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Research Article

DEVELOPMENT OF TANKER MANAGEMENT SELF ASSESSMENT SYSTEM IN TANKER SHIP OPERATIONS

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ABSTRACT

One example of a ship safety management system failure is a casualty that occurs in the ship system. This study is critical because it will study how the Tanker Management Self Assessment (TMSA) system works to ensure the efficiency and safety of tankers. The study shows that the tanker's safety culture, communication, safety performance, compliance, and Port State Control (PSC) Inspection Pass have improved due to the implementation of the TMSA system, which has reduced the accident rate. In addition, the system has increased safety awareness and culture among the ship's crew, increasing crew involvement in safety management. Limited resources, complexity, and limited training are some obstacles and limitations when developing the TMSA system. It is concluded that improving the development of the TMSA system for tanker operations is essential for crew safety.

Keywords: Assessment, Tanker Management Self Assessment (TMSA), Operation, Tanker Ship

INTRODUCTION

Safety and pollution prevention are essential parts of ship operations that cannot be addressed in isolation. All aspects of ship operations are affected by these elements. Ship management is responsible for the safety of personnel, property, and the environment. Quality of service consists of ease of use, operational reliability, and performance by the contract. The International Maritime Organization (IMO) recognizes the Tanker Own Management Assessment (TMSA) as a significant change in its approach to maritime safety standards. Today, the large shipping sector is beginning to implement the Code of Conduct with Quality Management System (QMS) requirements.

According to the Maritime and Coastguard Agency (MCA), an independent assessment tool should be created to evaluate the safety culture of non-tanker vessels. This tool should be similar to the Tanker Management and Self Assessment (TMSA) (Lappalainen, 2008). Instilling a “culture of safety, quality, and maritime environmental protection” in a company may have little impact on ship safety and pollution prevention. Therefore, external audits are usually included in company regulations. Consequently, it is essential to gather lessons from this experience to determine how regulatory instruments can benefit from industry approval of voluntary management tools (TMSA).

Currently, there is a possibility of decreasing safety standards due to economic reasons, which can affect all aspects of safety at sea, from implementing safety standards and procedures on board ships to the safety culture of the entire shipping company. Therefore, the decision to conduct this current research on developing an assessment system for two different safety management systems in the maritime industry is critical (Kristiansen, 2005; Algelin, 2010). This research combines the assessment systems and evaluates the methods and effects of two different management tools. This can indicate that the authors consider that there is a relationship between these two management tools, and they are trying to explain or prove the existence of this relationship. This research aims to study the current TMSA in the maritime industry sector. TMSA has been built on the International Safety Management (ISM) Code

(Kristina & Djunaidi, 2022; Mejia, 2001). Building the development of the TMSA system is the scope of this research.

After several significant accidents, the attention of shipping people turned to maritime safety (Kusumawati, 2023; Minqiang Xu, et al., 2023). It began to look for ways to improve shipping processes to protect the health of seafarers and especially the environment. The primary purpose of TMSA is to encourage the implementation of standards and procedures necessary for shipping company operations and to ensure the safety of human life at sea. In this regard, shipping companies must provide a safe working environment for their employees and anticipate the hazards that may occur during daily operations. TMSA was created because many studies have shown that the human factor plays a role in most accidents. For this reason, the system has documented rules, standards, and procedures. For example, laws and ship technology change frequently.

Companies must have established procedures to deal with special environmental and safety situations. According to the 2023 Annual Report on Port State Control in the Asia-Pacific Region, 1,334 ships under 71 flags were detained due to severe deficiencies on board. 13 flagged ships were detained in Indonesia. Based on the background above, the researcher wants to research the Development of a Tanker Self-Management Assessment System (TMSA) in Tanker Operations. Based on this background, the researcher is interested in exploring the ISM Code. This voluntary guideline was first published in 1993 by the Oil Companies International Marine Forum (OCIMF).

