



Evaluation of Lifeboat Maintenance on the KM. Sejahtera 36 to Ensure Crew Safety in Emergency Situations

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Abstract. Lifeboat readiness is a critical element of shipboard emergency preparedness because failure of life-saving appliances may delay evacuation and increase risks to crew safety. This study evaluates the implementation of lifeboat maintenance on board KM. Sejahtera 36 and assesses its conformity with the requirements of SOLAS Chapter III and the Life-Saving Appliances (LSA) Code. A descriptive qualitative approach was applied using direct observations during routine maintenance and drills, semi-structured interviews with the Master, Chief Officer, Second Engineer, Quartermaster, and Oiler, and review of maintenance records and shipboard documentation. The findings indicate that lifeboat maintenance on KM. Sejahtera 36 had not been fully implemented in accordance with applicable requirements. Weekly inspections, quarterly operational tests, and annual maintenance were conducted, but monthly inspections and five-year maintenance were not consistently carried out. In addition, a dedicated lifeboat maintenance checklist and logbook were not available. Technical problems were also identified in the lifeboat engine gas system, particularly a jammed gas valve and loose gas-line connections, which caused difficulty in starting the engine during operational testing. Interviews further revealed differences in technical understanding among crew members, particularly among ratings who relied on engineering officers for guidance. The study concludes that improving scheduled inspections, maintenance documentation, engine-system checks, crew training, and supervisory control is necessary to enhance lifeboat operational readiness and strengthen crew safety during emergency evacuation.

Keywords: *Lifeboat, Vessel Maintenance, Maritime Safety, MV. Sejahtera 36, SOLAS*

1. INTRODUCTION

In maritime world, there are various types of hazards that can threaten the lives of the ship's crew. These hazards include those caused by human factors, such as collision, leaking, sinking, and grounding. In addition to human factors, other hazards arise from natural factors, such as storms that can causes navigational hazards. In an effort to anticipate these hazards, the SOLAS Amendments 2012 mandate that vessels must be

equipped with adequate life-saving appliances on board (International Maritime Organization, 2024; SOLAS, 2014). The required life-saving appliances include lifeboats, life rafts, lifebuoys, lifejackets, immersion suits, and other safety equipment (International Maritime Organization, 2022; Dwimarta, 2018).

In emergency situations that endanger the lives of the crew, the Master may make the decision to abandon ship, taking into account the safety of all crew members (International Maritime Organization, 2024; SOLAS, 2014). In the effort to survive at sea after abandoning ship, the lifeboat is the most effective life-saving appliance to use. A lifeboat is a rescue craft that can be used to evacuate the entire crew because it has a stronger construction than other rescue equipment and a large capacity to accommodate more passengers (Rudiana, R.W., 2020; International Maritime Organization, 2022). To ensure that lifeboats are ready to use, every vessel must pay close attention to lifeboat maintenance so that there is no obstacles or malfunctions occur when they are deployed (Maritime Safety Committee, 2021; Johnson & Peterson, 2021; Rachmi & Kendek, 2023).

In South Korea, an incident occurred involving the ferry ship 'Sewol', which sank resulting in 304 casualties, partly because the lifeboats were not ready to use due to neglected maintenance (Korea Maritime Safety Tribunal, 2014). Investigations indicated that optimizing training through technology sensors could prevent similar failures (Korea Maritime Safety Tribunal, 2014). Another case was identified on board MV. Sejahtera 36 during the author's sea practice. Obstacles were encountered during periodic or quarterly maintenance. Specifically, when the lifeboat was lowered into the water, its engine was difficult to start. This issue was caused by a malfunction in the lifeboat's gas system. Based on this background, it is of utmost importance to conduct research titled "Optimization of Lifeboat Maintenance ship on MV. Sejahtera 36."

2. METHODOLOGY

This study utilizes a descriptive qualitative method. Data were collected through the following techniques: Observation: The observation method was conducted by directly inspecting the object of research, namely lifeboat maintenance. Observations were carried out during routine maintenance sessions and while drills were underway. The data obtained consisted of maintenance records, such as weekly, monthly, and annual maintenance data. Interviews: An interview is a data collection method required by directly questioning individuals who possess expertise in the field being reported, allowing the researcher to listen, comprehend, and record information directly from the sources. In this method, the researcher conducted interviews on board the vessel with officers, including the Master, Chief Officer, Second Engineer, Quartermaster, and Oiler, regarding lifeboat maintenance ship on MV. Sejahtera 36. Documentation: Documentation is a specific activity involving the processing, collection, retrieval, archive, and dissemination of documents.

