

Optimization of Navigation Equipment on the Bridge for Anchoring Position in Preparation for Loading and Unloading by Sts in Mv. Lumoso Jaya

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ABSTRACT

This study aims to determine the role or performance of navigation equipment such as AIS, GPS, ECDIS, Radar, and *Echosounder* in determining the anchor position and identify factors that affect the accuracy of motion processing activities during the anchoring process before the STS process with a barge is carried out. The type of research used is qualitative research. The analysis process is through qualitative descriptions of the results of observation of operational activities, interviews with the crew on the platform during the docking process, and analysis of historical data from the navigation system on the platform. The results showed that the damage caused to the *Echosounder* did not significantly affect the accuracy of the determination of the anchoring position thanks to the presence of other devices in the navigation system on the platform. The function of the *Echosounder* in determining the contour and depth of seawater at the berth can be replaced by the existence of ECDIS. The reliability of the navigation system on the ship will be maximized if the calibration and update process is carried out regularly. Maintenance and repair activities on damaged or malfunctioning equipment should be carried out at the first opportunity once damage is identified.

Keywords: *Optimization, Navigation Equipment, Echosounder, ECDIS.*

ABSTRAK

Penelitian ini bertujuan untuk mengetahui peran atau performa peralatan navigasi seperti AIS, GPS, ECDIS, Radar, dan *Echosounder* dalam menentukan posisi berlabuh jangkar serta mengidentifikasi faktor-faktor yang mempengaruhi akurasi kegiatan olah gerak selama proses berlabuh jangkar sebelum proses STS dengan tongkang dilaksanakan. Jenis penelitian yang digunakan adalah penelitian kualitatif. Proses analisis melalui deskripsi kualitatif atas hasil observasi kegiatan operasional, wawancara dengan kru di anjungan selama proses olah gerak berlabuh, serta analisis data historis dari sistem navigasi di anjungan. Hasil penelitian menunjukkan bahwa kerusakan yang terjadi pada *Echosounder* tidak berpengaruh secara signifikan terhadap keakuratan penentuan posisi berlabuh berkat keberadaan alat-alat lainnya dalam sistem navigasi di anjungan. Fungsi *Echosounder* dalam menentukan kontur dan kedalaman air laut di tempat berlabuh dapat digantikan fungsinya dengan keberadaan ECDIS. Kehandalan sistem navigasi di kapal akan maksimal jika proses kalibrasi dan update dilakukan secara rutin. Kegiatan

pemeliharaan dan perbaikan atas peralatan yang rusak atau tidak berfungsi harus dilaksanakan pada kesempatan pertama begitu kerusakan teridentifikasi.

Kata kunci: Optimalisasi, Peralatan Navigasi, Echosounder, ECDIS

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1. INTRODUCTION

Ship-to-Ship (STS) Activities Transfer of dry bulk cargo, such as coal, iron ore, or wheat, are a very important maritime logistics operation. This process involves moving cargo between adjacent *Bulk Carrier* ships at sea, which requires careful planning to run safely and efficiently. The success of STS operations relies heavily on three key aspects: safety, efficiency, and environmental impact. Accurate ship navigation plays a crucial role in ensuring safe *maneuvering* during cargo removal. Modern navigation equipment, such as GPS, Radar, and *Echosounder*, is key in this operation. GPS provides highly accurate position data, allowing the captain and guide to control the distance and angle between ships, while the Radar helps detect other ships around the area of operation, reducing the risk of collisions. *The echosounder* functions to measure the depth of the waters under the ship, ensure navigation safety, and help avoid hazards such as running aground due to changes in water conditions. Shipping safety is a key foundation in ship operations, and in the context of STS, the accuracy of ship positioning greatly affects both safety and cargo transfer efficiency. Although dry bulk ships are not equipped with advanced *Dynamic Positioning (DP)* systems like tankers, the use of GPS/DGPS and continuous position monitoring is essential. Relative movement between ships caused by environmental conditions, such as waves and currents, adds to the risk to the safety of operations. For example, research by Violinda Anji (2021) revealed an incident on the MV ship. HI 01, where the crew's lack of understanding in using navigation equipment can have fatal consequences, such as the loss of *anchor*. This underscores the importance of operating navigation equipment optimally.

