



Analysis of Unsafe Action and Unsafe Condition Levels of the PT Pertamina International Shipping Fleet

Isma Kurnia Casmono ¹, Marihot Simanjuntak ¹, Mauritz HM Sibarani ¹, Arif Hidayat ¹
¹Maritime Institute, Sekolah Tinggi Ilmu Pelayaran Jakarta, North Jakarta. Jakarta 14150

*Email Korespondensi: casmn2020@gmail.com

Submitted: 22/08/2023

Revised: 14/11/2023

Accepted: 12/12/2023

Published: 30/12/2023

ABSTRACT

This study analyzes the levels and causes of unsafe actions and unsafe conditions reported on PT Pertamina International Shipping's owned fleet during 2021. Using a qualitative descriptive approach, the research draws on near-miss reporting data collected by the Loss Prevention Safety Quality (LPSQ) division across all company-owned vessels over twelve months. The data were categorized using Heinrich's Domino Theory framework and Bird and Germain's Loss Causation Model. For unsafe actions, the analysis identified 59 cases of negligence during work and 36 cases of safety regulation violations as the two largest contributors. For unsafe conditions, damaged or unusable equipment accounted for 146 cases and excessively humid, cramped, or noisy work environments accounted for 57 cases. The findings indicate that human factors, particularly habitual negligence and inadequate use of personal protective equipment, drive the majority of unsafe actions, while equipment maintenance failures drive unsafe conditions. The study recommends stricter enforcement of PPE usage, a graduated disciplinary system, routine environmental inspections, and faster equipment replacement cycles to reduce incident rates across the fleet.

Copyright ©2023, **METEOR STIP MARUNDA**, pISSN: 1979-4746, eISSN: 2685-4775

Keywords:

Unsafe Action; Unsafe Condition; Maritime Safety; Near-Miss Reporting; PT Pertamina International Shipping

1. INTRODUCTION

Indonesia's maritime territory spans over 3.2 million square kilometers of water, with a coastline stretching 95,181 km across 17,508 islands [1]. This geography makes maritime transport the backbone of domestic energy distribution, and tanker operations carry inherent safety risks that demand constant

attention. The Indonesian Ministry of Transportation has identified three primary causes of maritime accidents: human factors (negligence, error, or deliberate action), technical factors (equipment and infrastructure failures), and natural factors [2]. Among these, human factors consistently account for

the largest share of incidents worldwide, a pattern that holds across vessel types and flag states [3].

PT Pertamina International Shipping (PT PIS), established in December 2016 as the Integrated Marine Logistics subholding of PT Pertamina (Persero), operates a fleet of owned and chartered tankers transporting crude oil, refined fuels, LPG, and LNG across domestic and international routes [4]. Within the Fleet Directorate, the Loss Prevention Safety Quality / Designated Person Ashore (LPSQ/DPA) function is responsible for monitoring and managing near-miss events, unsafe actions, and unsafe conditions on company-owned vessels. Despite the existence of this reporting system, incident data from 2021 showed that unsafe actions and unsafe conditions continued to occur at rates that warranted systematic analysis.

The distinction between unsafe actions and unsafe conditions originates from Heinrich's Domino Theory [5]. Unsafe actions are behaviors by individuals that deviate from accepted safety procedures, such as working without personal protective equipment, operating machinery incorrectly, or failing to secure equipment after use. Unsafe conditions are physical or environmental hazards in the workplace, such as damaged equipment, inadequate lighting, or exposure to toxic atmospheres. Bird and Germain's Loss Causation Model [6] extended this framework by tracing these immediate causes back to basic causes (personal and job factors) and ultimately to management control failures. The safety triangle concept, also attributed to Bird and Germain, establishes that for every serious injury, there are approximately 10 minor injuries, 30 property damage incidents, and 600 near misses [6]. This ratio underscores the importance of tracking and addressing near-miss events before they escalate into actual accidents.

