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ANALYTICAL APPROACH TO MECHANICAL DAMAGE OF REEFER CONTAINER ON MV. CAP SAN JUAN: CASE STUDY AND OPTIMIZATION RECOMMENDATIONS

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ABSTRACT

Ships used for shipping goods, especially on the MV. Cap San Juan there are things that must be considered, one of which is the reefer container which has strict maintenance and control to know that the reefer container can work optimally. In this case the reefer container has a risk of damage to its components so that the reefer container does not function as it should. Therefore, it is necessary to discuss as a form of effort in handling if damage occurs and unwanted obstacles occur. This study aims to determine the causes and effects of mechanical damage to reefer containers on ships and to find out how to overcome reefer containers that experience mechanical damage on the high seas based on field conditions. The research method used is a qualitative method using data collection techniques through observation, interviews and documentation regarding the handling of reefer containers when problems occur. Based on the results of observations made by the author regarding the various obstacles that occur in reefer containers during sea practice, there are two causes, namely component damage because it has passed the time limit for use and an electrical short circuit in one of its components which causes the reefer container to not be able to work optimally. This happened because there was no thorough checking and lack of maintenance.

Keywords: *Reefer container, Damage, Handling, Components*

INTRODUCTION

Reefer containers are a type of container that can transport chilled and frozen goods because chilled and frozen cargo is easily damaged if not handled properly (Widiyati & Ridwan, 2014). This increases the safety of shipping chilled and frozen goods, so it is expected that the goods arrive at their destination in good condition and without damage (Gilang, 2019). Many factors cause this type of cargo to be frequently damaged. Reefer containers require special care for air temperature issues (Behdani et al., 2019), especially when used for refrigeration (Chakravarthy et al., 2011). This shows that reefer containers must be handled directly by nauseaim who are experts in their field, namely Electrician. This is supported by a statement Wardani (2018) that Electricians are responsible for handling reefer containers that have problems. When they find a problem during the daily routine check, the Electrician writes a malfunction report or minutes explaining what problem or alarm appeared, the position of the reefer, and general information about the reefer container. Once this report is sent to the company and the charter, the initial handling is done according to the instructions in the manufacturer's manual. The company will send a reply regarding permission to continue handling and additional instructions. If the ship's crew cannot manage the malfunction or if the reefer container cannot be repaired, the ship may request to unload at the next

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port. This shows that it is very important for an electrician to handle and maintain reefer containers on board.

According Putra et al. (2022) reefer containers are a special type of container used to transport goods that are sensitive to temperature changes, by maintaining the temperature of the space or cargo in a container that can be adjusted within a temperature range ranging from -40°C to +30°C. This type of container has electronic cooling components and systems that rely heavily on electrical power, with an average generator consumption of around 3-4 kWh, for small islam around 59 kWh per day (Yousefzadeh et al., 2020). Each type of cargo has unique types and characteristics. Resources, various agricultural and livestock products, as well as processed raw materials for factory production, usually come from materials that are susceptible to temperature damage. Cold and frozen cargo is referred to as chilled or frozen cargo in shipping terms, and it is the most important system for protecting cargo (Notteboom, 2012).

Container vessel is a vessel used to transport goods or cargo in the form or size of intermodal containers (Septarudin, 2011). A container is a package specifically designed with certain dimensions, which can be used to store and transport goods safely to avoid damage to the goods (Martin et al., 2019). Containers come in various sizes, ranging from 20 feet, 40 feet, to 45 feet in dimension. There are various types of containers and design (Chawa & Mukkamala, 2018), commonly used such as dry storage, open top containers, flat rack containers, tunnel containers, open side containers, and reefer containers.

MV. Cap San Juan is a container ship capable of carrying 10650 TEUS containers with 1000 plugs for reefer containers. During the author's sea practice on the MV. Cap San Juan, the author found that almost every port is always faced with the obstacle of reefer container damage which requires the ship to call a reefer technician from the port to make repairs. On January 03, 2023 when the ship was 2 hours before arriving at the Port of Valencia, one of the reefer containers was found to have a malfunction in the control box which resulted in the temperature not being readable. Because the crew was not confident of being able to make repairs in a timely manner, the repairs had to wait for the ship to arrive at the port and ask the Chief Officer to request a reefer technician from the port. This study aims to determine the impact of mechanical damage to reefer containers on ships and to determine efforts to optimize the handling of reefer containers that experience mechanical damage on the high seas.

METHODS

The research method uses a qualitative method that aims to explore information related to the impact of mechanical damage to reefer containers on ships. This research was conducted on board MV. Cap San Juan for 6 months. This ship is a container type owned by Bernhard Schulte Shipmanagement. Data collection uses several methods, namely interviews, observation, and documentation. The data obtained was then analyzed using the fishbone analysis method which aims to identify and classify the factors that cause problems. The research flow in this study is shown in Figure 1.