RESEARCH METHOD

The research approach is descriptive qualitative because this research produces conclusions in the form of data described in numbers. Qualitative research is a scientific approach that reveals a social situation by correctly describing reality, formed by words based on relevant data analysis techniques from natural conditions. This study collected data through observation, interviews, and documentation of the research subjects. This method produces detailed data. This study is descriptive because descriptive research aims to provide a systematic, factual, and accurate description, picture, or painting of the facts and competitive characteristics between the subjects being investigated (Creswell, 2017). Considering the focus and objectives of the research, this type of research is very appropriate because the research will describe and combine the collected data.

For this research, later the researcher will look for descriptive data about the improvement of the Tanker Management System and Ship Management (TMSA) and its impact on the operation of tankers that generate research approaches to describe data or research results, as well as provide observations in the process of implementing safe ship operation activities. In this research, the author took the location of the shipping company PT Lintas Maritim Indonesia (LMI) in the Special Capital Region of Jakarta 12940. This is because PT. LMI is a shipping company that is experienced in implementing TMSA.

RESULT AND DISCUSSION

TANKER MANAGEMENT SELF ASSESSMENT (TMSA)

1.1 Key Performance Indicator (KPI)

KPI include setting targets and tracking progress towards achieving organizational goals. KPI are primarily used to evaluate the performance of companies in various economic sectors, especially in the shipping industry, where KPIs are mainly used to assess and forecast performance (Danelec, 2021). 1.3 KPIs in the Shipping Sector: Many economic sectors use a variety of KPI daily to measure their performance and outcomes. The three most common categories of KPI are used in shipping and logistics. The first category of KPI is procurement, which tracks arrival time, reorder time, and inventory costs. These KPI help manage and track inventory in a warehouse, for example, ensuring that all shipments are completed on time. Logistics indicators in the second category track the picking, tracking, and order accuracy per worker. Transportation indicators in the third category track shipping costs, pick and ship times, and expenses from order to placement. Shipping performance KPI are also used in the shipping industry, which assesses fuel consumption, speed profiles, weather conditions, trim compliance, energy efficiency, and emissions. In addition, some KPI assess system and engine performance**.**

1.2 Performance Management In Shipping Industry

Ship operators can use a variety of procedures to evaluate their business performance both on board and ashore. The most common method is to assess ship performance by measuring daily fuel usage and distance traveled. This procedure can calculate the ship's average daily power and speed. Many other procedures also fall into this category. Studies have shown that performance management can improve efficiency by up to 38% (Wahid et al., 2023). However, ship owners may find that following a similar system would be very expensive for the company. Owners and operators open to new technological opportunities can optimize the results and see that ships are equipped with many systems that monitor equipment and have the scope to improve performance and reduce costs. DNV GL recently conducted a study to show the enormous benefits of implementing a good Performance Management System (Andersen, 2015). The verdict was that the container fleet delivered environmental benefits and financial savings of $25 million. To be successful in the shipping industry, a performance management system must ensure high-quality data, make it easy for crew to use, and monitor KPIs as a basis for driving behavior.

1.3KPI and TMSA

In TMSA, KPIs are used as a company tool to evaluate performance. This evaluation is carried out at levels 1–4 for each of the thirteen elements. However, not all KPIs used in the shipping industry can be used in TMSA because they are designed for companies that manage tankers or barges. If a KPI is deemed not in accordance with the TMSA procedure, the company must explain why the KPI was not included in the procedure (Daskalou, 2018). After the assessment is completed, the organization will receive a clear summary of the performance assessment. If the findings indicate problems, the organization can find solutions to improve performance and meet additional criteria not met during the previous assessment.

1.4How TMSA Works

TMSA consists of thirteen sections, including several KPIs arranged from level one to level four. Companies must match SMS based on KPI, and the higher the level of each item, the closer the company is to the objectives of a particular TMSA item and achieving the desired performance. At the same time, each section has a Best Practice Guide section, which explains the best way to reach the level required by a particular section of TMSA (OCIMF, 2021). If the elements of TMSA are not met, this will be an opportunity for the company to propose new changes and improvements to improve its performance as much as possible. The TMSA data above shows that elements 2 and 3 are related to HR management. As a result, human resources and how KPIs are treated are significant in assessing the performance and risk of the organization. ExxonMobil International Marine Transportation's statement on the importance of TMSA is that the use of TMSA has helped reduce the number of accidents in recent yea.