A similar incident occurred on the MV ship. Lumoso Jaya on March 16, 2024, where the ship almost ran aground while maneuvering in the Sampit shipping

channel. Preliminary investigations showed that the contour diagram readings from *the Echosounder* were not optimal, leading to errors in the interpretation of the depth of the waters. This incident risks disrupting *the maneuvering process* and causing economic losses to the company. Based on the analysis of this problem, the author proposes the title of the thesis "Optimization of Navigation Equipment on the Platform for the Anchor Anchor Position in the Preparation of STS Loading and Unloading in MV. Lumoso Jaya". This thesis aims to provide solutions to the problems faced, as well as provide conclusions and suggestions related to the operation of navigation equipment that is more effective to improve the safety and efficiency of STS operations.

2. METHOD

This study uses a qualitative approach to explore the factors that affect the performance of navigation equipment in determining the anchor position in the MV. Lumoso Jaya. This method was chosen because it allows researchers to explore in depth the technical, environmental, and human aspects related to the operation of navigation equipment, as well as the obstacles encountered in practice.

Conceptual Definitions describe the terms used in this study. Radar serves to detect objects around the ship and provide an overview of the surrounding environment, which is very useful in conditions of limited view. GPS is a tool for accurately determining the position of the ship through satellite signals, which helps monitor whether the ship is moving or staying in the desired position. ECDIS is a digital map-based electronic navigation system that provides information on the position of ships and water conditions. *The echosounder* measures the depth of the sea in *real-time*, it is important to determine the depth of a safe berth area. Anchoring is the process of tying a ship to the seabed so that the ship does not drift due to currents or winds, while *Ship To Ship* (STS) refers to the transfer of cargo between two ships sailing close to each other in the sea.

The Data Collection Technique in this study involves three main methods: Observation, which is carried out by directly observing the use of navigation equipment; Documentation, which collects data from related documents, such as procedures or work reports; and Interviews, which were conducted with Mualim 2 to dig deeper information. Data Analysis Techniques involve several stages. First, the

presentation of data is carried out to describe the condition of the research object systematically, through tables and narratives that facilitate understanding. Second, data analysis is carried out to identify patterns, problems, and relationships between variables that affect the performance of navigation equipment. Third, the discussion with theory will refer to the relevant theories about the operating system of navigation equipment on ships, as well as the factors that affect its effectiveness. Fourth, the conclusion will summarize the main findings of the research regarding the operation of navigation equipment on ships. Finally, Advisory will focus on recommendations to improve the operation of navigation equipment, including improvements to maintenance systems, improved crew training, and better optimization and implementation of operational procedures.

3. RESULTS AND DISCUSSION

3.1 RADAR

Based on observations on the MV. Lumoso Jaya, Radar serves as the main navigation tool that is very useful for *second officers*, especially in low visibility conditions at night. In the March 16, 2024 incident, although *the Echosounder* was damaged and could not provide depth data, the Radar remained functioning properly and assisting in maintaining the safety of *the ship's maneuvers*. In dark situations without visual guidance, Radar detects objects around the ship such as other ships, surface obstacles, and navigation buoys. This function is essential to ensure the ship does not get too close to dangerous objects and to determine a safe area to anchor the ship. Radar is also used to monitor the ship's position against fixed objects around the ship, as well as ensure that the ship remains in a safe position even if it cannot display depth. The success of the Radar shows the importance of regular maintenance of navigation equipment. *The second officer* (D, 30 years old) confirmed the great role of the Radar in keeping the ship's position safe when *the Echosounder* was unreliable.

3.2 GPS

GPS is used to ensure the ship's position remains as planned, as well as monitor the ship's movement against the digital map in ECDIS. In conditions of limited visibility and without the support of depth data from *the Echosounder*, GPS still provides accurate information about the position of the vessel. GPS helps *the*

second officer to ensure that the ship does not shift due to currents or wind after the docking is carried out. Although it does not present the depth or conditions of the environment directly, GPS is vital in ensuring that the position of the ship remains safe. *The second officer* (D, 30 years old) emphasized the role of GPS in ensuring the ship's position remains in a safe place even though *the Echosounder* is damaged. GPS is an important foundation in a ship's navigation system, working in conjunction with other tools to maintain the safety of sailing.

