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Analysis Abnormal of Engine Noise in UD Truck Quester CWE 370 Unit

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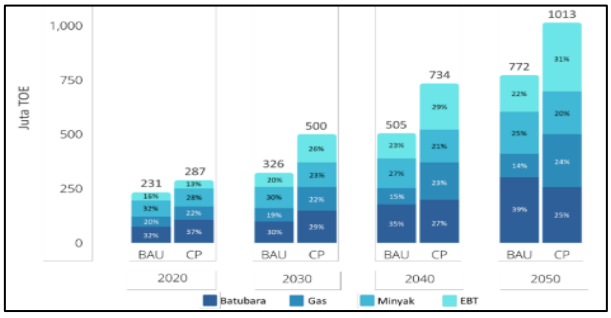
ABSTRACT

Engine is the main driving force of a vehicle used in all types of vehicles. Its function is to drive the components present in the vehicle so that the vehicle can move and perform its functions. In the UD Truck Quester CWE 370 unit, the engine functions as the main driver for both the vehicle drive system and the vehicle hydraulic system. With a high hours meter, various issues may arise, such as abnormal engine noise characterized by a rougher-than-usual engine sound. In the case of abnormal engine noise in the Quester CWE 370 unit, after troubleshooting and testing, it can be concluded that this occurs due to a cam lobe shifting from its camshaft. Because this shifted cam lobe can affect other cam lobes, replacing the camshaft unit is highly recommended. Of course, after replacing the parts, perform several tests to ensure that the abnormal engine noise has returned to normal.

Keywords: Troubleshooting, Engine, Camshaft

1. Introduction

Currently, coal is quite dominant in the primary energy mix because it is considered the most economical with the least cost consideration, especially for the primary energy needs of power plants. Domestic coal utilization grew quite steadily to reach 12% per year based on the National Energy Council [1].



Source: (Afin, 2021)
Figure 1: Primary energy

Fossil energy still dominates Indonesia's primary energy supply until 2050 with an increase during the projection period of 407 million tons of oil equivalent (TOE) (BAU) and 448 million (CP). Although the absolute value of fossil energy has increased, the share of fossil energy to total primary energy supply has decreased to 88% (BAU) and 69% (CP) [2]. The share of coal is expected to continue to decline but its role is still quite high until 2050. This is because the dependence on the use of coal, especially in the power generation sector, is still quite high.

In mining areas, dump trucks are used to transport soil, rocks, or transport mining materials in very large capacities. This unit can carry very large loads in one dump, thereby making work time efficient, the process of moving materials in large quantities also makes work more effective. To have knowledge and understand the repair steps or often referred to as troubleshooting, in order to repair the unit properly and correctly. Incorrect and unplanned repairs can result in new damage, or damage that spreads to other parts resulting in more severe damage or fatality damage.

Basri [3] conducted analysis research and problems were carried out by using 8 steps troubleshooting. The results of the study showed that the cause of service brake malfunction is a pressure switch that does not send a signal to the retard control monitor. Hendro [4] conducted research to determine the cause of oil leakage and how to handle it with the 8-step method of solving problems.
When the UD Truck Quester CW 370 unit was operating in the mining area of the Bakungan site in East Kalimantan, PT. X as the operator reported a problem that arose in the unit. Several times the operator heard the unit make an abnormal sound in the engine, which is a rougher engine sound than usual. One common problem is abnormal engine noise, which is generally characterized by a rougher engine sound. There are several things that cause abnormal engine noise, including air entry in the fuel system, a clearance gap that is too wide on the valve mechanism and wear on the crank mechanism where one of the components is the camshaft, BMC UT [5].

2. Material and Methods

In solving problems that occur in abnormal engine noise in UD truck quester CWE 370 units, researchers used eight troubleshooting steps as shown in figure 2 below.

