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LACK OF FRESHWATER COOLING IN AIR COMPRESSORS ON SHIPS

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ABSTRACT

The aim of this research is to find out the factors causing the drop in fresh water cooling system pressure on the compressor, to find out the impact of the factor of the drop in fresh water cooling system pressure on the compressor, and to find out the lack of fresh water cooling in the air compressor on the ship. This research is qualitative research by observing and collecting information from the company. The results of the research show that the impact caused by the decrease in compression pressure on the Main Air Compressor at KM TONASA LINE

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1. INTRODUCTION

In the current era of globalization, technological developments have almost touched all aspects of human life. This makes life more competitive, so that we are required to give the best. Sea transportation is the transportation of cargo via the water transportation network (Rachman, Nasir, et al., 2022). Transportation is an important and valuable asset, transportation must be managed well and correctly, especially those related to sea transportation to run the economy. Ships are very effective sea transportation because they can carry large quantities of goods from one island to another, even from one country to another(Rachman et al., 2023).

Therefore, ship operations require routine, regular and periodic repairs and maintenance on the main engine and auxiliary machinery to support the work of the machinery so that the ship can work smoothly, safely and optimally (Geitner, F.K, 2012). To support smooth sailing, the role of the air compressor is very important, for almost all activities in the engine room and on deck. An air compressor is a device that facilitates the conversion of engine power (usually an electric motor, diesel engine, or locomotive engine) into kinetic energy by compressing air (Mahmuddin et al., 2022). The completeness and readiness of the air compressor is an important factor in producing high pressure air which

can be used as air in the main engine and auxiliary engines, also used for other services such as cleaning filters, cleaning nozzles and other parts, as well as for air services above the deck, such as fluting air. in cleaning accommodation (Pratama et al., 2022).

In carrying out practice at KM. TONASA LINE Initially the ship will prepare for maneuvering, therefore preparations for maneuvering are immediately prepared. When a ship is maneuvering, it needs more wind supply, to turn the engine on and off according to needs when maneuvering (Rachman et al., 2023). When preparing for exercise when filling the two air bottles, to make it faster and more optimal, operate two compressors. At that time the air bottle was not filled to the maximum and the filling process slowed down, then the number one processor experienced an overheating problem and automatically stopped operating (Rachman, Abbas, et al., 2022). When checking compressor number 1, there was water coming out of the compressor cylinder head. Then the engineer checked the compressor oil and it turned out that the oil had mixed with water, and when the air bottle was drained, quite a large volume of water came out. This can endanger the main engine and other auxiliary machinery, because water entering the machinery system can hinder and damage the working of the machinery system.

2. METHOD

This research was carried out on the KM ship. TONASA LINE XVIII from July to August 2023. Company PT. TONASA LINES is located in Pangkep Sul-Sel and was founded in 1968 PT. TONASA LINES up to now has improved service, bulk carrier cargo and improved the quality of handling alone, for a more efficient and leading way to become a pioneer in shipping in Eastern Indonesia and highly upholds the motto and is supported by our competent professional team, PT. TONASA LINES continues to improve its network to provide high quality services. PT. TONASA LINES has several branches in Indonesia, among others.

3. RESULTS AND DISCUSSION

A. Factors that cause a drop in freshwater cooling pressure on the air compressor

At the time of carrying out research on the KM ship. Tonasa line XVIII from February 20, 2022 to November 26, 2023, there was a problem with the air compressor engine. On May 15, 2022, when the ship was in Sulawaesi, after completing cargo loading, there was a compression pressure problem in the air compressor where the air pressure in the bottle was reduced while the air compressor worked continuously. After checking and disassembling the air compressor, damage to the piston ring fracture was found, and valve plate wear on the suction valve and pressure valve, this resulted in a decrease in air pressure produced by the air compressor, where the normal pressure that should be generated is 25 kg / cm2 – 30 kg / cm2 in approximately 10 minutes to drop

The results obtained from this study that the flow of fresh water coolant on the intercoler main air compressor due to damage to the cylinder head packing, compressor valve damage, jacket pump pressure is too high, and porous jacket cooling pipe. To overcome the above problems in the main air compressor to be optimal, it is necessary to replace the pistons, replace packing, select packing materials according to certain specifications, and supervise or replace the cooling jacket pipe with a new one, maintenance and repair of all compressor components are carried out in accordance with the manual book to prevent damage, and replace components on the compressor according to the compressor's running hours.