1.5Verification Process and Report Submission

TMSA results can be submitted for verification review by an external assessor. The assessment verification agreement is usually confidential between the external assessor and the company conducting the assessment. If performance is considered high, the company can use the assessment results to demonstrate that the KPIs have met the TMSA elements. Once the evaluation is complete, the company must submit a report with the results to the TMSA online tool, selecting who will have access and read the report (Cevic & Arslan, 2022). No other organization can access this report and publish the information it produces.

1.7 TMSA Element Description

1. Elements 1 and 1A Leadership and Safety Management Systems
2. Element 2 Recruitment and Shore Management (Based Personnel)
3. Elements 3 and 3A (Ship Personnel Recruitment and Welfare Management)
4. Elements 4 & 4A - Ship Reliability and Maintenance Including Essential Equipment
5. Element 5 – Safety of Navigation
6. Elements 6 & 6a – Cargo Operations, Ballast, Tank Cleaning, Bunkering, Mooring and Anchoring
7. Element 7 – Change Management
8. Element 8 – Incident Reporting, Investigation and Analysis
9. Elements 9 & 9a – Safety Management
10. Element 10 – Environmental and Energy Management
11. Element 11 – Emergency Preparedness and Contingency Planning
12. Elements 12 & 12a – Measurement, Analysis and Improvement
13. Element 13 – Maritime Security

1.8 Development and Implementation of Safety Management on Tanker Ships

Due to improved design, maintenance, and operational practices, tankers have evolved into a safe and environmentally friendly means of transportation. However, no tanker is equipped with an anti-accident system. A well-designed safety management system can reduce the likelihood of major accidents and disasters. This section will discuss the various parts of developing and implementing tanker safety management (Arslan et al., 2016; Purba et al., 2019). The safety management system consists of the following functions: definition, analysis/control, monitoring, and review. Safety assessment performs the definition and analysis functions. The control function consists of two distinct parts: the first deals with developing management controls, and the second deals with implementing management controls (Purba et al., 2018; PS et al., 2022). Fleet safety and environmental policies, safety assessment results, and national and international regulations assist in developing management controls. Monitoring consists of two parts. Audits and inspections are the proactive part, and accident/incident reporting is the reactive part.

1.9 Safety Assessment

Safety assessment is a systematic process for identifying and analyzing hazards associated with an activity or operation and assigning a level of risk. The safety assessment process must be completed without any uncertainties or biases. The key word is "objective." The primary focus should be on determining how safety is managed, not how safety is perceived to be managed. This exercise aims to develop better techniques for accomplishing tasks in a less hazardous manner. Hazard identification will help a company meet the requirements of ISM Code paragraph 1.2.2.2, which requires companies to "establish safeguards against all identified risks (DachlanAndi Sadly, 2014; Mudiyanto, 2021; Purba et al., 2020) ." Hazard identification techniques are generally divided into comparative and fundamental methods. Comparative methods consider all hazards that have occurred on similar ships or ship systems in the past and determine whether they are present on the proposed vessel or system. Hazard and Operability Analysis (HAZOP) is a more comprehensive technique. The intent is to thoroughly study all project activities and processes using keywords or a combination of guide words and parameters in a multidisciplinary approach.

