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ANALYSIS OF NOT ROTATING VALVE ROTATOR ON MAIN ENGINE PERFORMANCE IN KM. LABOBAR

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ABSTRACT

The main engine serves as the primary power source for propelling the ship forward and backward. This engine operates on an internal combustion system, where fuel and air are compressed in the combustion chamber to generate thermal energy, which is then converted into mechanical energy through piston movement. This study employs a qualitative descriptive method with SHEL data analysis techniques, identifying the causative factors, impacts, and corrective measures associated with the non-rotation of the valve rotator in the main engine. The findings indicate that the primary cause of the valve rotator's non-rotation is improper installation of the valve collet and wear on the valve rotator body, which affects valve performance and reduces the overall efficiency of the main engine. Corrective actions include replacing the valve rotator and performing routine lubrication checks to prevent further damage.

Keywords*: Engine performance, Main engine, Valve rotator*

INTRODUCTION

The development of science and technology has brought significant changes in the shipping industry, especially in improving the efficiency and safety of the process of transporting goods by ship. According to Government Regulation of the Republic of Indonesia No. 31 of 2021, shipping includes transportation systems in waters, safety, security, and protection of the maritime environment. Passenger ships, such as KM. Labobar operated by PT Pelni, plays an important role in providing transportation for the community with a large passenger capacity and extensive routes.

However, the smooth operation of the ship is highly dependent on the condition of the engine (Liu et al., 2022). Damage to the engine can result in shipping delays and financial losses for the company (Fauzan & Nugroho, 2022). Therefore, onboard engine maintenance must be optimized (Widiatmaka, 2018). Proper engine maintenance not only includes technical aspects, but also requires good management and competent human resources. In this case, a planned engine maintenance system is crucial to prevent sudden breakdowns and ensure optimal engine performance (Akinfaloye & Onwuamaeze, 2021).

The main propulsion engine, or main engine, is a vital component that converts thermal energy into mechanical energy to rotate the propeller shaft, allowing the ship to move (Hamid et al., 2022; Van Hoten et al., 2019). Engine components such as rotator valves play an important role in the overall performance of the engine (Hartantrie et al., 2022). The malfunction of the rotator valve can cause serious problems, such as leaks and exhaust gas temperature differences (Hendrawan et al., 2021; Hermanto et al., 2024), which can disrupt ship operations.

Against this background, this study aims to analyze the impact of rotator valve non-rotation on main engine performance. This research is expected to provide a deeper understanding of the importance of proper maintenance of engine components, as well as their contribution to the smooth operation of ships in the shipping industry.

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METODE

Research method is a systematic approach used to pursue the truth, taking into account logical considerations to obtain a clear interrelation of facts related to the problem under study (Wakarmamu, 2022). In this research, some of the techniques used include observation, literature study, documentation, and interviews.

1. Observation
   Observation is carried out to obtain data directly from the object under study, namely the main engine. This process is carried out at a certain predetermined time, during the observation period. The duration of each observation session ranges from 2 to 4 hours, depending on the complexity of the constraints observed. During the observation, the researcher records specific and factual data related to the condition of the machine and the problems that occur.
2. Literature Study
   Literature study is the process of collecting data through the search for references and theories that are relevant to the problems that occur in the main engine. Data was collected from various sources of information, such as journals, books, and documents available in the PIP Semarang library. Researchers also identified the theoretical basis that could support the analysis of the problem at hand.
3. Documentation
   The documentation technique was used to collect secondary data in the form of transcripts, numbers, writings, and relevant descriptions to support the research. The data collected will be used to strengthen the analysis that will be discussed in the research.
4. Interview
   Interviews were conducted by directly interviewing the person in charge of the machining section, namely the head of the machine room. The questions asked focused on the problems that occurred in the main engine as well as the experience and insight of the head of the engine room related to engine maintenance and operations.
5. Data Analysis Technique
   Data analysis was conducted using the SHEL (Software, Hardware, Environment, and Liveware) technique. This technique was applied to analyze the interaction between the components involved in the operation of the main engine, as well as to identify factors that affect engine performance. Further explanation of the application of the SHEL technique in the context of this study will include analyzing the impact of environmental and human resource factors on the performance of the engine.