Previous research on maritime safety in Indonesia has examined regulatory compliance, port safety management, and seafarer competency [7], [8]. However, fewer studies have focused on the specific patterns of unsafe actions and unsafe conditions within a single company's fleet over a sustained period. This gap matters because fleet-level data reveals company-specific patterns that generic industry statistics cannot capture, such as which types of negligence recur most frequently, which equipment categories fail most often, and which locations on board generate the most reports [9].

This study addresses that gap by analyzing unsafe action and unsafe condition data from all PT

PIS owned vessels throughout 2021. Two research questions guide the analysis: first, what are the levels of unsafe action and unsafe condition occurrence across the fleet, and second, what are the two largest causes in each category. The findings are intended to support targeted safety interventions by the LPSQ/DPA function and fleet management.

2. RESEARCH METHOD

Research Design

This study uses a qualitative descriptive approach. The descriptive method allows the researcher to document and categorize safety events as they occurred, without manipulating variables or testing causal hypotheses [10]. This approach is appropriate for analyzing incident report data where the goal is to identify patterns and frequencies rather than to establish statistical relationships between variables.

Research Setting and Period

The research was conducted at PT Pertamina International Shipping, specifically within the LPSQ (Loss Prevention Safety Quality) division of the Fleet Directorate. The company is headquartered at Jl. Gatot Subroto No. 3, Kav 32-34, South Jakarta, with operational offices at Jl. Yos Sudarso No. 32-34, North Jakarta. Data collection took place during the researcher's twelve-month onshore internship from August 2021 to August 2022, with the incident data covering the full calendar year of January through December 2021.

Data Collection

Data were collected through two methods. First, participatory observation during the internship provided direct exposure to the LPSQ reporting workflow, including how crew members submit reports, how the LPSQ team categorizes and processes them, and how corrective actions are tracked [11]. Second, documentary review of the company's near-miss, unsafe action, and unsafe condition reporting database for 2021 provided the quantitative data for analysis. The reports were submitted by crew members on owned vessels and processed through the LPSQ division's standardized reporting forms (Form 104) [4].

Data Analysis

The incident data were organized in Microsoft Excel and categorized according to Heinrich's classification of unsafe actions and unsafe

conditions [5]. For unsafe actions, categories included: working without authorization, failure to warn, working at incorrect speed, causing protective equipment malfunction, using damaged equipment, working without safety equipment, violating safety rules, horseplay at work, and negligence/drowsiness/intoxication. For unsafe conditions, categories included: safety equipment not meeting requirements, damaged/unusable materials or equipment, inadequate ventilation and lighting, excessively humid/cramped/noisy environment, explosion/fire hazard, insufficient signage, and toxic

atmosphere. Monthly totals were compiled for each category, and the two largest causes in each group were identified for further analysis [6], [12].

3. RESULTS AND DISCUSSIONS

3.1. Results

Unsafe Action Analysis

Table I presents the monthly distribution of unsafe action incidents across all PT PIS owned vessels in 2021, broken down by cause category. The data were compiled from LPSQ reports submitted by crew members throughout the year.

Table 1. Monthly Unsafe Action Incidents by Cause Category (2021)

Month	No Auth.	Fail Warn	Wrong Speed	Equip. Malfunction	Damaged Equip.	No Safety Equip.	Rule Violation	Negligence
Jan	0	1	2	3	1	6	5	3
Feb	0	2	1	2	0	3	8	4
Mar	1	0	2	1	0	2	3	7
Apr	0	1	3	5	1	4	3	4
May	0	0	1	2	0	7	2	12
Jun	0	1	0	3	0	4	2	15
Jul	0	0	0	0	0	0	2	2
Aug	0	0	2	0	0	0	0	1
Sep	0	0	0	1	0	1	1	3
Oct	0	0	1	0	1	1	1	3
Nov	0	1	5	1	0	2	2	2
Dec	0	0	1	0	0	3	1	3
Total	1	6	18	18	3	33	36	59

The data reveals that negligence during work was the single largest cause of unsafe actions throughout 2021, with 59 reported cases. These ranged from leaving electronic equipment powered on when not in use, to failing to close pipe valves, to leaving deck hatches unsecured. The month of June recorded the highest number of negligence cases (15), with incidents including improperly locked cargo tank valves, open deck seals, and recreation room windows left open during operations.