3. DISCUSSION

Based on observations and interviews, the maintenance of the lifeboats on the KM. Sejahtera 36 does not comply with the International Life Saving Appliance Code (LSA Code). Numerous aspects remain inconsistent with the LSA Code, including monthly

maintenance, maintenance every five years, and the lack of a lifeboat maintenance checklist and logbook used to record all maintenance, inspections, and repairs. Due to the lack of recorded maintenance results, it is unclear what routine maintenance is required. During research on the KM. Sejahtera 36, problems were encountered during the lowering of the lifeboats, with the engines being difficult to start. This occurred because maintenance was not carried out routinely and thorough inspections of the lifeboat engines were not conducted during maintenance.

Based on the research, the maintenance of the lifeboats on the KM. Sejahtera 36 does not comply with the LSA Code. Maintenance on the KM. Sejahtera 36 only includes routine inspections and periodic maintenance. Routine inspections and maintenance are carried out weekly on the KM. Sejahtera 36 usually inspects the lifeboat's physical condition for cracks, corrosion, or leaks. Additionally, oil and fuel levels must be checked. This routine maintenance is usually carried out by the Bosun and crew on duty.



Source: KM. Sejahtera 36 documentation, 2025

Figure 1. Cleaning and checking the physical condition of the KM. Sejahtera 36 lifeboat

In addition, routine inspections and maintenance are also carried out every three months. The lifeboat is usually lowered into the water by a designated crew. The designated crew members include the first officer, the second engineer, the bosun, and the crew. Upon lowering into the water, the lifeboat's engine is started and driven around for three minutes. This is to check engine performance and oil pressure. It also

ensures the lifeboat's lifting and lowering system is running smoothly and without interruption. Grease is also applied to the wire and the lifeboat's retaining pin.



Source: KM. Sejahtera 36 documentation, 2025

Figure 2. Lifeboat drill on the KM. Sejahtera 36

Regular maintenance is usually performed annually. It is carried out by company technicians while the ship is docked at port. During maintenance on the lifeboat on the KM. Sejahtera 36, researchers discovered obstacles that prevented the maintenance process from running optimally. These obstacles were caused by problems with the gas system in the lifeboat's engine. The inhibiting factors identified were jammed gas valves and loose gas line connections. A jammed gas valve is a major problem that frequently occurs and can hinder the lifeboat maintenance process. The gas valve regulates the flow of gas from the cylinder to the line and engine. If the valve is faulty, the gas flow will be obstructed or unstable, making the engine difficult to start. Meanwhile, loose gas line connections are another factor contributing to suboptimal lifeboat maintenance, especially on the engine. The gas line connection is the part where the line connects to the gas cylinder or engine. If the connection is loose, gas will leak, causing gas pressure to drop and the engine to be difficult to start.

To anticipate these obstacles, measures are being taken to address these issues. To prevent disruptions to lifeboat maintenance, the crew, particularly the engine crew, took several preventive measures. The Second Engineer (Machinist II) rechecked the valve's exterior with a clean cloth dampened with alcohol and then applied a small amount of special gas lubricant to the valve shaft. Next, any loose gas line connections were handled by removing the connection and cleaning the surface with a cloth dampened with alcohol to remove dirt. The seal was then inspected; if damaged, it must be replaced. However, if no other damage is found, the connection can be reattached tightly, but not overtightened. Overtightening can damage the threads or seal.

