Analysis Of Injector Flowing On Auxiliary Engine On KMP. Portlink

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Abstract
Auxiliary Engine is an engine in which air is compressed to a high enough temperature to ignite diesel fuel injected into the cylinder, where combustion and emission drive pistons which convert the chemical energy in the fuel into mechanical energy. Good fogging is needed in diesel engines, in order to get maximum power. The condition of the injectors on the Auxiliary Engine greatly affects the condition of the Auxiliary Engine itself. The presence of injector damage can affect the operating conditions of the Auxiliary Engine, so the condition of the injectors must always be maintained.

The research method that the author uses in the preparation of this thesis is a qualitative research method as a data analysis technique to analyze the problems that exist in the Auxiliary Engine, namely what factors cause injector damage to the Auxiliary Engine, the impact and what efforts are made to overcome these factors. Of these problems by systematically identifying various factors on human factors, environment, methods, machines to formulate strategies to be taken.

Based on the results of research that has been done by the author on the ship KMP. PORTLINK, it can be concluded that the damage to the injector on the Auxiliary Engine is caused by two factors, namely the high operational schedule of the ship, and the infrequent maintenance of the Auxiliary Engine injector and the use of inappropriate fuel. To overcome these factors, maintenance can be carried out according to PMS time, as well as good filtering on low-quality fuel.

Based on the results of research that has been done by the author on the ship KMP. PORTLINK, it can be concluded that the damage to the injector on the Auxiliary Engine is caused by a clogged nozzle and looseness in the injector component.

Keywords : Auxiliary Engine, Qualitative, Ship, Injector, Nozzle

1. Introduction
Ship is a means of sea transportation that is useful as a carrier of goods or people from one place to another. To serve transportation services at sea, of course, must be supported by adequate machinery. For this reason, shipping companies must have a strong fleet of ships and
are always ready to serve transportation services at sea at all times and on time.

Ships can be divided into various kinds according to the cargo to be transported by the ship and one of them is a passenger ship (passenger). A passenger ship can carry passengers and vehicles, such as motorcycles, personal cars, and loaded trucks. In supporting its operational activities, the role of the ship is inseparable from the existence of the auxiliary engine as a power plant on board.

On the auxiliary engine there are 4 systems to support engine performance in order to run perfectly, namely the lubrication system, cooling system, starting air system and especially the fuel system by the injector when there is combustion in the cylinder chamber so that it can work perfectly. In order for the fuel can be fog well and perfectly it must be held a good maintenance according to the procedures in the manual book so that combustion in the cylinder chamber can occur perfectly and auxiliary engine can work properly.

If at the end of spraying the fuel injector drips or leaks, there will be less than perfect ignition when the ship is sailing. Then the author tries to compile research with the title ANALYSIS OF INJECTOR IGNITION ON AUXILIARY ENGINE IN KMP PORTLINK.

2. Research Method

This study uses a qualitative method that is qualitative analysis process research that is based on the existence of a systematic relationship between the variables under study. The purpose of qualitative data analysis is that researchers get the meaning of the relationship of variables so that it can be used to answer the problems formulated in the study. Systematic relationships are very important because in qualitative analysis, researchers do not use numbers as in quantitative analysis. The main principle of qualitative data analysis techniques is to process and analyze the collected data into systematic, organized, structured and meaningful data.

The research method is optional for original research articles. This method is written in a study, research methods and techniques relate to the quality of the data obtained. Namely by using methods including:

a. Primary Data

Primary Data is data obtained directly from the first source through the procedure and recorded. In this case the authors obtain primary data directly from the results of interviews with the crew on board The Machinist III named Heri Mulyono who has responsibility for the auxiliary engine.

b. Secondary Data

Secondary Data is data obtained from indirect sources, usually in the form of documentation data and official archives, which are self-collected by the author, apart from the source under study. This Data is obtained from books and the internet related to the object of research proposal or related to the problem to be discussed, which is necessary as a guide, theoretical and formal provisions of the real state of observation. As well as from other information that has been submitted during the lecture.
3. Results and Discussion