Safety rule violations ranked second with 36 cases. These included battery handles left attached to

fully charged tank batteries, mechanical gas lighters left on ECR tables, and crew members conducting pilot ladder rigging without proper pre-use testing. Working without safety equipment came third with 33 cases, involving crew members performing tasks on the main deck, in pump rooms, or during chipping operations without required PPE such as helmets, safety goggles, or gloves.

Unsafe Condition Analysis

Table II presents the monthly distribution of unsafe condition incidents across the fleet in 2021.

Table 2. Monthly Unsafe Condition Incidents by Cause Category (2021)

Month	Equip. Not to Std.	Damaged Equip.	Poor Ventilation/ Light	Humid/Noisy Env.	Fire/Explosion	Toxic Atm.
Jan	2	17	3	4	1	0
Feb	1	9	2	9	0	0
Mar	2	15	6	3	0	0
Apr	3	21	4	5	1	0
May	2	15	3	11	0	1
Jun	3	22	2	5	1	0
Jul	4	5	1	2	0	0
Aug	1	5	2	3	0	0
Sep	2	7	1	3	0	1
Oct	1	3	1	2	0	0
Nov	2	9	2	6	0	0
Dec	1	18	1	4	1	0
Total	24	146	28	57	4	2

Damaged or unusable materials and equipment dominated the unsafe condition reports with 146 cases across the year. The most common issues were pipe leaks, malfunctioning deck doors, broken mooring tails, and defective hydraulic seals. June recorded the highest number (22 cases), including fire hose leaks and self-closing doors that failed to shut properly. April was close behind with 21 cases, primarily involving coolant system failures, pipe leaks, and damaged deck doors.

The second largest category was excessively humid, cramped, or noisy environments with 57 cases. These included oil spills from overflow in bilge areas, blocked deck drainage, water pooling beneath dispensers, and oil-contaminated cotton rags found near machinery. February and May showed the highest counts in this category (9 and 11 cases respectively).

3.2. Discussion

The dominance of negligence (59 cases) among unsafe actions aligns with Heinrich's original observation that the majority of workplace accidents stem from unsafe acts rather than unsafe conditions [5]. What is notable about the PT PIS data is the specific nature of the negligence: most cases involved crew members forgetting to secure, close, or deactivate equipment after use. Leaving a microwave running unattended, failing to lock a manifold drain valve, or leaving electronic devices powered on are

not acts of deliberate risk-taking. They are lapses in routine attention, the kind of habitual oversight that safety literature associates with fatigue, time pressure, and insufficient procedural reinforcement [13].

The safety rule violation cases (36 total) tell a somewhat different story. These involve crew members who are aware of the rule but choose not to follow it, whether by skipping pilot ladder testing before use, leaving battery handles attached to charged equipment, or storing ignition sources in restricted areas. The distinction matters because negligence and deliberate violations require different interventions. Negligence responds to procedural aids such as checklists, buddy systems, and environmental cues. Violations respond to enforcement, accountability, and cultural change [14].

On the unsafe condition side, the overwhelming number of damaged equipment cases (146) points to a systemic maintenance issue rather than isolated failures. Pipe leaks, broken mooring equipment, and malfunctioning door mechanisms recurred month after month, suggesting that either the equipment replacement cycle is too slow, the maintenance scheduling system is not capturing recurring failures, or both [6]. The LPSQ division's Planned Maintenance System (PMS), managed through DNV GL software, should in theory catch these issues. The persistence of the same categories of equipment failure suggests that the PMS may need recalibration to prioritize the components that fail most frequently in the fleet's specific operating

conditions.