Source: (Stoll, 2020)

Figure 2: Flow chart 8 step troubleshooting

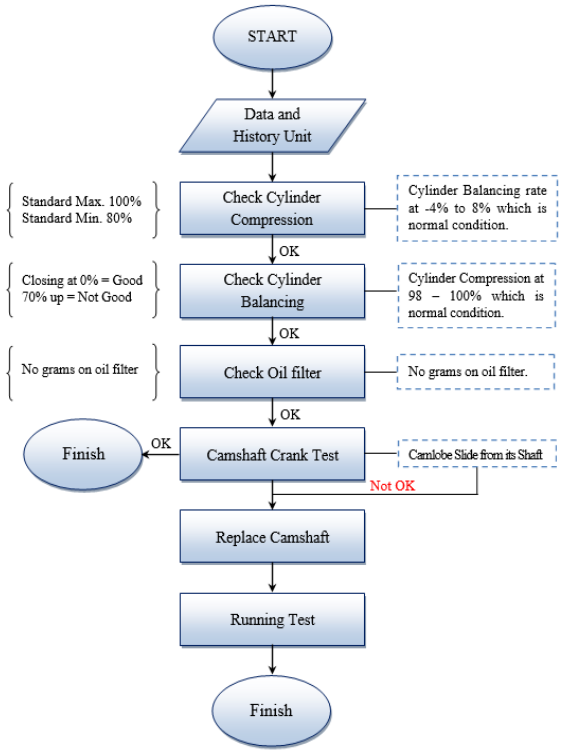
Troubleshooting activities are analyzing a problem on the engine with the aim of determining the cause of the problem appropriately so that it can take corrective steps effectively. It becomes very important to study and understand the structure and function of each system in a unit, Stoll (2020) [6]. Troubleshooting properly will reveal the root cause of the problem with the engine. Even if the damage can be repaired, if the root cause of the problem is not fixed, the same damage will reappear.

Source: (UD Trucks, 2023)
Figure 3: Tech tool software

Tech Tool is a Windows-based software used by UD Trucks to communicate with all UD Truck units. Tech Tool serves to diagnose damage, view unit repair history, perform system testing on units, calibrate units, and program a unit's sensor system as a whole for all units, The UD Truck Group (2023). The results of the diagnosis carried out by this Tech Tool software can be used as a reference for troubleshooting [7] shown in Figure 3.

3. Results and Discussions

In line with the symptoms of damage that appear, adjust to the troubleshooting diagram contained in the Impact manual. Prioritize the simplest and most easily identifiable problem identification based on the information present in the troubleshooting diagram. Make sure each step in the diagram is executed correctly and document the results for each step taken. Here is the abnormal engine noise troubleshooting chart shown in Figure 4.



Source: research

Figure 4: Abnormal engine noise troubleshooting chart

There are several things that are possible causes of trouble in abnormal engine noise problems, such as:

1. Engine hunting from fuel system or unstable engine speed in the fuel system.
2. There is a clearance gap that is too wide on the valve mechanism.
3. Wear on the engine drive mechanism.

The possibilities mentioned above, based on references commonly used to sharpen the analysis of causes (Troubleshooting chart, Impact manual). After the necessary information has been obtained, the next stage is to conduct a diagnostic test including cylinder balancing test, cylinder compression test, & camshaft test to check whether the trouble that occurs is in accordance with the initial information from the operator. The following is the unit data obtained during the initial inspection which can be seen in table 1.

Table 1: Unit Data

Unit Model	Quester CWE370 6x4
Unit Serial Number	MMHCWM30DHK803105
Engine Model	GH11 370 EC01
Engine S.N	417182
Code Unit	42
Hour Meter	19065.45
Kilometer	210036,9
Location	site bakungan
Problem Information	abnormal engine noise

Data was collected by, among others, conducting visual inspections, interviews with operators and using tech tool software as diagnostic test software used by UD Trucks. Cylinder balancing testing using tech tool software. The goal is to see any indications of abnormalities in each combustion chamber. The test was conducted for 15 minutes, low engine rotation speed of 600 rpm with neutral gear position. From the test results, it can be seen that the percentage of compensation on the lowest fuel cylinder is at -4% and the highest at 8%. It can be concluded that the cylinder is in the state of balance shown in figure 5.