HAZOP will identify potential hazards and operational problems by examining processes and actions in inshore and on-board management. Thorough identification of risks will require a complete understanding of the procedures or actions being discussed. A team of people from various disciplines will most effectively conduct the study. The ship's superintendent, fleet safety officer, inspector, commercial manager, personnel manager, purchasing manager, and service manager should be included in the team. The team should have a leader who understands the HAZOP methodology and a secretary to record the discussions and results. The HAZOP team should systematically focus on the various activities in the tanker's operations and identify all faulty processes and dangerous malfunctions. Team members should understand their areas of specialization and their relevance to the safety management system. National legislation, flag state and port state regulations and guidelines, international conventions, recommendations and codes of practice, product information, expert advice, and opinions, records of previous accidents and incidents in the organization and other organizations, personal knowledge and experience of managers and employees, and industry or trade association guidelines are some sources of relevant information (Sulistijo, 2002).

Tankers must consider the following hazards: fire, explosion, collision, stranding or grounding, personal injury, pollution, pirate attacks, and uncontrolled release of dangerous cargo. Tankers with highly reactive cargoes must also consider the hazards of accidentally mixing incompatible cargoes with air, water, and other substances. During the hazard analysis, procedures on board that are potentially hazardous must be thoroughly reviewed. This review should include procedures on the bridge, machinery space, life-saving, fire-fighting, pollution prevention, cargo handling, permits to work, berthing and berthing, ship security, emergencies, and maintenance.

In most cases, a triggering event causes an initial failure in the system, which continues until a series of events culminates in a hazardous outcome. The causal analysis investigates the chain of events of each operation or activity to determine how the events relate to the dangerous outcome. Two methods can be used to study the sequence of events: event tree analysis and fault tree analysis. The first method requires a flowchart for each relevant process or activity. A failure in the process is the point at which the analysis begins. This exercise aims to determine whether a triggering event could have produced a particular hazardous outcome. After a system failure, the sequence of possible events is traced to determine which combination would have led to the dangerous condition. If a trace branch produces a harmless outcome, the trace is not traced any further. This method has the limitation that the same outcome could arise from other reasons not apparent from a single trace. The advantage of this technique is that the overall outcome can be analyzed from the same tree. This can be referred to as the "bottom-up method".

Once hazards have been identified and their sources analyzed, a risk assessment must be performed by estimating the likelihood of the hazard occurring and its consequences. One way to evaluate the probability and outcomes of a hazard is to look at its impact on the receptor. This type of assessment is known as a qualitative assessment, where the hazard rating based on previous experience is expressed in a qualitative scale for the likelihood and consequences of the hazard. This scale can assess the probability and consequences of each identified hazard scenario. This scale can then enter each hazard scenario into the risk matrix below. The upper right corner of the matrix will display the high-risk hazards. Using this matrix, it is easier to determine unacceptable levels of risk and develop strategies to reduce the risk to acceptable levels. This criterion can be used when creating controls: risks that can cause small losses should be prioritized over risks that can cause significant losses.

1.1.1 Developing Controls

When developing controls, environmental and safety policies, national and international regulations, and safety assessment results must be considered. This process consists of design elements, documentation, and instructions.

1.10 Control Design

Actions designed to reduce risks that are difficult to eliminate are necessary to eliminate the risk (Reason, 1991). If changes to the engineering design cannot be made, procedural actions may need to be considered. The steps developed should be easy to understand and use.

1.11 Documentation

Safety documentation management is the core of the safety management system. Everything related to safety and pollution prevention must be identified and recorded. The Company's Main Manual may consist of several parts. Each component can be stored in a separate folder. The loose structure for most reference documentation will make it easy to update the document when corrections are needed. The Company's Main Manual serves as the basis for the company's safety management system. This system must be governed by safety and environmental policies. The first section of the Company's Main Manual should be dedicated to safety and environmental policies. This section is usually followed by sections that provide:

- A brief description of the company's business.
- Information about the fleet.
- A formal strategy for implementing the safety and environmental policies..

The Safety Management Office Manual should be part of the office management documentation. This manual should include a specific section dedicated to each shore activity or department whose actions affect the safety and pollution prevention of the ship. This manual should also thoroughly explain the procedures, job descriptions, and instructions to be followed by each department. The procedures and instructions should only cover the ship's safety and pollution prevention aspects. Shipping lines typically have personnel, operations, insurance, purchasing, and technical departments. By following established procedures with safety and pollution prevention in mind, the primary purpose of this document is to prevent accidents or incidents. In addition, it is a good idea to establish protocols for responding to and following up on reports of accidents or incidents. Each section of this manual should be written by the respective department and signed by the department head to ensure that all procedures noted are implemented.