Based on the results of the analysis using the *fishbone* and *SHEL* methods above, the author will further describe the problems listed in the problem formulation, as follows:

1. Factors that cause a decrease in compression pressure in *the main air compressor* in KM. TONASA LINE XVIII..

Material factor

Material factors are one of the factors that can affect the decrease in compression pressure in the *main air compressor*. Such factors are the quality of suction valves and pressure valves. Because if the quality of the suction valve and pressure valve is not good and not in accordance with the specifications in the *manual book*, the suction and pressure system will not work optimally.

Human factor or in methods

SHEL* is called *Liveware

The human factor is a factor that plays an important role among other factors, because humans are the main party responsible for the operation and maintenance of the main *air compressor* in KM. TONASA LINE XVIII. Human factors that can cause a decrease in compression pressure in *the main air compressor* in KM. TONASA LINE XVIII. is the lack of maintenance about the *main air compressor* due to limitations or conditions. If the engine crew cares about the *main air compressor*

Less due to limitations so that maintenance is less than optimal, the maintenance will be carried out carelessly and not according to existing procedures, as a result the machine cannot work optimally, it can even damage the machine.

The method factor is closely related to the maintenance procedure, where the maintenance procedure is related to the *manual book* and *Plan Maintenance System (PMS)* in KM TONASA LINE XVIII. PMS is carried out according to the working hours specified by the *manual book* or when machining is disrupted.

This machine or *hardware* factor is influenced by the condition of the machine itself. Here are some engine factors that can affect the drop in compression pressure in the *main air compressor* at KM TONASA LINE XVIII.

Dirty air *filter* by sucked dirt. Filter is a component that serves to filter dirt in a system. In this case, the air filter serves to filter dirt in the sucked air so that dirt does not circulate into the system. Because if dirt circulates into the system, it will cause the performance of the main air compressor *is not optimal, it can even damage other components of* the main air compressor. Therefore, care and checking need to be considered.

Piston ring wear *due to friction of the piston ring with the liner over time the piston ring will experience high wear and heat. As a result, the final compression pressure is relatively low and the compression pressure in the air compressor is reduced. Symptoms that occur due to damaged or worn piston rings then the compression pressure on the main air compressor* will decrease, this can be seen on the manometer. On the manometer, the first compressive level (1st *stage*) is seen to show a measuring value at a pressure of 3 kg / cm2 and even lower, which should reach a pressure of 5 kg / cm2. From the resulting pressure drop to fill the air tube becomes longer.

Suction valve and pressure valve leakage. The occurrence of leaks in the suction valve and pressure valve can be seen in the pressure generated in the *pressure gauge in the* main air compressor, and can be seen in the length of time filling the air bottle which may take a long time. The leak can be proven by disassembling it and checking by giving kerosene to the valve surface and checking it by looking at it from below, if there is a leak, kerosene seepage will be seen in the valve gaps.

B. The impact is caused by the decrease in freshwater cooling pressure on the air compressor

The impact of decreasing compression pressure on *the main air compressor is the failure of starting M/E, failure of starting A/E, and disrupting the ship's motion process Air compressor is an auxiliary aircraft that can produce compressed air that must get regular attention and maintenance so that the* main air compressor can operate smoothly. Given the importance of the main air compressor *on board the impact caused by the decrease in compression pressure on the* main air compressor *at KM TONASA XVIII:*

1. Disrupting the ship's motion process The ship's motion process is a process to change the position of the ship from one place to another. The motion processing process requires *a* quick and precise engine start and stop, so the role of compressed air to *start* the engine is very much needed. According to the observations made by the author, we already know that the decrease in compression pressure can result in the lack or even absence of compressed air production. As a result, the ship's motion processing process will be hampered, and if the motion processing process is hampered, it will result in the danger of ship collision.