1. The cause of incomplete ignition of the injector on the auxiliary engine
   a. Clogged nozzle hole
      Due to incomplete combustion causes the presence of carbon-carbon attached to the surface of the nozzle tip in the form of carbon granules and if left unchecked, the carbon-carbon will increase and eventually will cause inhibition of atomized fuel in the fuel chamber.

   b. Dirty fuel
      As a result of dirty fuel can also inhibit the nozzle because the fuel impurities are not retained by the filter and retained in the nozzle holes are smaller than the impurities contained in the fuel. If the use of dirty fuel is still done it will affect the combustion in the engine, the cause of dirty fuel is the lack of maintenance of supporting equipment in the fuel system such as:
      1) Fuel tanks.
      2) Fuel Filter.

   c. Looseness that occurs in the Injector components
      To find out that the Injector component is loose, by unplugging and testing with a pressure test so then it can be known, so if loose then the fuel will drip so that the occurrence of afterburning, wasteful fuel and smoke ngebul on the ship panel that will cause environmental pollution. The causes of component looseness are:
      1) Excessive vibration
         Excessive vibration occurs when starting early, when increasing the load or doing sports and raising the engine RPM so that excessive vibration occurs and results in looseness between the Spindle and the needle on the Injector.
      2) Wear on the spring
         Spring wear occurs because the spring has changed forms, because the heat from the fuel and engine during long operation in other words exceeds its working hours. When this happens, the fuel drips into the engine fuel chamber.
2. Efforts have been made to overcome the incomplete ignition of injectors on auxiliary engines, among others:
   a. Inspection and testing of injectors
   Inspection and testing of the injector must be carried out in accordance with the instruction manual book so that the results achieved can be maximized. The results of the inspection and testing of the injectors of each cylinder must be recorded so that they can be used as references and guidelines for subsequent maintenance.

The inspection and testing are as follows: injector testing is carried out every working hour or used 500-1000 hours of motor rotation. Before conducting the test first check the nozzle and injection hole if there is a crust of carbon/charcoal covering, it must be cleaned first. Testing the injector includes:
   1) Injection test (spraying test)
      Adjust the pressure slowly by using injector tester. Measures the pressure at the moment when the injector starts spraying. In accordance with the instruction manual on the ship cadets practice is M&W M.A.N INSTRUCTION BOOK that the pressure setting at the time of injection is 250 MPa.

   2) Atomization test
      When the fuel pressure becomes high enough it will open the valve so that the fuel will fog up. The fogging of the fuel should spread regularly and should not drip. Atomization is influenced by the movement of the atomizer needle and the accuracy of the pressure setting, if the atomizer mouth hole is clogged.

Figure 2. Injector Test Pump
b. Care on the nozzle

Inspection and repair must be carried out with accuracy and maintain the cleanliness of the parts that have been uncovered, should not be scattered on the work table but placed on a clean compound, before being reassembled to these parts must be washed and rinsed first with diesel until clean.

The things that are considered in carrying out nozzle repairs are:
1) first clean the hole in the middle of the nozzle and the hole in the fuel sprayer hole from dirt and carbon that has become solid by using a special drill that has been recommended in the main engine maintenance manual.
2) check the spray holes using a special puncture needle. If a special puncture needle can only enter one hole from the other, it means that there is a lot of dirt so that it is clogged because the nozzle must be replaced.
3) at the time of cleaning with a needle puncture, pay close attention and be careful not to let the sprayer hole into an oval shape, and to find out the shape of the hole then use a magnifying glass.
4) Do the cleaning with diesel on the spindle guide and then do the sanding by tying it to the lathe with low rotation while sanding until the dirt and residual carbon are clean, you can use brasso and soft sandpaper.
5) when reinstalling the nozzle, it must be considered that its location must be right on the existing pin, so that the nozzle is firmly bonded.
6) to find out this, the Injector pressure drop tool available on the ship is used. This tool is a Test Injector. Injector all the fuel in the spray out the nozzle must be the same length and be a mist, after completion of the test, placed the injector as a spare.
c. Dirty Fuel Handling
Checks are carried out on the fuel system, among others:
1) Cleaning and inspection of tanks, fuel needs to be cleaned, because as we know not always clean fuel tanks. As for how to clean it as follows:
   a) the fuel that is still in the tank is pumped out to another tank using a transfer pump until it runs out.
   b) then open the Man Hole to remove or eliminate the gases contained in the tank or by using a Blower until the gases are gone.
   c) after the tank is in good condition, the fuel is transferred back into the tank that has been cleaned.
   d) and do not forget to hold the pengelatan every day so that dirt and air contained in the tank is free from the above.

