



Identify of The Dropping in Hydrophore Tank Pump Pressure at MT. Inter Armada 01

Mustholiq Mustholiq^{1*}, Fitri Kensiwi², Wisnu Ageng Pangestu³
^{1,2,3} Politeknik Ilmu Pelayaran Semarang, Indonesia

Received : August 26, 2023

Revised : September 15, 2023

Accepted : October 2, 2023

Online : October 5, 2023

Abstract

A hydrophore tank or water pressure tank is a tank that stores water temporarily and then separates water and air through a membrane so that the air in it is compressed. The water in the tank is flowed into a distribution building. The pump works automatically, regulated by a pressure detector, which closes/opens the electric motor's switch driving pump. The pump stops working when the pressure in the tank reaches a specified minimum. In this system, the compressed air will press water into the distribution system. After repeatedly expanding and compressing over time, it will decrease because it dissolves in water or is carried out of the tank. Pressure tank systems are usually designed so that the air volume is no more than 30% against the volume of a 70% tank filled with water. Factors causing pressure drops in the hydrophore tank pump at MT. Inter Armada 01 is a PMS that is not carried out properly; packing is impermeable, and the fresh water pump does not work normally. The impact of the lack of pressure on the hydrophore tank is the lack of fresh water supply to the accommodation and disruption of the crew's comfort. How to prevent pressure drops on the hydrophore tank is to replace damaged components with new ones according to the manual book periodically check the components and systems of the hydrophore tank so that the hydrophore tank system can run properly and normally again. The method used in this thesis is a qualitative descriptive method with SHEL analysis techniques as a method to determine the cause and efforts to overcome it. The formulation of the problem from this study is the factors causing the lack of pressure on the hydrophore tank, the impact caused by the lack of pressure on the hydrophore tank, and the efforts that must be made to overcome the pressure drop in the hydrophore tank.

Keywords: *Hydrophore Tank, SHEL Method, MT. Inter Armada 01*

INTRODUCTION

Shipping will reach a destination on time, safely, and safely if all existing facilities, infrastructure, and supporting machinery are well fulfilled. The supporting machinery infrastructure can be in the form of those directly related to machinery operational equipment, loading and unloading, and navigation, and can also support the welfare of the ship's crew. One of the most important supports related to welfare and health is the quality and quantity of fresh water.

Machinery in terms of providing fresh water on board comes from the engine room to accommodation, namely the hydrophore tank. There are good maintenance requirements for supporting and main components so that the hydrophore tank can work to meet freshwater needs. The hydrophore pump is one of the supporting components of the hydrophore tank system.

A hydrophore pump is a type of centrifugal pump. Which type of centrifugal pump is used to pump fluid with low viscosity? The pump is one type widely used in existing industries. Its working principle is the impeller rotation for fluid transfer elements, which are then driven by a drive. The liquid in the pump will rotate due to the push of the blades, which causes centrifugal force and causes the liquid to flow from the middle of the impeller. The liquid flows out through the channel between the blades and then leaves the impeller at a high speed. After the liquid comes out of the impeller, the space between the blades becomes a vacuum and causes the liquid to be sucked in, resulting in a suction process.

The availability of spare parts and lack of maintenance of the hydrophore pump and also the

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Corresponding author's email: wisnuageng4556@gmail.com

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lack of attention from the shipping company and the author prove that when the author conducts marine practice, there is a problem with hydrophore pumps whose pressure decreases resulting in disruption of the supply of fresh water to accommodation. With the facts that occurred when the author practiced the sea, the author was interested in taking the title "Identification of the cause of the drop in hydrophore pump pressure at MT. INTER ARMADA 01". In this problem, the author will discuss and hope that each machinist is responsible for carrying out his duties, namely consistently carrying out repairs and maintenance instructions from the manual book.

LITERATURE REVIEW

According to Manual Book MT. Inter Armada 01 "Hydrophore" tank type f-655" is a water pressure tank called a pressure water tank. According to Wei Jie Wang (2018), a hydrophore is a tank that holds and provides water that supplies water using pressure air from the tank. Using a pressure tank with a hydrophore tank stores water temporarily, with the principle of providing air pressure on the upper surface of the water in the tank (Rezandy, 2019).

The function of a hydrophore tank is to accumulate pressure on the pump until it reaches the required installation pressure. For example, for installing a freshwater system where fresh water can only work perfectly at a pressure of 3 kg/cm to 6 kg/cm, with the hydrophore tank, the pressure can be maintained at that level.

A hydrophore tank or water pressure tank is a tank that stores water temporarily and then separates water and air through a membrane so that the air inside is compressed. The water in the tank is flowed into a distribution building. The pump works automatically, regulated by the pressure detektor, which closes the electric motor's open switch driving pump. The pump stops working when the tank pressure has reached a predetermined minimum limit. In this stem, the compressed air will press water into the distribution system. After repeatedly expanding and compressing over time, it will decrease because it dissolves in water or is carried out of the tank. The thestem of pressure tanks is usually designed so that the volume of air is no more than 30% of the tank's volume and 70% of the tank's volume is filled with water (Abluri, 2019).