The shore and shipboard contingency plans should work together. Ideally, they should consist of two separate components of the same strategy. An emergency response plan that covers shore and shipboard contingency actions will be called an Emergency Response Plan (ERP). The ERP should guide shipboard and shore personnel in an emergency. Introduction to the ERP requires an explanation of its purpose and scope. The ERP optimizes emergency response time and ensures ship and shore readiness. Its primary purpose is to help maintain control in an emergency by pre-planning, delegating, and rehearsing critical tasks, allowing more time to make crucial strategic decisions. Determining the situation and type of emergency is necessary to establish the scope of the ERP.

In emergency response, internal and external communications are essential. For activation of emergency plans, onboard communications, maintaining ship-shore contact, and situation reporting, the general instructions section of the ERP should include instructions. All languages used in emergency communications should be described here. Recording methods should be thoroughly described in this section. Instructions on media management should be provided. Mandatory and voluntary reporting to other agencies should be provided in this section. This section should provide guidance for handling next of kin inquiries and a system for notifying the next of kin of victims.

1.12 Implementation of Safety Management System

People from all relevant departments in the organization must be involved in the development process to implement the safety management system successfully. This will ensure that the proposed system will be introduced in a way that is compatible with the existing system, and an added benefit is that the crew will feel ownership of the proposed system. A realistic implementation schedule should be established. Communication, training, and system development can be carried out simultaneously. A safety management system typically takes twelve to eighteen months. The company should use all available means to communicate to others about establishing a formal safety management system. Conferences, posters, bulletins, and circulars can be used. Communication is intended not only to convey information but also to make personnel willing to accept the change.

The organization should introduce the various components of the system in a phased manner. The first step is to ensure that all required documentation is maintained at each location in the system. Next, the recommended document control protocol should be added to the safety management documentation to ensure that the procedures followed follow the safety management manual. The system should then be allowed to function reasonably without applying for certification. During this period, the internal auditor should act as an auditor and facilitator. Any deficiencies in the system should be identified and corrected immediately. Unscheduled audits should be conducted to ensure compliance with the specified parameters. Certification can only be granted after the system is operating correctly.

DISCUSSION

There are enough checks and balances to gauge the viability of a tanker charter since the ISM code and SIRE inspections are already in place for most tanker companies. However, the OCIMF needs to implement more safeguards on all the tankers they inspect and eventually charter beyond the legal and commercial reports mentioned above. Not all operators follow the ISM code, although many praise it (Ginting, 2023; OCIMF, 2018). This seems to be in line with the STCW convention, which whitelists every country. This is not meant to disparage conscientious tanker operators but to emphasize that every operator manages to fall under the same umbrella. Second, the SIRE inspections, which are a step in the right direction, fail because they tend to be highly subjective and audit-based. Like previous inspections, they can overlook essential system weaknesses. These inspections, conducted by multiple inspectors, can confirm the truth about them. TMSA has managed to avoid the spirit of the ISM and the uncertainty of the data presented by the limited and circumscribed SIRE audits (Bhattacharya, 2009; Wahyuni et al., 2018).

To achieve this goal, the guidance suggests providing tanker operators with clear standards, which will be assessed by the operators themselves, and for the OCIMF to review and investigate the results. The Core Elements, Core Element Objectives, Guidance Notes, Key Performance Indicators (KPIs), and Best Guidance Practices assist operators. Each essential element is built through increasingly severe stages, which now total four. Each tanker operator must report to the OCIMF a “progress report” on the “stages” achieved in each stage (OCIMF, 2017). This report must be consistent and updated each time the operator reaches a higher stage.