RESULT AND DISCUSSION

Based on observations made during sea practice on KM. Labobar, researchers identified several factors causing the non-rotation of the rotator valve, which can be categorized as follows**:**

1. Software (method or procedure)

SOP (Standard Operating Procedure) plays an important role in maintaining the performance of the main engine. The observation results show that the rotator valve maintenance is not in accordance with the Plan Maintenance System (PMS). This happens because are:

a. Maintenance that is not in accordance with the Plan Maintenance System
   Maintenance is only carried out when there is a change in exhaust gas temperature in the cylinder. Without this temperature difference, the crew prioritizes maintenance on more urgent components. The following is a table of the plan maintenance system implemented in accordance with the instruction manual book. Maintenance on the valve rotator can be carried out every 150 working hours. Table 1 shows that the lack of attention to valve rotator maintenance results in exhaust gas temperature differences and overheating in the cylinder head, so that engine performance decreases when PMS procedures are not followed, and potentially results in the non-rotation of valve rotators in other cylinders.

Table 1. Plan Maintenance System

No	Item	Maintenance Interval	Valve rotator												2022
			Week												Remarks
			1	2	3	4	5	6	7	8	9	10	11	12	
1	Inspection of the valve rotator every 150 hours	3 month	-	√	-	√	-	√	-	√	-	√	-	√	

2. Hardware

Hardware factors that affect the rotator valve are

a. Improper installation of collet valve (tiger nail) components

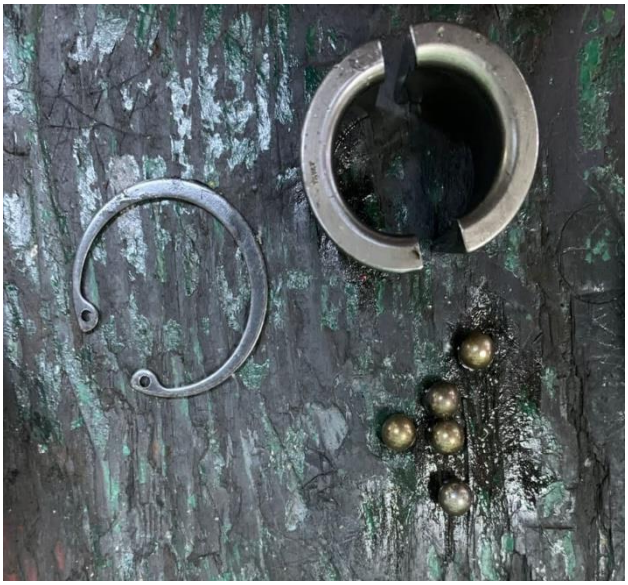

Figure 2. *Collet valve Main Engine* (Source: personal document)

Improper valve collet installation and valve rotator wear had a significant impact on engine performance. One of the cylinders experiences different exhaust gas temperature emissions, causing the valve to not function optimally.

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b. Damage to rotator valve components

The cause of damage to the valve rotator on the main engine is due to wear on the body so that this can affect the performance of the valve rotator on the performance of the main engine, which is connected to the valve spring, valve bridge and rocker arm.

Figure 3. Valve rotator wear and tear
Source: personal documents

The wear that occurs on the rotator valve body on the main engine causes the rotator valve on the main engine to not rotate. The pressure generated from the valve spring and rocker arm or valve bridge causes the rotator valve body to wear and results in the rotator valve not rotating. Poor lubrication of the rotator valve leads to increased exhaust emissions and faster wear of components, decreasing engine performance and causing leaks from the combustion chamber.