2) Cleaning Against Fuel Filter
Handling of the filter is to do the cleaning by following the steps as follows:
   a) before cleaning the filter make sure the valves before and after the fuel filter are closed. To avoid the discharge of fuel from the system when holding a filter discharge.
   b) unscrew the plug bolts so that the fuel comes out completely from the filter housing.
   c) unscrew the air exhaust couplers following the locking bolts so that the cap on top and the filter housing can be separated.
   d) remove the filter element from its housing.
   e) clean the filter element by using kerosene or diesel fuel.
   f) after cleaning put the filter back into the filter housing.
   g) when holding refueling open the false air couplers, use the air in the fuel installation.

d. Handling Loose Injector Components
The looseness of the Injector component is the presence of a gap between the Spindle and the Needle. So for that it is necessary to hold the correct binding, namely:
1) lift the Injector from the cylinder Cover and close the Injector hole on the cylinder Cover to prevent dirt from entering.
2) Perform Injector testing by installing on the "Injector Testing". If the pressure does not meet the opening pressure, it is necessary to re-tighten.
3) tightening is done by using a special Injector key in accordance with the Instruction Book. If the value of the opening pressure is appropriate and does not drip fuel after the test, the Injector can be moved again.

4) installation of the Injector is done after the Injector is smeared grease on the Injector hole and on the cylinder that has been cleaned.

Figure 5. Correct installation of the injector

e. Handling of wear on the Spindle spring to overcome wear is;
   1) Adding To The Ring Plate (Ring Plate)
   Plate rings to be added Are plate rings that are specifically in accordance with the Instruction Book. As for how it is :
   a) disassemble the components in the Injector and make sure not to get confused or missing components.
   b) place the Spindle Body on the vise and tie and then shouldered with a special key and rubber hammer until loose.
   c) clean all parts with diesel and then spray with wind.
   d) check the springs for excessive deformation.
   e) if the deformation is very severe then add a plate to the spring so that the spraying pressure can be jacked in accordance with its value.
   f) reassemble using a special key and placed on the drilling machine used to press the Spindle Body so that it is tightly bound.

2) Replacing the spring with a new one
   The spring change can be carried out if the old Spring is completely unusable or in a jack with a ring plate or its tightness properties are greatly reduced so that the Injector spraying pressure can correspond to the value. The replacement is based on the Instruction book so that there are no procedural errors. After testing if it is good can be directly installed back to the cylinder.

4. Closing
   a. Conclusion
      Based on the description in the previous chapter, the authors draw the following
conclusions:
1) The cause of imperfect injector fogging on the auxiliary engine is due to lack of maintenance such as clogged nozzle holes, dirty fuel because it is less well filtered and looseness in the injector components.
2) To overcome imperfect injector fogging by checking and testing the injector, cleaning the nozzle hole and installing each injector component correctly after maintenance.

b. Suggestion
1) The need for maintenance and repair of injectors are regular and planned and if found kelaian and interference in the injector must be addressed as early as possible so that the auxiliary engine can work optimally.
2) The need for maintenance by taking into account the conditions of permesian working hours and checks carried out from the impact caused both in a short period of time and the long-term impact of incomplete combustion of fuel on the auxiliary engine.

5. References