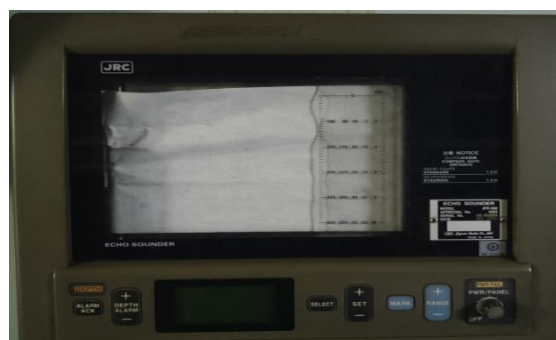
3.3 ECDIS



ECDIS at MV. Lumoso Jaya is used to read underwater depth and obstacle maps, although it does not provide real-time depth data. In this incident, ECDIS still functions well to display ship positions and depth estimates based on pre-stored map data. While ECDIS provides an important picture of the contours of the seabed and the presence of obstacles, *the Echosounder's* inability to provide accurate depth data means that decisions must be made based on limited information.

ECDIS helps *second officers* select safer alternative berths locations, although the reliability of the data is highly dependent on the quality of the information stored on the map. Depth readings from ECDIS help in determining the anchor position, but remain limited without *real-time depth data* from *Echosounder*.

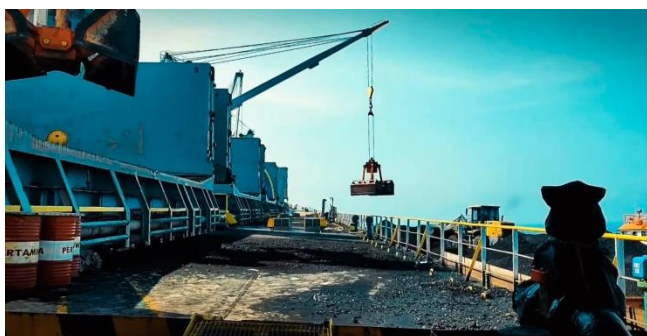
3.4 Echosounder



Echosounder is an important tool for determining sea depth in *real-time* and assists the guard officer in determining the depth for the anchorage position. However, in MV. Lumoso Jaya, *Echosounder* type of statistical paper is damaged and does not provide the required depth data. This damage resulted in a failure to verify the depth of the sea and the contours of the seabed, which is important to ensure the correct number of anchor chains. Without accurate depth information, *the second officer* must make decisions based on estimates and map data, which increases the risk of the ship getting too close to the seabed or colliding with another vessel.

This *malfunction of the Echosounder* severely limits the crew's ability to cross-verify navigation data and increases the potential for errors. *The second officer* (D, 30 years old) confirmed that the damage *to the Echosounder* made it difficult to make the right decision regarding the anchor dock position.

3.5 Other Findings



In addition to the problems with the navigation tool, it was found that *the Navigational Checklist* that was supposed to be filled was not noted. *This checklist* contains a checklist of essential navigation equipment, such as Radar, ECDIS, *Echosounder*, AIS, compass, and navigation lights.

Filling out this checklist functions as part of the ship's operational risk assessment and quality control system. With *the Checklist*, the guard officer can detect damage early, so that corrective actions can be taken before the ship enters a critical navigation situation.

The incident almost ran aground on the MV ship. Lumoso Jaya on March 16, 2024 in the Sampit shipping channel reflects weaknesses in the ship's navigation system, especially related to equipment readiness and procedural discipline. The main problem found was a malfunction in the *Echosounder*, which did not function properly and could not provide accurate depth data.

In fact, the Echosounder is very important for determining a safe anchor berth point, especially in waters with unstable seabed contours. Although other tools such as Radar, GPS, and ECDIS function optimally, the damage to the Echosounder indicates negligence in the maintenance and inspection of the tool that should have been carried out before the ship sailed. In addition, it was found that the Navigational Checklist that must be filled out before critical maneuvers such as entering a narrow groove is not filled. This indicates that there is no thorough check on the readiness of the navigation aids, which causes damage to the Echosounder to not be detected early.