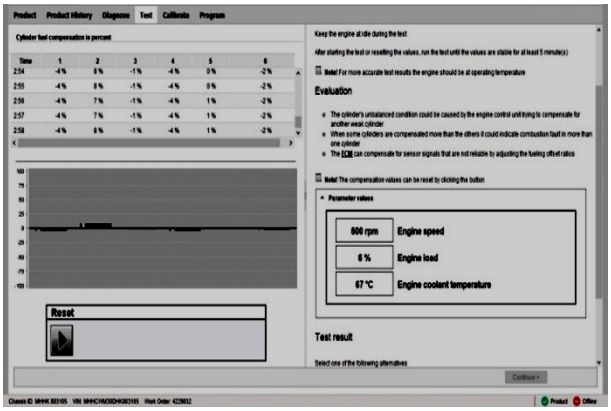


Figure 5: Cylinder balancing test

Cylinder compression test using Tech Tool software. The goal is to see an indication of compression pressure in each combustion chamber. Tests are carried out when the engine is off, the gas pedal or accelerator is released or not stepped on, the coolant liquid temperature on the engine is above 60ºC and the gear position is neutral. From the test results, it can be seen that the percentage of compensation in the fuel cylinder is in the highest position, 100%, the lowest is in the 98% position, shown in figure 6. It can be concluded that the compression on the cylinders is in good condition.

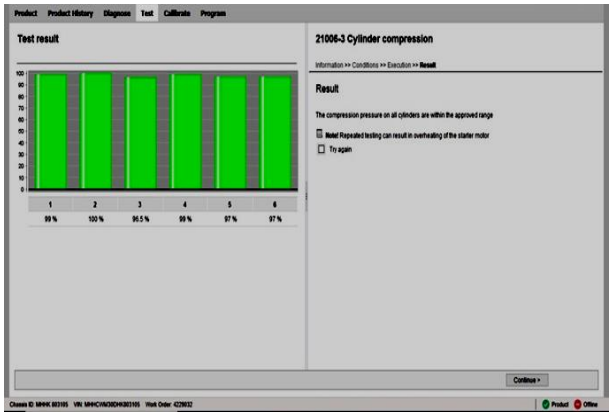


Figure 6: Cylinder compression test

Camshaft Crank Test is a test carried out by rotating the flywheel using a turning tool or crank adapter. The purpose of this test is to find unnatural sounds on the camshaft or on the cross head on the rockerarm. Camshaft crank test is performed in the following way:

1. Position the cam shaft at point 0 or TDC (Top Dead Center) as the default position by rotating the flywheel.
2. Rotate the cam shaft to perform a cam slide test.

The results of testing on the camshaft using a camshaft crank test, showed the cam lobe had shifted from its shaft. Under normal conditions, the cam lobe should be in a position parallel to the shaft. This is the cause of abnormal engine noise. The recommended action is to make a replacement on its camshaft unit. can be seen in figure 7.

Figure 7: Camshaft crank test

After step-by-step troubleshooting, it can be concluded that the abnormal engine noise problem on the UD Truck Quester CWE 370 unit is caused by the cam lobe contained in the camshaft has shifted from its position. This is due to wear on the camshaft due to the high hour meter. After finding the cause of abnormal engine noise, the next step is to determine the repair steps, namely by replacing or replacing the camshaft.

4. Conclusion

Abnormal engine noise that occurs in UD Truck Quester CWE 370 units is a problem that can occur on any machine that is generally characterized by a rougher than usual engine sound. After troubleshooting the UD Truck Quester CWE 370 unit, it can be concluded as follows: The cause of abnormal engine noise is wear on the camshaft which causes the cam lobe to shift from its position. Wear can occur due to Camshafts that have experienced a fairly high hourmeter above 12,000 HM or 3 years after the purchase and delivery of the unit. Replacement of one camshaft unit is highly recommended, because it can spread to other cam lobes.

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