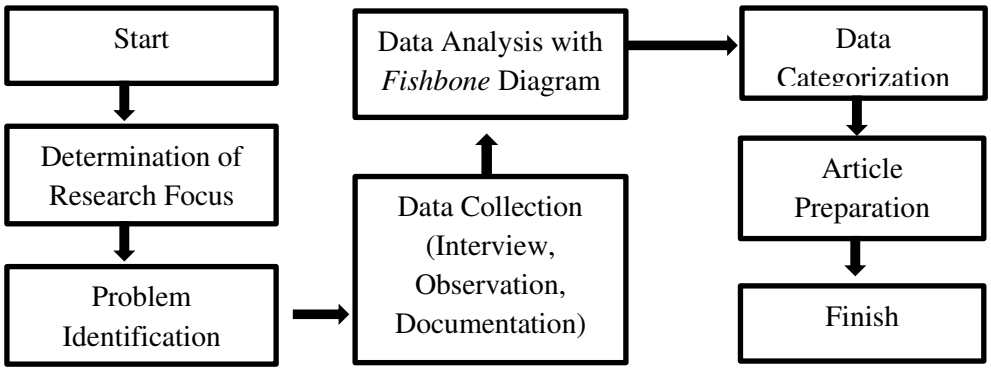

Figure 1: Research flow diagram

RESULTS AND DISCUSSION

A problem was found on January 3, 2023, 2 hours before the ship arrived at the Port of Valencia. When Refeer Assistant was conducting safety round and preparation before docking, it was found that MNBU 3992140 reefer had malfunction in the control box which resulted in the temperature could not be read. Refeer Assistant immediately checked with ETO and found that there was a short circuit on the components in the control box. As the vessel was nearing arrival time and the time for repairs to be carried out was short, the Reefer Assistant and ETO agreed to carry out the repairs upon arrival at the Port of Valencia. This step was taken because the crew was not sure that they could complete the repairs on time, namely before the ship arrived at the port. After arriving at the destination port, the Reefer Assistant immediately reported the matter and asked the Chief Officer to request a Reefer Technician from the port in order to make repairs to the control box. After the repair, the reefer container returned to normal functioning.

Figure 2. Temperature control box on reefer container

There are various factors that cause the temperature of the reefer container to not be read, for example, such as a short circuit in one of the components in the control box as shown in Figure 2 and then repaired as in Figure 3. This obstacle can be related to spare parts or ship electricity which can affect the quality of the cargo in the reefer container. This is the same case that occurred in the MNBU 3992140 reefer container control box on the MV. Cap San Juan. The factor that caused the delay in handling the damage was from the crew who still lacked experience and this was based on an interview conducted by the author with the Reefer Assistant where he said that it was his first contract as Reefer Assistant. Therefore, regular checks and crew skills are very important in handling reefer containers on board.

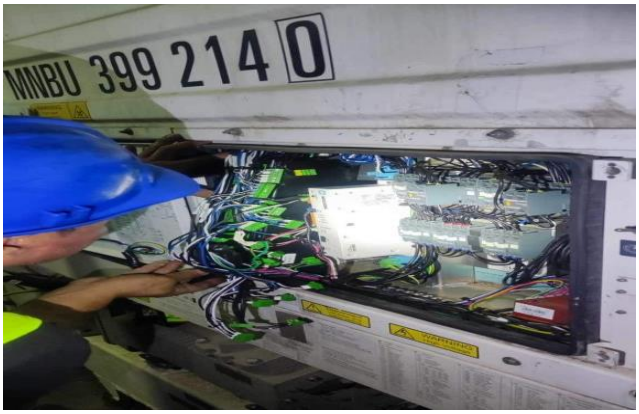

Figure 3. Repair on control box by reefer technician

From the findings that have been described, an analysis is carried out regarding the problems that occurred during sea practice on the MV. Cap San Juan with the aim of conducting a discussion that can be an improvement effort and become a reference or guideline for handling so that it does not recur if problems occur in the future. The analysis carried out by the author is through the fish boneanalysis approach (Desai et al., 2015; Li & Lee, 2011) as shown in Figure 4.