According to the Life-Saving Appliances Code (LSA Code) with the latest amendments, such as MSC.402(96), lifeboat maintenance should include routine weekly, monthly, and quarterly inspections. Periodic maintenance is performed annually and every five years. However, on the KM. Sejahtera 36, routine inspections are only carried out weekly and quarterly. Meanwhile, periodic maintenance is carried

out annually. In addition, no lifeboat inspection checklist was found on board the KM. Sejahtera 36. This has been included in SOLAS Chapter 3 life-saving appliances where every ship must have a lifeboat inspection checklist that is filled out when maintenance activities have been carried out. From this, a comparison was made of several maintenance aspects including routine inspections, periodic maintenance, engine condition, and maintenance documentation. This comparison aims to provide a systematic overview of the suitability of the maintenance procedures applied on the ship with safety standards set by the International Maritime Organization (IMO) (IMO, 2022; IMO 2024). The results of the comparison are presented in the following table:

Table 1. Comparison of Lifeboat Maintenance According to the LSA Code and on the KM Sejahtera 36

No	Maintenance Aspect	Maintenance in Accordance with the LSA Code	Maintenance at KM. Sejahtera 36
1	Weekly Inspection	Visual inspection of the lifeboat, davit, release gear, and engine operation for at least 3 minutes	Inspection of the lifeboat's physical condition, fuel and oil levels by the Bosun and Crew
2	Monthly Inspection	Inspection of the completeness of the lifeboat's equipment using an official checklist and recorded in the logbook	This has not been conducted routinely and does not use a specific lifeboat checklist
3	Quarterly Inspection	The lifeboat is launched into the water and operationally tested to ensure all systems are functioning	The lifeboat is lowered into the water, and the engine is run for approximately 3 minutes for a functional test
4	Annual Maintenance	Performed by a certified technician with a thorough inspection	performed by the company technician while the ship is docked
5	5-Year Maintenance	Load testing, structural testing, and overhaul of the lifeboat's main components	This has not been performed in accordance with the LSA Code
6	Lifeboat Engine	The engine must be ready for use at all times and must be tested periodically	A problem with the engine's gas system has been identified
7	Maintenance Documentation	Completely recorded in the official log book and checklist	No log book was found, and a lifeboat checklist was not available

Based on the comparison of lifeboat maintenance between the LSA Code provisions and the implementation on board the KM Sejahtera 36, as presented in the comparison table, it is clear that lifeboat maintenance on the KM Sejahtera 36 did not meet established safety standards. This is evident in the maintenance implementation, which only included weekly routine inspections, including checking the physical condition of the lifeboat, its fuel and oil levels, and quarterly periodic maintenance, which included lowering the lifeboat into the water and testing the engine.

Interviews and observations by the researchers revealed that lifeboat maintenance on the KM Sejahtera 36 did not meet basic standards, and several deficiencies remained that needed to be addressed. Difficulty starting the engine indicated the need for improved maintenance of the lifeboat's engine. SOLAS Chapter III regulation 20 requires that all emergency equipment be inspected and replaced on schedule, and this finding suggests the need for more stringent audits of electronic components.

The lifeboat engine plays a crucial role in the evacuation process. An engine that cannot be started quickly will hinder the lifeboat's movement away from the mother ship. On the KM. On the Sejahtera 36, the main problem lies in the gas system, namely a stuck gas valve and loose gas line connections. Technically, this problem can be caused by several factors, including component age, lack of lubrication, exposure to corrosive sea air, and low frequency of use. Infrequently used lifeboat engines are prone to dirt buildup and stiffness in the gas valve. Therefore, more intensive maintenance is required, such as regular engine testing outside of scheduled drills and detailed inspections of the fuel system.

Lifeboat drills are an important tool for assessing the readiness of equipment and crew. Based on research, lifeboat drills on the Sejahtera 36 are conducted periodically and follow a predetermined muster list. These drills play a role in improving the crew's understanding of evacuation procedures and strengthening coordination between departments. The engine problems encountered during the drills provide an important lesson: drills serve not only as training but also as evaluations of equipment condition. Drills enable early detection of potential damage and prompt response. This aligns with maritime safety theory, which states that regular training can reduce the risk of accidents and increase the chances of crew survival.

Regarding roles and responsibilities for lifeboat maintenance, the crew on the KM. Sejahtera 36 has received training in lifeboat maintenance in accordance with the LSA Code and SOLAS, including daily/weekly inspections (engine and lubricants), checking spare parts availability, and operating the launching system. Interviews revealed the importance of cooperation, with each crew member actively participating in lifeboat maintenance. However, there are gaps in understanding responsibilities, particularly at lower levels, which require further training. For example, the helmsman and oiler admitted they lacked understanding of the technical aspects of the engine and therefore relied on the engineer for guidance.

