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ANALYSIS OF THE CAUSES OF DECREASED LUBRICATING OIL PRESSURE IN THE TONASA LINES XII AIRCRAFT CARRIER ENGINE

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The lubrication system on the main engine plays a crucial role in maintaining optimal engine performance during operation. Its function is to lubricate moving engine components, lower engine temperature, reduce vibration, and protect core components from corrosive substances so that engine performance will always be maintained and can support the smooth operation of the ship, from the researcher's observation of the mother machine in KM. Tonasa Lines found that the main engine had a problem with the lubricating oil part, namely the dropped lubricating oil pressure. This study is directed to determine the cause, impact of the pressure drop, and handling steps so that the main machine can work normally again. This study applied the FTA (Fault Tree Analysis) method to understand the causes and effects of decreased lubricating oil pressure. The results showed that the decrease in lubricating oil pressure was caused by a pump not functioning optimally and blockages in the lubricating oil filter. This results in inefficient lubrication of the main engine. Decreased lubricating oil pressure that reaches 2.0 kg/cm2 increases the main engine's temperature. The recommended solution to restore the lubricating oil pressure to the normal pressure of 3.0 kg/cm2 is to add lubricating oil to the degraded/reduced Lubricating Oil Tank. In addition, it is important always to ensure the cleanliness of lubricating oil filters, monitor pump RPM through routine maintenance, and document any incidents in log books.

1. INTRODUCTION

In the world of shipping, the mother engine is a crucial element that determines the smooth and successful operation of the ship. The main function of the mother engine is to convert fuel energy into mechanical power that propels the ship across the ocean. For the main engine to work optimally, various support systems, including the lubrication system, must operate perfectly. The lubrication system ensures that the main engine components get enough lubrication so that friction between components can be minimized, wear can be prevented, and engine temperature is maintained. However, various problems can arise in ship operations, including a decrease in lubricating oil pressure. This decrease in pressure can significantly impact engine performance and service life. The ship Tonasa Lines XII, as the object of study, encountered similar problems that required in-depth evaluation.

Based on the background above, several problem formulations that can be identified are related to the factors that cause the decrease in lubricating oil pressure on the Tonasa Lines XII Main Engine, the impact of decreasing lubricating oil pressure on the performance of the main engine, and steps that can be taken to prevent and overcome the decrease in lubricating oil pressure. This study was conducted to identify the causes of the decrease in lubricating oil pressure in the Tonasa Lines XII Main Engine, assessing the impact of the decrease in lubricating oil pressure on the performance and durability of the main engine and Making recommendations based on findings to improve the lubrication system and prevent future problems.

The results of this research are expected to be a reference for ship operators and maintainers, especially those operating on Tonasa Lines ships, provide insight into the importance of maintenance and maintenance of lubrication systems, and can improve the efficiency and service life of ship engines by ensuring the lubrication system functions optimally.

2. METHODS

The methods used in this study are qualitative and quantitative. The qualitative approach is carried out to gain an in-depth understanding of the lubrication system of the aircraft carrier of the Tonasa Lines XII Ship. In contrast, the quantitative approach measures relevant parameters such as lubricating oil pressure. According to Abdussamad, Z. (2022), in his book entitled Qualitative Research Methods, explains that qualitative methods are research methods used to examine natural object conditions, where researchers are the key instruments. This approach tends to prioritize process over outcome or goal. In qualitative research, data analysis is not separate from other aspects that support the research process. At the same time, the quantitative approach is a research method based on the philosophy of positivism, used to examine certain populations or samples and using standard and specific research instruments. The resulting data is in numbers, and statistical methods carry out data analysis.

This research was carried out directly on the Tonasa Lines XII Ship during the ship's operation, with the research time carried out from January to April 2023. According to Bungin, M. Burhan (2007), there are 4 data collection methods used in collecting research data, namely Direct Observation by making direct observations on the main machine during operation to see the lubrication process and potential problems. The measurement uses a manometer to measure lubricating oil pressure and a thermometer for temperature. The viscosity of lubricating oil is also measured using viscosity test equipment. In addition to observation and measurement, researchers interviewed ship engineers and other crew members who knew about engine operations and lubrication systems. Researchers do documentation to study the operational annuals of the master machine and record any changes or anomalies that occur during the observation process.

Data Analysis the data was obtained using 3 methods, namely Descriptive Analysis using qualitative data from observations and interviews to provide an overview of the condition of the lubrication system in the main engine. Statistical analysis is applied by using quantitative data from measurements to identify certain patterns or trends in the pressure and temperature of lubricating oil. And Comparison by comparing the data obtained with the operational standards set in the master machine manual. This method is in accordance with Sugiyono's opinion (2017: 147).