The report will show tanker operators' position in relation to the OCIMF guidelines on TMSA. The OCIMF acknowledges that these guidelines must be reviewed and updated continuously (OCIMF, 2020). How difficult is it for a tanker operator to meet these criteria? The OCIMF must complement the ISM code and SIRE inspection guidelines through TMSA, indicating that this will be challenging for companies that only talk about ISM (Irawan, 2023). However, operators who have implemented ISM, again using the cliché, will consider at least the first two stages of the standard. Parts 3 and 4 of the essential components involve planning, reorganizing, and renovating the company’s SMS to some degree. As mentioned earlier, the fourth stage is not the final stage because TMSA provides for continuous improvement in line with future requirements. If viewed negatively, the goals of the ISM code are the same (Thamrin. 2001; Utoyo Hadi, 2007). However, there is a significant difference between TMSA and ISM: TMSA provides the goals to be achieved and detailed guidelines for achieving them. While these guidelines are not vague, they are clear and definite enough that it is almost impossible to avoid them.

Each tanker operator should study the guidelines for the key elements and sub-elements and compare them with the results achieved through their SMS (Piraeus, 2020). Progress gradually through the four stages given for the twelve different vital elements. Each critical component has different Key Performance Indicators (KPIs) for specific steps. These KPIs provide appropriate Best Practice recommendations. The idea is to see if the Best Practice Guidelines and the company's practice align. If they are, then nothing more needs to be done. If not, the system should be improved until best practice is implemented, and evidence must be provided. Therefore, each operator should review the ISM policies and procedures as they progress through the stages (Putro et al., 2020; Siregar et al., 2023).

GAP analysis is the best way to prepare a company to meet TMSA requirements. It will show the differences between the company's current practices and the TMSA best practice guidelines for crucial KPI elements or sub-elements. For example, some key elements may be entirely new for many operators. While practices such as change management may be in place today, there is no evidence to suggest that they are. An example is the new training requirements for Shore personnel in presentation skills, negotiation skills, diversity, and team building. This is the "best practice guide" in stage 4, key element 2, relating to the recruitment and management of shore personnel (Anchal Kapoor, 2019).

Seafarers are very concerned about how much paperwork they will submit with TMSA. However, TMSA aims to reduce the burden of paperwork and repetitive reporting. According to the guidelines, "A uniform approach to information collection will eliminate duplication of effort by operators." Of course, it will take time to implement new practices (read the document), but this is evident now from the numerous interactions with audit teams who come to inspect tanker operators' offices to ensure the level of achievement of the TMSA stages. You should complete these steps immediately. The more realistic a company's performance standards are, the more resistant they are to the scrutiny that major oil companies have proven to be (Wibowo, 2019; Ginting, 2024). Overstating the status of a company's management system can result in information being provided that is inaccurate or meaningless to improvement efforts, the guidance notes. The results achieved in meeting KPI should be as accurate and substantive as possible. Therefore, mariners need not worry about increasing additional paperwork; however, TMSA will gradually reduce the dreaded shipboard paperwork if done correctly. However, the authors argue that TMSA requirements are more stringent than those currently. As a result, this burden will shift to shore personnel, especially those responsible for incident investigation, recruitment, and training.

CONCLUSION

Developing a Tanker Management Self Assessment (TMSA) System in Tanker Operations is an important step to ensure the safety and efficiency of tankers. The findings of this study indicate that the development of a TMSA system has significantly improved the safety culture, communication, safety performance, compliance, and Passing of Port State Control (PSC) inspections of tankers, thereby reducing accidents. The system has also improved the safety culture and awareness among ship crews and increased crew involvement in safety management. This study identified several challenges and limitations related to the development of a TMSA system, including limited resources, complexity, and limited training. This study highlights the importance of improving the development of an effective TMSA system in tanker operations. Future research should address these challenges and limitations to ensure the continued effectiveness of developing a TMSA system. By implementing these recommendations, the Development of a Tanker Management Self Assessment (TMSA) System in Tanker Operations can be further improved and ensure safe and efficient operations among tankers.

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