documentary evidence statistically validates a reduction in near-miss incidents alongside a year-on-year increase in hazard submissions.

##### 2) Impact on Safety Culture

The analysis indicates that the implementation of the hazard reporting system has significantly bolstered the onboard safety culture. Informants across all levels agreed that the system has heightened crew awareness, resulting in more consistent use of Personal Protective Equipment (PPE) and swifter mitigation responses to identified risks. The Chief Officer emphasized that the system is instrumental in reducing near-misses, a view supported by the Boatswain who noted visible behavioral changes in crew vigilance. Although the Able Seaman noted that not every hazard is

formally documented due to time constraints, the underlying safety awareness and "safety attitude" have indisputably improved across the vessel's hierarchy.

##### 3) Operational and Psychological Barriers

Despite the positive trajectory, the study identified distinct technical, psychological, and structural barriers that hinder full participation, particularly among ratings. Technical impediments include the complexity and length of digital reporting forms, which crew members find impractical during periods of high workload, leading to avoidance of the formal reporting process. Psychological factors further complicate compliance; junior crew members exhibit hesitation to report due to a fear of making errors or the social anxiety of being perceived as assigning blame to colleagues. Furthermore, structural inefficiencies were observed in the coordination between deck and engine departments, where a lack of synchronized prioritization occasionally delays the necessary follow-up actions for reported hazards.

#### 4.5 Analysis of Hazard Categories and Hierarchy of Control

To provide a more granular OHS analysis, the observed hazards and corrective actions were mapped against the Hierarchy of Hazard Control and specific risk categories. Based on the observation data and internal records, the hazards identified on MT. Al Daayen can be categorized into:

1. Physical Hazards: Such as trip hazards from loose covers on the main deck and slippery surfaces due to oil residue.
2. Mechanical/Technical Hazards: Including abnormalities in the boiler system within the engine room.
3. Chemical/Atmospheric Hazards: Specifically related to risks in enclosed space entry which require gas checks.

The implementation of the Hazard Report system has shifted the focus of control measures. While initial mitigations often relied on Administrative Controls (e.g., installing safety cones, warning signs), the follow-up investigations by the Safety Officer drove the implementation of Engineering Controls (e.g., installation of new clamps for boiler systems). This transition demonstrates that the Hazard Report system effectively pushes risk mitigation

to a higher level in the hierarchy, reducing reliance solely on Personal Protective Equipment (PPE) or awareness.

#### 4.6 Correlation of Safety Performance Indicators

Addressing the need for quantitative risk measurement, the study data reveals a concrete improvement in safety performance. Between 2021 and 2024, the Leading Indicator (Hazard Reports) increased by 115% (from 45 to 97 reports), while the Lagging Indicator (Near Misses and Accidents) decreased by 58% (from 12 to 5 near misses). This inverse correlation statistically validates that the proactive identification of hazards (leading indicators) effectively lowers the probability of actual incidents. The increase in reports indicates a lower tolerance for risk among the crew, effectively reducing the overall risk level of the vessel's operations from "High" to "Manageable" through continuous monitoring.

#### 4.7 Research Limitations from an OHS Perspective

It is necessary to acknowledge several limitations in this study regarding OHS methodology. Firstly, the data relies heavily on self-reporting, which may still contain bias due to the "fear of blame" factor identified among junior crew. Secondly, the observation period (May–November 2024) captures a snapshot of operations but may not fully represent risks associated with different seasonal weather conditions or cargo operations. Lastly, this study focuses on the *frequency* of reports rather than a quantitative calculation of *risk scores* (severity x probability) for each identified hazard, limiting the ability to measure the exact magnitude of risk reduction for specific technical failures.

### 5. Conclusion

The research concludes that the Hazard Report system on MT. Al Daayen has successfully functioned as a vital leading indicator, significantly improving safety culture and reducing accident rates. However, the effectiveness is constrained by technical barriers (complex forms) and psychological barriers among ratings.

To optimize the system beyond administrative improvements, the following technical OHS recommendations are proposed:

1. Integration with Risk Management: Hazard Reports should not stand alone but must be formally linked to the ship's Risk Register. Frequent reports on specific equipment (e.g., boiler clamps) should trigger a review of the Job Safety Analysis (JSA) and the Permit to Work (PTW) system to prevent recurrence at the system level.
2. Digital Simplification (QR Codes): As suggested, implementing QR codes for quick reporting addresses the "time constraint" barrier, allowing immediate data entry at the hazard source.
3. Reinforcement of Control Hierarchy: Management should prioritize and track corrective actions that fall under Elimination or Engineering controls, ensuring that hazard reporting leads to physical safety improvements rather than just procedural warnings.
4. Feedback Loop Enhancement: Establishing a mandatory feedback mechanism where the "Reporter" receives a notification upon the "Closure" of a hazard investigation is crucial to validate their contribution and maintain high engagement levels.

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