NO	Objek	Hasil Observasi	Hasil Wawancara
1.	<i>RADAR</i>	<i>Radar</i> berfungsi baik dan digunakan untuk mendeteksi objek disekitar kapal seperti kapal lain, buoy, dan daratan. Sangat membantu dalam memastikan area sekitar kapal aman dari tabrakan saat menentukan posisi	Second officer menyatakan <i>Radar</i> membantu memastikan area sekitar kosong dan kapal tidak terlalu dekat dengan rintangan.
2.	<i>GPS</i>	<i>GPS</i> berfungsi optimal dan memberikan informasi posisi kapal secara akurat dalam peta <i>ECDIS</i> , serta membantu memantau pergeseran kapal selama proses manouver	Second officer menyatakan <i>GPS</i> sangat diandalkan untuk melihat posisi kapal secara tepat selama <i>Manuver</i> dan labuh.
3.	<i>ECDIS</i>	<i>ECDIS</i> berfungsi normal dan menampilkan peta data kedalaman berdasarkan data lama	Second officer menyatakan <i>ECDIS</i> sangat membantu dalam menentukan lokasi labuh.
4.	<i>Echosounder</i>	paper statistic <i>Echosounder</i> tidak menampilkan data kedalaman secara real-time, baik angka maupun grafik. Alat tidak berfungsi dengan baik.	Second officer menyatakan <i>Echosounder</i> sudah tidak berfungsi dengan baik

To prevent similar incidents in the future, the ship and the company need to take several repair steps. From the ship's side, filling out the Navigational Checklist must be done consistently and thoroughly before any important maneuvers. Each navigation device must be inspected individually and verified by a guard officer and a senior officer or skipper as a form of dual control. In addition, functional testing of all navigation equipment must be carried out regularly, both before departure and when entering critical areas. Preventive maintenance on the Echosounder is also essential to prevent repeated breakdowns, such as by cleaning the transducer sensor regularly, checking the wiring periodically, and calibrating it according to the

manufacturer's guidelines. The guard officer must also be trained to operate the Echosounder in accordance with the manual so that no errors occur in its use.

From the corporate side, it is important to establish a standard of periodic inspection of navigation equipment, ideally once every two weeks or before each voyage. Any malfunctions or potential malfunctions of the navigation tools should be reported systematically in the maintenance logbook, which can be the basis for subsequent technical decision-making. With the implementation of better inspection and maintenance systems, as well as the filling of *more disciplined Checklists, ships and companies can reduce the risk of marine accidents and improve the safety of future shipping.*

4. CONCLUSION

Based on the results of the study, it can be concluded that navigation tools such as Radar, GPS, ECDIS, and *Echosounder* play an important role in the smooth anchoring process. Each of these tools has its own function that supports docking activities, provided that the equipment is in good condition and functions in accordance with standards. In the incident that occurred on the MV Lumoso Jaya ship, only Radar, GPS, and ECDIS navigation tools that played an effective role in the smooth docking were Radar, GPS, and ECDIS. Radar functions to determine the right anchoring position by monitoring the distance and direction of the target determined by the skipper, while GPS provides accurate information on the ship's position, both in latitude and longitude. ECDIS displays an electronic map containing ocean contour data, although it is limited to the latest update and does not provide real-time depth data. The *Echosounder*, which was supposed to provide important ocean depth information, suffered a malfunction of a statistical paper, so it could not provide the data needed to determine the number of anchor chains to release.

To prevent a recurrence of similar incidents, several corrective steps can be taken. First, regular inspections of navigation equipment must be scheduled according to a predetermined maintenance plan. If there is damage, make repairs immediately to ensure the ship is always in seaworthy condition. Secondly, good maintenance on the *Echosounder* should be carried out regularly, including cleaning of the transducer sensor, checking the connecting cables, as well as calibrating the tool according to the manual book. The operation of *the Echosounder* must also be in accordance with procedures to ensure the accuracy of the depth data generated.

Third, filling out the *Navigational Checklist* form must be done thoroughly and disciplined, especially before the ship performs important *maneuvers* such as anchoring in narrow shipping lanes or high-risk areas. *This checklist* needs to be verified by senior officers to ensure the readiness of navigation tools. Finally, functional tests of navigation devices such as *Echosounder*, ECDIS, Radar, AIS, and GPS should be carried out periodically, both before departure and when entering critical shipping areas. These measures can reduce the risk of navigation system failure and improve vessel safety, especially in anchorage and sailing situations in challenging waters.

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