Analysis of Rising Fresh Water Cooler Temperature Main Engine KM. Leuser

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Abstract
Cooler is a auxiliary engine that functionaly to cooling fresh water on board, cooler usage is very important because the operational of main engine depends the cooler, because for diesel engine the cylinder liner always getting hot after combustion. If the cylinder get no cooling, the oil viscosity will be low and make piston and cylinder damaged.
The purpose of this research is to know the problem of unnormaly temperature cooler. To understand the maintenance the trouble fresh water cooler. The method to solve this problem is observation. This method demanded the writter doing observation. The next is interview with first engineer, and looking for data from manual book, main engine journal. The study of this research is about the trouble from fresh water cooling KM. Leuser. With the important of the cooler we have to know the factor that’s make the temperature going up. And the result of the research is unoptimalize heat absorbtion from cooler plate and the stool from sea water filter, after the clean up the cooler is more cool.

Keywords: Cooler, Temperature, Main Engine, Maintenance, Filter

1. Introduction
For the smooth running of a diesel motor that is used as a propulsion force on ships requires perfect cooling and lubrication because the combustion chamber produces a very high temperature. So that the motor part is very hot as a result of the combustion. In the process of operating the main engine, there are often disturbances in the cooling system, due to an important factor in the smooth operation of the ship. On the main machine where the author carries out sailing practices on KM ships. Leuser often experiences abnormally rising freshwater temperatures, causing abnormal cooling in the main motor. By paying attention to the freshwater cooling system on the mother motor on board the ship, so that the ship can operate properly even though it sails for a long period of time. At the time of operation the normal cooling water temperature is 52-59 °.

2. Research Method
Method basically means the method used to achieve the goal. Therefore, the general purpose of the study is to uncover the problem, then the steps taken should be relevant to the problem that has been formulated. The authors used primary and secondary data in this study. 
a. Primary data
Primary data is a source of data obtained directly to the data collector (Sugiyono, 2018). Primary data is obtained by methods, including:
1) Interview Method
Based on the results of the interview, the author obtained data in the form of causes of temperature increases in the freshwater coolant of the main motor, prevention and how
to overcome the increase in the temperature of freshwater coolant.

2) Observation Method

Based on the results of observations, the authors obtained data in the form of freshwater temperature under normal conditions and abnormal conditions.

b. Secondary Data

Data obtained or collected by people conducting research from existing sources (Hasan, 2002). The secondary data in this study is guilty on the part of PT. PELNI in the form of documents obtained from the Maintenance Book.

3. Results and Discussion
a. Result of Research

During the implementation of the Screen Practice, the author obtained the following data:

Table 1. Table of Temperature and Pressure Before and After Maintenance

<table>
<thead>
<tr>
<th>Tanggal</th>
<th>Sebelum Masuk Cooler (°C)</th>
<th>Sesudah Masuk Cooler (°C)</th>
<th>Suhu Air Laut (°C)</th>
<th>Tekanan Pompa Air Laut (bar)</th>
<th>Tekanan Pompa Air Tawar (bar)</th>
</tr>
</thead>
<tbody>
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<td>Out</td>
<td>In</td>
<td>Out</td>
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<td>30</td>
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<tr>
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<td>59</td>
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<td>56</td>
<td>29</td>
<td>2,3</td>
<td>2,3</td>
</tr>
</tbody>
</table>

b. Analysis

The author conducted a direct review of the object under study and recorded the temperature conditions of the fresh water cooler and the pressure of the seawater and freshwater pump for 3 months. By comparing the data in the field during normal and abnormal conditions. To find out how high the temperature rise is on the fresh water cooler and the pressure on the seawater and freshwater pumps on board the ship. According to the Manual Book. The normal temperature of fresh water that can be cooled at the Fresh Water Cooler (High Temperature)
is 52°C -58°C, for Fresh Water Cooler (Low Temperature) the temperature of fresh water that can be cooled is 36°C - 40°C. The seawater temperature to cool fresh water is normally at 28°C - 32°C. In freshwater pumps, the normal has a pressure of 2.8 bar and for seawater pumps it normally has a pressure of 2.2 bar to 2.3 bar.

c. Study
With the fixing of this problem, the author discusses the causes of disturbances in the freshwater cooling circulation system of the Main Motor, namely:

1. The Factors of rising cooler temperature
   a) Dirt on Cooler Plate
      The amount of dirt that enters with seawater into the cooler plates. This can cause the flow of seawater entering the cooler plate to be less than optimal and have an impact on suboptimal heat absorption. The temperature of fresh water that comes out after cooling the Main Motor is 68 °C and after cooling to 56 °C under normal conditions while in abnormal conditions fresh water after cooling fresh water entering to 72 °C and after cooling only to 60 °C this condition can cause engine performance to be not optimal.
   b) Dirt on Sea Chest Filter
      Dirt on the sea chest filter can cause obstruction of seawater entering to cool the Fresh Water Cooler. The dirt that enters comes from garbage or mud contained in marine waters. Normally, the Sea Chest is cleaned every 2 weeks because the ship goes through dirty waters such as in Surabaya waters and shallow waters such as in Timika, Agats, Merauke
   c) Inadequate Fresh Water in Expantion Tank
      The lack of water in the expansion tank of the Main Motor also affects the cooling of the Main Motor, if the water in the expansion tank is lacking, it can have an impact on the supply of fresh water that is not optimal for circulating.

2. Efforts to cope with rising temperatures in the freshwater cooling of the Main Motor
   a) Inspection of freshwater and seawater pumps
      One of the causes of the rising temperature of the freshwater coolant is the decrease in pump pressure, therefore routine maintenance must be carried out by checking the pump components.
      1) Stop pump
      2) close inlet valve dan outlet pump
      3) open and relase pompa
      4) check impeller
      5) check bearing
      6) give a grease in bearing
      7) check mechanical seal
      8) change the overdue component
      9) reassembly the component
      10) open inlet dan outlet valve
      11) running test pump
      12) if the pressure normal, the pump are ready to operate
   b) Give the Chemical Liquid
      The provision of chemical liquid in the form of Arcel CWS 217 to reduce the occurrence of corrosion and scale contained in the freshwater circulation system. Arcel's provision is entered through an expansion tank with a dose of 1 liter for 200 liters of fresh water.
c) Cleaning on Sea Chest sieves and Cooler plates
   Sea Chest filter cleaning must be done regularly because the sea chest is a place where seawater enters the system to cool fresh water. If the seawater supply is not optimal, the cooling on the Main Motor will also not be optimal. Likewise with Fresh Water Cooler plates if the plate is dirty, the heat absorption will not be optimal. Here's how to care for sea chests and plates Cooler:
   1) Cleaning of Sea Chest
      (a) Close Sea Chest valve
      (b) Close sea chest valve that goes to sea water pump
      (c) Open nuts cover Sea Chest
      (d) Open the filter and clean it
      (e) Get back the filter and close the sea chest cover
      (f) open Sea Chest valve that goes to pump
      (g) running test the pump, if the pressure in normal condition the pump are ready to use
   2) Cleaning of Fresh Water Cooler
      (a) Close the valve from expantion tank to main engine
      (b) Close cooler valve that goes to main motor
      (c) Close fresh water valve that goes to cooler
      (d) Close sea water valve
      (e) open Fresh Water Cooler cover nuts
      (f) clean the every plates
      (g) close back and tight the nuts fresh water cooler cover
      (h) open cooler valve that goes to main engine
      (i) open fresh water valve that goes to cooler
      (j) open fresh water valve
      (k) open expantion tank valve to main engine
      (l) running test the pump, when pressure gas risen the fresh water are ready to use

4. Closing
   a. Conclusion
      Based on the analysis and discussion, the following conclusions can be drawn: Based on the analysis and discussion, the following conclusions can be drawn:
      1) After making observations and research, the author found several factors that cause the freshwater temperature to increase which causes non-optimal cooling in the Main Machine, the dirtyness of the sea chest filter. The sea chest itself is a place for seawater to cool fresh water on the ship. If the sea chest filter is dirty, it will cause the flow of incoming seawater to be not optimal, which affects the performance of the engine.
      2) Efforts made to overcome the rising temperature of freshwater coolant are to carry out routine maintenance on the pump to prevent a decrease in pump pressure, routine maintenance to clean the fresh water cooler so that heat absorption is more optimal and the provision of chemical fluids to prevent scale in the circulation pipe of the freshwater cooling system.

   b. Suggestion
      1) To pay attention and check directly and regularly when the Fresh Water Cooler is operating. Immediately report to the Machinist guard if there is an abnormal increase in the temperature of the Fresh Water Cooler.
2) In order to prevent the temperature of the freshwater cooling water at the Fresh Water Cooler, it is always considered and carries out routine maintenance according to PMS. So that factors that can cause the rise in the temperature of freshwater coolant can be avoided.

5. References