According to Jepry, A. (2013) <http://antonjepry.blogspot.com>, the working principle of the compressed tank system (Hydrophore) is as follows: water that has been accommodated in the lower tank is pumped into a closed tank, which results in the air in it being compressed so that water is available with sufficient initial pressure to be distributed to plumbing equipment throughout the planned building.

The ship's hydrophore tank system is designed to meet the demand for fresh water on board. This system is complete with electronic control and monitoring equipment to measure water quality to measure water consumption. All connections, on the one hand, can lower costs and facilitate installation on ships. Such a system will consist of one or more front chambers of valves, sensors, and pipes (Sumarsono, 2020).

RESEARCH METHOD

The research method used in this study is the qualitative descriptive method.

Time and Place of Research

The study was conducted from February 2, 2022, to August 27, 2022, on the MT. Inter Fleet 01. This ship is a tanker type and under the auspices of PT. Kapal Mini Indonesia.

Research Data Source Samples

The sample data sources of this study are primary data and secondary data. Primary data were obtained from direct observations and interviews with three machinists and the chief

engineer about the abnormal work of the hydrophore tank on the freshwater supply on board the MT. Inter Armada 01. While secondary data is obtained from the hydrophore tank diary and operation notes.

Data Collection Techniques

The methods used to collect data in this study are observation, interviews, documentation studies, and literature studies.

Research Instruments

In qualitative research, the data collection tool is the researcher himself; non-human tools (e.g., questionnaires, interview guidelines, instructions, observations, etc.) can also be used, but their function is limited to supporting research work.

Qualitative Data Analysis Techniques

The data analysis technique used in the preparation of this thesis is the SHEL method. The SHEL model is named after the initial letter of each component: software, hardware, environment, and liveware.

Data Validity Testing

To check the validity of data in qualitative research, namely triangulation. With triangulation, certain information will be obtained using various data sources such as documents, archives, interview results, and observations.

FINDINGS AND DISCUSSION

Overview of Research Context

In this study, researchers used objects where researchers identify the cause of the drop in pressure of the hydrophore tank pump at MT. Inter Armada 01 is one of the tankers under the auspices of PT. Kapal Mini Indonesia.

A hydrophore tank or water pressure tank is also called a pressurized water tank, and the function of a hydrophore tank is to store pressure on the pump until it reaches a certain pressure. The pressure required to install fresh water works perfectly is 3 kg / cm² to 6 kg / cm². Thus, the hydrophore function can stabilize the pressure needed. A hydrophore tank is one of the supporting aircraft that operates based on the principle of hydrodynamics and fluid displacement with a composition of 40% water and 60% water.

One of the supporting components of a hydrophore tank is a water pump. The water pump is the heart or main center of a very important component of this hydrophore tank system. It is because the water pump moves fresh water from the freshwater tank to the hydrophore tank before the freshwater is distributed to the accommodation. The water pump also increases the pressure in the hydrophore tank to the pressure required by the system. Thus, the pump pushes freshwater into the tank with a minimum pressure of 4 bar and a maximum pressure of 6 bar.

The role of the air pressure system in the hydrophore system functions as a cushion for compressed air in the hydrophore tank. The air cushion pressurizes the water inside the hydrophore tank until it reaches maximum pressure. At this maximum pressure, the pump starts not working. Meanwhile, if the water channel is opened, water will flow due to the pressure exerted by the air cushion. The water that comes out causes the volume of the room in the hydrophore tank to increase. It will reduce the pressure of the hydrophore tank. Suppose the pressure drops to a pressure of 3.73 kg/cm². In that case, the pressure relay switcher will automatically turn on the Feed Water Pump and refill the hydrophore tank until the air volume decreases and the pressure

increases.

Furthermore, if the pressure reaches 5.5 kg/cm², the pump will be stopped automatically through the pressure relay switcher. Hydrophore is used to serve freshwater or seawater systems needed for sanitary, drinking water and freshwater. Considering the capacity calculation by taking into account the number of crew and based on U.S. standards of 144 liters/person/day, hydrophore tank specifications with compressed air requirements of 5 bar are obtained. This compressed air requirement will be supplied from the compressed air system through a reduction valve to reduce the pressure from 30 bar to 5 bar.

Other components associated with a tank hydrophore include goggles, pressure sensors, safety valves, exhaust valves, and water intake/outlet valves. Of these components, it plays an important role in the operation of the hydrophore tank so that it can function properly. If there is a problem with one of the Hydrophore's components, the tank does not work, and the freshwater supply has a problem. In this chapter, the author will explain the general description of the material or object to be studied using the shell method. The object studied is the drop in pressure of the hydrophore tank pump on MT. Inter Armada 01. When researchers carried out screen practice (prala), researchers experienced several problems in installing hydrophore tank pumps, which caused a decrease in hydrophore tank pump pressure. The problem will be explained in detail based on the obstacles experienced by researchers on the MT ship. Inter Fleet 01.