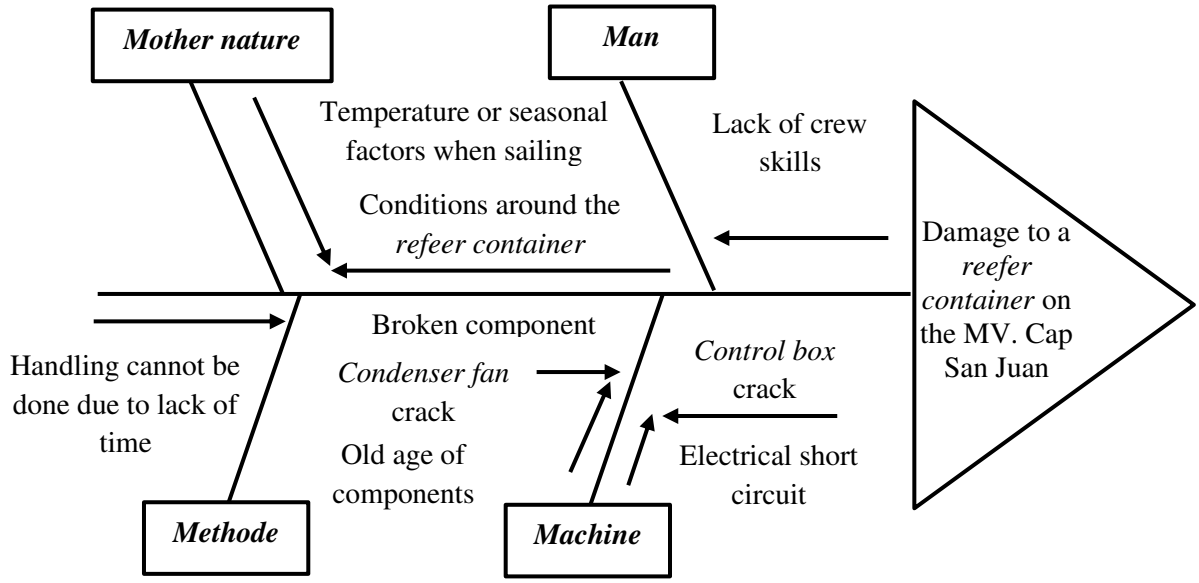

Figure 4. Fishbone diagram analyzing the causes of refeer container damage

Through this diagram, it can be seen that there are several things that are the causal factors of reefer container damage, among others:

1. Man
   One of the factors of reefer container damage is the ship's crew on duty as human resources. This happened in one of the cases when the ship almost arrived at the destination port, the Reefer Assistant and ETO could not make repairs with limited time due to minimal work experience.
2. Machine
   The machine in question can be adjusted to several other influencing factors ranging from electricity to the age limit of the usability of each component in the reefer container. The newer the components used, the more optimal the performance.
3. Methode
   The method used in handling or damage prevention efforts in reefer containers is the most important thing to maintain reefer containers. Damage can occur because there is no thorough check of each component to ensure the reefer container can function properly.
4. Mother Nature
   Mother Nature is one of the last factors in reefer container damage that can occur due to changing temperatures and air factors and the surrounding conditions when the ship is sailing.

Some of the things that are the main focus in optimizing the mechanical optimization of reefer containers are one of them by checking. Through the discovery of events found during the research, checking can be done regularly and routinely. This is done to avoid delays in ship departure due to component damage and can be handled quickly if the component must be repaired immediately before damage occurs. This is expected to help in optimizing the performance of the reefer container so that damage does not occur.

After checking and controlling, it is necessary to carry out maintenance. Maintenance is a way to maintain the condition or state of an item so that it continues to function normally and as it should.

Maintenance on every component on the ship must be carried out in the hope of preventing the same thing from happening as in the author's findings during sea practice. Handling will also be easier if maintenance is often carried out because it can more quickly find out the condition if damage occurs and know the handling steps. Therefore, here are some solutions that can be done to overcome the problems that commonly occur in reefer containers as a form of handling, among others:

1. Routine Care and Maintenance
   Performing regular maintenance and care on reefer containers can reduce mechanical damage and ensure the refrigeration system operates properly during shipping from one port to another.
2. Ensure Sufficient Electrical Power
   During shipping, power interruptions can be avoided by periodically testing the generator and ensuring that the reefer container has a sufficient source of electrical power.
3. Temperature and Environment Monitoring
   Monitoring the environmental conditions and temperature inside the container during shipping can help spot problems and prevent product damage.
4. Training and Supervision
   Conducting training and supervision on the crew responsible for the use of reefer containers can help prevent human errors that can cause damage to products.
5. Use of More Advanced Technology
   The use of new technologies, such as automated monitoring and control systems, can improve the efficiency and reliability of shipping goods in reefer containers.

CONCLUSIONS

The occurrence of mechanical damage to reefer containers on MV. Cap San Juan that cannot be handled optimally, has an impact on the smooth loading and unloading at the port and damage to the cargo, causing losses to various parties even though the cargo is covered by company insurance. In order for this not to happen again, it is necessary to check the reefer thoroughly, check the temperature regularly, enter the temperature check data in the reefer temperature log, and always update the inventory list so that there are no vacancies in reefer spare parts.

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