The environmental condition reports (57 cases) are also worth examining. Oil spillage, blocked drainage, and humidity are not random events. They are downstream consequences of other failures: equipment leaks that are not cleaned up promptly, drainage systems that are not inspected regularly, and deck areas that are not maintained between operations. Addressing these requires the Boatswain and Ordinary Seamen to maintain cleaning routines, but also requires the management system to allocate time and resources for environmental maintenance alongside equipment maintenance [15].

One limitation of this study is that it relies on self-reported data from crew members. The safety triangle principle [6] suggests that the reported numbers represent only a fraction of actual events. Underreporting is a well-documented problem in maritime safety research, driven by fear of blame, lack of time to file reports, and skepticism about whether reports lead to corrective action [16]. The actual levels of unsafe actions and unsafe conditions on PT PIS vessels are likely higher than what the data shows. Strengthening the near-miss reporting culture, including providing positive feedback to reporters and demonstrating that reports lead to tangible changes, would improve data quality and enable more accurate safety analysis in future periods.

4. CONCLUSION

This study analyzed unsafe action and unsafe condition levels across the PT Pertamina International Shipping owned fleet throughout 2021, drawing on LPSQ reporting data from all company-owned vessels. Two principal findings emerged. For unsafe actions, negligence during work (59 cases) and safety rule violations (36 cases) were the two largest causes, together accounting for more than half of all reported unsafe actions. For unsafe conditions, damaged or unusable equipment (146 cases) and excessively humid, cramped, or noisy environments (57 cases) dominated the reports. The findings point to a need for targeted interventions: a graduated disciplinary system to address both negligence and deliberate violations, improved PPE availability and storage to remove barriers to compliance, accelerated equipment replacement for the most frequently failing components, and routine environmental maintenance schedules. Future research should expand the analysis to cover multiple years to identify trend lines and should investigate whether the recommended

interventions produce measurable reductions in incident rates.

REFERENCES

- [1] Government Regulation of the Republic of Indonesia No. 51 of 2002 on Shipping.
- [2] Ministry of Transportation of Indonesia, "Maritime accident investigation reports," KNKT, Jakarta, 2021.
- [3] IMO, "Revised guidelines for formal safety assessment (FSA)," MSC-MEPC.2/Circ.12/Rev.2, International Maritime Organization, London, 2018.
- [4] PT Pertamina International Shipping, "Company profile and annual report," Jakarta, 2021. [Online]. Available: <https://pertamina-pis.com>
- [5] H. W. Heinrich, D. Petersen, and N. Roos, Industrial Accident Prevention, 5th ed. New York, NY: McGraw-Hill, 1980.
- [6] F. E. Bird and G. L. Germain, Practical Loss Control Leadership, Rev. ed. Loganville, GA: International Loss Control Institute, 1990.
- [7] R. C. McKinnon, Safety Management Near Miss Identification, Recognition, and Investigation. Boca Raton, FL: CRC Press, 2012.
- [8] National Safety Council, Injury Facts, 2013 ed. Itasca, IL: NSC, 2013.
- [9] D. Santosa, Pokok-pokok Hukum Perkapalan. Yogyakarta, Indonesia: Andi, 2004.
- [10] Sugiyono, Educational Research Methods: Quantitative, Qualitative, and R&D. Bandung, Indonesia: Alfabeta, 2019.
- [11] W. Gulo, Research Methodology. Jakarta, Indonesia: Grasindo, 2002.

- [12] Government Regulation of the Republic of Indonesia No. 50 of 2012 on Occupational Safety and Health Management Systems.
- [13] J. Reason, Human Error. Cambridge, UK: Cambridge University Press, 1990.
- [14] J. Reason, Managing the Risks of Organizational Accidents. Aldershot, UK: Ashgate, 1997.
- [15] A. S. Graha and B. Priyonoadi, Terapi Masase Frirage. Yogyakarta, Indonesia: FIK UNY, 2009.
- [16] IMO, "Casualty investigation code," Res. MSC.255(84), International Maritime Organization, London, 2008.