Based on interviews, lifeboat maintenance is divided based on shipboard position. The captain, as the leader, is responsible for overall supervision and ensuring compliance with regulations. The first mate, as chief of navigation, focuses on the physical inspection of the lifeboat, such as the condition of the hull and launching lines. The second engineer handles the technical aspects of the lifeboat's engine, such as refueling. The helmsman and oiler are involved in daily tasks such as cleaning the lifeboat and checking for leaks, with the oiler specifically responsible for maintaining

the lubricant supply. Respondents highlighted the importance of teamwork, with every crew member actively participating in lifeboat maintenance.

To raise awareness of the importance of lifeboat maintenance, crew training on the KM Sejahtera 36 was conducted, focusing on routine checks, including daily and weekly inspections, launching system operation, which involves training on how to safely lower the lifeboat, and lifeboat drills, where crew members are required to participate regularly to ensure their ability to operate the lifeboat in an emergency.

The success of lifeboat maintenance is determined not only by procedures but also by the active role of the crew. Interviews indicate that the crew on the KM Sejahtera 36 have a fairly good basic understanding of the function and use of lifeboats. The crew's direct involvement in routine maintenance has a positive impact on preparedness and confidence. However, improved discipline and consistency are still needed. Crew members are often focused on primary operational tasks, potentially neglecting lifeboat maintenance.

Proper lifeboat maintenance not only has short-term impacts but also impacts long-term safety. Well-maintained lifeboats have a longer lifespan, directly increasing the crew's chances of survival in emergency situations. Conversely, neglecting maintenance can increase the risk of additional accidents, such as delayed evacuations or injuries during lifeboat lowering. Therefore, lifeboat maintenance should be viewed as a non-negotiable long-term safety investment. Furthermore, the impacts found are supported by maritime safety theory, which states that preventive maintenance reduces the risk of accidents.

The lifeboat maintenance system cannot be separated from the role of shipping company management. The company is responsible for providing adequate resources, spare parts, and training. Furthermore, the ship's safety management system (SMS) must integrate lifeboat maintenance as a key element. Internal and external audits of lifeboat maintenance should be conducted periodically. Complete and accurate maintenance documentation will facilitate evaluation. With strong managerial support, lifeboat maintenance can be more effective and sustainable.

The results of this study align with several previous studies that suggest that suboptimal lifeboat maintenance can increase safety risks. The main difference lies in the focus of the research, where this study focused on the technical analysis of lifeboat engines and the implementation of maintenance on a general cargo ship. Overall, the results of this study highlight that the KM. Sejahtera 36 lacked a sound maintenance foundation and needed improvements in inspections, component replacement, and training to significantly improve safety. These findings are consistent with global trends in the maritime industry, where lifeboat safety is often a primary focus for preventing maritime accidents. This follow-up discussion is expected to strengthen the research findings and provide a more comprehensive picture of the importance of lifeboat maintenance as part of a ship's safety system.

4. CONCLUSION

Based on the research findings regarding the optimization of lifeboat maintenance ship on MV. Sejahtera 36, the following conclusions can be drawn: The implementation of lifeboat maintenance on MV. Sejahtera 36 has generally not been fully executed in accordance with the provisions of SOLAS Chapter III concerning Life-Saving

Appliances. This is evidenced by maintenance being limited mostly to weekly routines, quarterly periodic tests, and annual maintenance by company technicians. Several aspects do not fully meet the LSA Code mandates, particularly monthly inspections, five-year maintenance, technical maintenance of the engine, documentation, checklists, and the unavailability of a logbook to record maintenance results. Therefore, enhanced supervision and more comprehensive maintenance procedures are required to achieve optimal compliance with the LSA Code. Based on the interview results, respondents emphasized the importance of synergy, where every crew member must play an active role in lifeboat maintenance. However, there is a gap in understanding responsibilities, particularly among the ratings who require further training. For example, quartermasters and oilers acknowledged their limited understanding of technical engine aspects, making them dependent on engineers for guidance.

Based on the conclusions above, the author offers the following recommendations: It is necessary to increase supervision and conduct more detailed inspections of the engine system, specifically the gas system, prior to conducting drills or lowering the lifeboat into the water. A thorough re-checking process should be conducted before and after periodic maintenance to prevent recurring issues with engines that are difficult to start. For future researchers, it is suggested to expand the scope of research to other vessels or compare multiple types of ships, so that the findings can serve as a broader reference for improving maritime safety.

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