3. RESULTS AND DISCUSSION

Research Results

Researchers process data sourced from the Engine Room Log Book, which contains temperatue voltage, current, and power data, with time intervals following the guard time. From these data, a data set with the following details:

Table 1. Observation Results of Lubricating Oil Pressure of Master Machine

Guard Time	Oil Pressure Lumas (kg/cm)	Temperature Minyak Lumas (Out)	Temperature Minyak Lumas (in)	Temperature Gas Buang	Temperature Air Laut	Tegangan (V)	Current (A)	Force (KW)	Information
00.00-00.04	3	50	42	250	30	440	60	22	Normal
04.00-08.00	3	50	42	252	30	440	60	22	Normal
08.00-12.00	3	50	42	251	30	440	60	22	Normal
12.00-16.00	3	52	42	250	30	440	60	22	Normal
16.00-20.00	**2.5**	60	42	**300**	**30**	**440**	60	**20**	**Abnormal**
20.00-00.00	**2**	65	42	**330**	**30**	**440**	60	**18**	**Abnormal**

Sumber: Engine room Log Book

The table above shows that at guard time 16.00 – 20.00, there is a decrease in lubricating oil pressure from 3kg/m2 to 2.5 kg/m2. At the same time, exhaust gas temperature increases by 50oC. Electric power has also decreased to 20 KW. Changes again occur at the guard time of 20.00 – 00.00,

which begins with oil pressure dropping to 2kg/m2. Exhaust Gas Temperature has increased to 330oC. Current and Power have decreased significantly.

In addition to the above data, researchers also conducted interviews with machinists on duty to determine the cause of the drop in lubricating oil pressure. After conducting interviews, it was found that several factors caused the decline in lubricating oil technology. One of the most common factors was the dirty lubricating oil filter. The decrease in lubricating oil pressure increases exhaust gas temperature and a decrease in power from the main engine. Furthermore, handling this is to clean or replace the lubricating oil filter.

After conducting interviews, researchers made direct observations by following the replacement of lubricating oil fillters.

Figure 1. Lubricating Oil Filter Replacement in the main machine

After replacing the lubricating oil filter, data is retrieved at the same time interval as the data before it was replaced.

Table 2. Observation of Lubricating Oil Pressure of Master Machine After Replacement of Lubricating Oil Fillter

Guard Time	Oil Pressure Lumas (kg/cm)	Temperature Minyak Lumas (Out)	Temperature Minyak Lumas (in)	Temperature Gas Buang	Temperature AirLaut	Tegangan (V)	Current (A)	Force (KW)	Information
00.00-00.04	3	50	42	250	30	440	60	22	Normal
04.00-08.00	3	50	42	252	30	440	60	22	Normal
08.00-12.00	3	50	42	251	30	440	60	22	Normal
12.00-16.00	3	52	42	250	30	440	60	22	Normal
16.00-20.00	3	51	42	**251**	**30**	**440**	60	**20**	Normal
20.00-00.00	3	51	42	**250**	**30**	**440**	60	**20**	Normal

The data above shows that the lubricating oil pressure returns to normal at 3 kg / m2, followed by the exhaust gas temperature that returns to normal, which is 250-252^{o}C. This also affects the power (KW), which increases to 20 KW.

Discussion

Several factors affect the drop in lubricating oil pressure on the main engine, including a Dirty lubricant filter, viscocity (viscosity) that does not match the manual book, lubricating oil pump problems, etc. This causes the exhaust gas temperature to rise and affects the Main Engine Power, as

evidenced by the data in Table 1. At the time of observation, determine the cause of the drop in lubricating oil pressure in KM. Tonasa Line XII found that the cause was a dirty lubricant filter.

To deal with this, the machinist performs maintenance by replacing the lubricating oil filter with a new one. After being installed and checked again, the lubricating oil pressure returns to normal and is followed by the exhaust gas temperature, which drops to normal, and the power increases back to normal.

4. CONCLUSION

From the results of the research and discussion, it can be seen that the drop in lubricating oil pressure in the KM Tonasa Line XII main engine. A dirty lubricating oil fillter causes the decrease in lubricating oil pressure increases the temperature of the main engine exhaust gas because lubricating oil circulation is not smooth. The heat transfer carried out by lubricating oil does not occur properly and results in decreased engine power. The handling carried out is to replace the lubricating oil filter. Thus, the lubricating oil pressure is normal so that the power on the main engine returns to normal. Advice from researchers to ship crews, especially in KM. Tonasa Line XII to always carry out maintenance on ship machinery by paying attention to maintenance procedures in the manual book and paying attention to the machinery parameters that is working when carrying out watch duties in the engine room.

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