Data Description

This research was carried out during marine practice at MT. Inter Armada 01, ship MT. Inter Armada 01 is a tanker owned by PT. Mini Indonesia ship made or built in 1993 with DWT 4,991 t and GT 2,983 t MT Inter Armada 01 is one of the units of Japanese-made ships with an Indonesian flag operated by the crew of PT. Kapal Mini Indonesia, with Indonesian shipping routes. MT. Inter Armada 01 is a tanker with Nippon Kaiji Kyokai (NK) classification and the type of cargo transported in the form of Crude Palm Oil (CPO).

Findings

Table 1. Factors Cause the Hydrophore Tank Pump Pressure to Drop

No.	Category	Factor
1	Software	a. Non-implementation PMS (plan Maintenance system)
2	Hardware	a. Impermeable packing b. Mechanical seal conditions that are no longer feasible c. Improper bearing conditions
3	Environment	a. Dirty, fresh water
4	Liveware	a. Lack of communication between crews b. Lack of awareness of the operation and maintenance of the Hydrophore

1. What factors cause the hydrophore tank pump pressure to drop?

a. Software category

One of the factors causing the decrease in pressure of hydrophore tank pumps in the software category is the non-implementation of PMS (plan maintenance system) on MT Inter Armada 01. Here is a breakdown of the problem from factor factors. The PMS (plan maintenance system) is not carried out according to a predetermined schedule. PMS itself is a benchmark for carrying out periodic maintenance according to engine working hours or running hours that each manufacturer has determined in the manual book.

To strengthen the observations obtained by conducting interviews with the third driver responsible, stated, "The factors that cause the decrease in pressure of the hydrophore tank pump are the implementation of maintenance activities not following PMS, which can result in a decrease in the pressure of the hydrophore tank pump".

b. Hardware category

From the factors causing the drop in pressure of the hydrophore tank pump, there are hardware factors, namely the impermeability of packing, and the freshwater pump works abnormally because the components are damaged. The following is one of the factors that cause freshwater pumps to work abnormally:

1) There is a problem with improper packing

It can occur due to vibrations in the engine room so that the bolts in the flank can become loose and because when the installation is rushed, the bolts are not installed tightly.

2) Mechanical seals that are no longer suitable for use

Leaks in the mechanical seal can cause pump rotation not to be optimal, and much water is coming out of the mechanical seal. It can affect the straightness of the shaft.

3) Improper bearing conditions

Because the ball bearing is broken, the bearing will rotate abnormally as before or cause vibration. The following are factors causing damage to ball bearings that are not right: lubrication, usage and product quality, improper installation techniques, and contamination.

c. Environment category

The factor causing the drop in pressure of the hydrophore tank pump in environmental factors is dirty, fresh water. Fresh water is the main medium of hydrophore tanks to exert pressure on the freshwater supply. Whether or not fresh water is clean is very influential on the flow of hydrophore tanks because if fresh water is dirty, it will cause blockages in the system due to deposits from the dirt. If the hydrophore tank operates in dirty, freshwater conditions, it will impact the emergence of impurities.

d. Liveware category

1) Lack of communication between crew members

Communication is very important to support the smooth operation of machinery. When ship crews communicate well, a work problem can be appropriately resolved. Missing communication between ship crews results in a job or problem not being resolved.

2) Lack of awareness of operation and maintenance

The lack of awareness of the operation and maintenance by the crew in question is the driver and crew's lack of concern for the hydrophore tank's condition. The driver and crew are less concerned, underestimate the abnormalities that may occur, and lack awareness of the care that must be done in time to avoid severe damage.

2. What was the impact caused by the abnormal work of the hydrophore tank?

a. Lack of freshwater supply to the property

It is due to the pressure in the hydrophore tank being reduced. Other causes can also be caused by the volume of water in the hydrophore tank is reduced. The normal pressure required in the system is 4 to 6 bar, and the normal volume of fresh water in the hydrophore tank is 60% of the tank capacity.

b. Disturbing the comfort of the crew

The life of the ship crew depends on the need for clean or fresh water. Therefore, if the need for fresh water on board is less, it will interfere with the comfort and survival of the crew on board. The use of freshwater that is very basic is for daily drinking water needs and toilet washing needs. If these basic needs are not met optimally, the activities on board will feel uncomfortable.

CONCLUSIONS

Factors causing the decrease in pressure of the hydrophore tank pump on MT. Inter Armada 01 has a target factor, namely the non-implementation of PMS (plan maintenance system) properly, improper packing, mechanical seals that are no longer feasible, bearing conditions that fall out, dirty freshwater conditions, lack of cooperation between crews, lack of awareness of operation and maintenance.

The impact is caused by factors that cause a decrease in hydrophore tank pressure on MT. Inter Armada 01 has two impacts, namely experiencing a lack of freshwater ply soup that goes to ship accommodation and disrupting the daily activities of the ship crew.

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