1) Lack of compressed air produced by the main air compressor According to observations made on the auxiliary aircraft *main air compressor when the compression pressure on* the main air compressor is low, the filling *of compressed* air in the wind bottle lasts very long, even until there is no air filling in the air bottle by the compressor. According to the results of an interview conducted by the author together with machinist 3, this is because if the compression pressure is low, then the air pressure produced is not maximum.

3.Efforts are being made to prevent the lack of fresh water cooling on air compressors on ships

Efforts made to prevent the lack of compression pressure in the *main air compressor* at KM TONASA LINE XVIII Clean the plates of suction valves and pressure valves periodically. After cleaning the valve plates, machinist 3 and cadet check, on the suction valve plates and pressure valves visually and make sure there are no leaks. Then after cleaning and checking, re-install the plates on the suction valve and pressure valve, then check the valve.

Driver III disassembles and measures the looseness of piston *rings and* piston grooves on low pressure and high pressure pistons. The measurement steps taken by the machinist to measure the piston rings are as follows:

The measurement of *the piston ring gap is done by smearing* the piston ring with oil or oil and then the *piston ring* is attached to a clean piece of white paper. After the piston rings are attached, the paper will form an image of the piston ring gap. From the image formed, measurements are then made using a caliper measuring instrument. Piston groove measurement In measuring the *gap between* the piston ring *and* the piston groove*, a feller gauge* measuring instrument is used . This measurement is done by inserting the *feller gauge* between the piston ring and the piston *groove.* The gap that exists between the *piston ring* and *the piston groove* is useful as a piston ring expansion space when hot. If this gap is not in accordance with the provisions, it can cause wear on the *piston rings*. After measurements were made on the piston *rings* and *piston grooves*, the results of the measurements that have been made by the machinist are as follows:

1) *Low pressure groove piston* 0.5 mm
2) *High pressure groove piston* 0.5 mm

From the measurements that have been made by the machinist, it is known that there has been wear of the piston rings on the main air compressor because according to the manual book the tolerance value of the piston groove is 0.4 mm. Quality and quantity as well as maintenance of an orderly and planned air compressor lubrication system is absolutely necessary, because it aims to avoid major damage to the air compressor parts and to prevent additional waste of repair costs, so that the air compressor can work optimally.

As for if the lubricating oil has been found dirt or sediment, it needs to be replaced as soon as possible to prevent wear and tear on compressor parts that rub against each other which can wear out the pistons, piston rings, or other components. Done. Periodically check the components of the main air compressor mentioned above so that there is no more sudden damage, and the same problem will not recur.

Lubrication is one of the factors that greatly affect the performance and life of a compressor. Good lubrication is indispensable for compressors, given that the lubrication function is:

a. Reduce friction
b. Reducing wear and tear
c. Prevents corrosion
d. Transfer heat

Some commonly used lubrications in compressors are:
1) Press lubrication

Compressive lubrication is the most effective means of lubrication. This lubrication is generally used in large compressors that are used continuously. In principle, compressive lubrication has a pump that sucks lubricating oil from the base of the crank housing and distributes it to all parts of the compressor, both moving and immobile.

2) Splash lubrication

Spark lubrication is the simplest way of lubrication. The working principle of splash lubrication is that the lower end of the connecting rod every time the rotation stirs the lubricating oil, causing splashes. This spark will lubricate the selinder walls and crankshaft bearings as well as the piston spring.

3) Lubrication with rings

This lubrication method can only be used for small compressors with a capacity of about 150 l / minute. This kind of compressor is not used continuously. The working principle is that a ring hangs on the crankshaft with its bottom immersed in lubricating oil. The ring will rotate following the rotation of the crankshaft while carrying lubricating oil. As a result of the rotation of the ring, some of the lubricating oil will splash into the crankshaft chamber and some will flow through the crankshaft bearing channels

4. CONCLUSION

Efforts made to prevent a decrease in compression pressure on the *Main Air Compressor* at KM TONASA LINE XVIII are to clean the plates of suction valves and pressure valves periodically. If there is a build-up of carbon in the valve gap, cleaning can be done with kerosene and *lapping*. In addition, it is necessary to check the lubricating oil capacity of the *Main Air Compressor Crankcase*, replace the Piston Ring *when the* Piston Ring *has worn out, and periodic maintenance of the air filter.*

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