3. Environment

In terms of the environment, poor lubrication quality causes malfunctions or malfunctions in the valve rotator. The quality of lubrication must be optimal to ensure good performance and can prevent damage to the main engine. Paying attention and ensuring proper lubrication quality on the rotator valve of the main engine is very important to keep things undesirable. And if the lubrication is not functioning properly on the rotator valve of the main engine, it can cause several potential problems, including the following:

a. Damage to valves

Inadequate lubrication can cause excessive friction between main engine components such as valves and valve seating. Lubrication does not function properly resulting in rapid wear or even damage to the valve itself. Lubrication not functioning properly can cause the valve rotator not to rotate and cause the valve to not work properly causing overheating and can even cause damage to the valve seating on the main engine, decreasing the performance of the main engine and resulting in damage to the valve.

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Figure. 4 Damage to the valve (valve)

b. Liveware

Lack of cooperation between crews contributed to the system failure. During duty, the lack of checks led to no maintenance action on the main engine rotator valve.

Figure 5. the lack of checks

CONCLUSION

From the results of the research conducted on the causes of non-rotation of the rotator valve on the main engine at KM. Labobar, it can be concluded that there are several key factors that contribute to this problem, namely procedural, technical, environmental, and human error aspects. It is important to revise and strengthen the implementation of the Standard Operating Procedure (SOP) related to the maintenance of the rotator valve to include scheduling periodic maintenance that does not only rely on the observation of exhaust gas temperature, but is also carried out systematically every 150 working hours, regardless of the apparent operational conditions, developing a regular training program for the entire crew on the importance of cooperation in the maintenance of the main engine and related

components, implementing a better lubrication system with regular monitoring to ensure that the quality of lubricants used meets optimal standards, and carrying out periodic checks and systematic audits to ensure that all procedures are followed properly and detect potential problems early. This can help prevent more severe damage and improve the overall performance of the host machine.

BIBLIOGRAPHY

Akinfaloye, O. A., & Onwuamaeze, I. P. (2021). Evaluating Parameters Affecting the Performance of the Spark Ignition Engine. *Saudi J Eng Technol*, *6*(8), 232–241.

Fauzan, A., & Nugroho, E. A. (2022). Studi Identifikasi Biaya Perawatan Dan Perbaikan Pada Motor Penggerak Kapal Munic 1. *Humantech: Jurnal Ilmiah Multidisiplin Indonesia*, *2*(01), 116–122.

Hamid, A., Abdullah, M., Febriana, I. D., Kurniawan, H. E., Wilujeng, A. D., Wijaya, S. D., & Fatah, M. (2022). Pemanfaatan karbon aktif dari limbah kulit pisang untuk catalytic converter pada mesin diesel. *Jurnal Rekayasa Mesin*, *12*(3), 709–716.

Hartantrie, R. C., Lesmana, I. G. E., TK, A. R., Rahman, R. A., & Nugroho, A. (2022). *Motor Bakar Pada Mesin Konversi Energi*.

Hendrawan, A., Sasongko, A., & Daffa, M. (2021). Pengaruh Umur Pelumasan Terhadap Suhu Mesin Induk KM. LOGISTIK NUSANTARA 4. *Jurnal Sains Teknologi Transportasi Maritim*, *3*(2), 1–9.

Hermanto, A., Pradana, W., & Widiatmaja, A. (2024). Identifikasi Kenaikan Suhu Minyak Lumas Pada Motor Induk di MV. Manalagi Dasa. *Jurnal Sains Teknologi Transportasi Maritim*, *6*(1), 27–35.

Liu, S., Chen, H., Shang, B., & Papanikolaou, A. (2022). Supporting predictive maintenance of a ship by analysis of onboard measurements. *Journal of Marine Science and Engineering*, *10*(2), 215.

Van Hoten, H., Gustriranda, H., & Nurbaiti, N. (2019). Recondition cylinder head engine Wartsila diesel 18V32DF. *METAL: Jurnal Sistem Mekanik Dan Termal*, *3*(2), 73–78.

Wakarmamu, T. (2022). *Metode Penelitian Kualitatif*.

Widiatmaka, P. (2018). *Manajemen Perawatan dan Perbaikan Kapal*. PIP Semarang.

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