Analysis Of The Cause Of The Imperfect Process Of Fogging The Injector Of The Main Engine On The Ship KMP. Trimas Laila

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Abstract

One of the components contained in the main motor, which affects the combustion system is the injector. The smog of fuel into the combustion chamber is determined by whether or not the condition of the nozzle on the injector is good. If the middle nozzle is in a state of constraint, the nozzle cannot atomize the fuel optimally. If that happens, the combustion process will also be disrupted and will affect the power of the engine.

The method carried out at this KKW uses data collection techniques by direct observation during maintenance and direct interviews from people who know on the ship, with the aim of knowing the cause of the imperfection of the injector fogging process on the main engine on the ship, it will affect the injection and fogging system on the ship. So that it can be known what factors are the cause of the problem.

Based on the results of research that has been carried out on the KMP. Trimas Laila, it can be concluded that what affects the imperfection of the fogging process on the injector is the clogged nozzle hole and the dripping of fuel at the tip of the nozzle. From this it can result in the engine not reaching maximum speed and irregular exhaust gas which initially reached 360°C to 440°C, after treatment the exhaust gas temperature returned to normal to 360°C.

Keywords: Injector, Nozzle, fogging

1. Introduction

Today's transportation mostly uses ships as a means to distribute goods, especially in many islands of Indonesia, ships that are used using diesel engines as ship propulsion in diesel engines there are components for the working process of diesel motors through combustion using injectors to ignite the fuel.

Injectors are designed in such a way to change the fuel pressure of the high-pressure injection pump to form a mist pressure between 60 to 260 kg/cm3, this pressure resulted in an increase in combustion temperature in the cylinder increased to 600°C. The air pressure in the form of fog through this injector only lasts once in each cycle, namely at the end of each compression step so that after spraying in a certain capacity where the conditions are perfect, the injector is
equipped with a needle that serves to close or open the injector channel so that excess fuel that does not fog up will be flowed back to another part or to the fuel tank as excess flow (over flow).

The Injector can simply be interpreted as an atomizer. For internal combustion engine injectors one of the main components in the diesel fuel system is the injector or atomizer or nozzle. Injector serves to deliver diesel fuel from the injection pump into the cylinder at each end of the compression stroke where the piston (piston) is at 14° before TMA.

To improve the function of this injector, we will find injectors in several types, of course with different characteristics, including consisting of (Single hole) and multi-hole injectors. PIN or trotle model injectors, these injectors are found in trotle models and pintle models. Various injectors as mentioned above with different fogging properties and characteristics, the selection for the use function is also different which depends on the combustion process and the combustion process is determined by The Shape of the combustion chamber, for the properties of this injector, among others, are as follows one perforated injector (single hole) the fogging process is very good but requires a high injection pump pressure.

Thus, the injector with many holes (multi hole) is very good. This Injector is very appropriate to use in direct injection (direct injection). Injector with pin model, this pin model injector trotle model and pintle model is more appropriate to use on diesel motors with combustion chambers that have combustion chambers, advance rooms and navel rooms (turbulent) and Lanova types. Injectors on diesel motors function to deliver fuel into the cylinder at the end of the compression stroke when the piston is at 14° before TMA, at this step the nozzle ( injector part ) sprays fuel in the form of a perfect mist continuously and regularly according to the valve mechanism. The Injector in the mechanism is assisted by supporting components to maximize the performance of the injector in igniting the fuel. From the above factors, cadets are interested in taking the title as follows analysis of the causes of the imperfect process of ignition on the main engine injectors on the KMP. Trimas Laila

2. Research Method

Research is a process of a series of steps that are carried out in a planned and systematic manner in order to obtain problem solving or answers to certain statements. This Proposal uses the type of qualitative research according to Suryabrata (2006), qualitative research is research that produces and processes descriptive data, such as transcriptions of interviews, field notes, images, video footage and others. So that the research method contains knowledge that examines the provisions regarding the methods used in research. In general, research is a reflection of the desire to acquire and develop knowledge that is a basic human need so that it becomes a motivation to conduct research.

The type of method used in this study is to use descriptive methods, namely research that aims to solve the actual problems faced and collect data or information to be compiled, described and subsequently analyzed

a. Data Sources

This study was conducted at the time of cadets carry out marine practices on ships owned by shipping companies. Due to the entire cadets Polytechnic Inland water ferries Palembang, during the fourth and V semesters carry out the program of the institution, namely the
practice of the sea (prala), where this program must be carried out for approximately one year. And the place of research conducted by the author is on the ship. The plan of the place where the research is carried out is carried out when carrying out marine practices on the ship for 1 year or 9 months by collecting data that can be later.

b. Subject Of Research

On this mandatory paper cadets search for data sources through the scale method. The scale is a measurement tool in the form of a written statement that contains a number of items to reveal affective aspects as indicators of the variables to be studied.

3. Results and Discussion

The following are some descriptions of the experiences or data that have been experienced by cadets at the time of carrying out sea practices in KMP. Thanks Laila. During the cadets carry out marine practice cadets find problems that occur in the main engine injectors and in this compulsory paper cadets try to describe the problems that have been experienced in the fuel system contained in the main engine, there is damage to the injector nozzle, it is indicated from several indicators.

At the time of the ship KMP. Trimas Laila docked at Merak on January 26, 2022 the crew and engine cadets were doing daily work, checking and periodic injector maintenance and maintenance on the fuel filter. At the time of checking The Machinist assisted by oiler and cadet with mambawa necessary equipment, at that time the opportunity to ask all the problems that occur in the injector and how to overcome them as well as how to care for the injector is not quickly damaged. And here is the damage to the injector nozzle, it is indicated from several indicators, namely:

a. Indication of injector nozzle malfunction while in transit.
   1) weak power when the ship is in transit.
   2) There is a foreign sound in the combustion chamber cylinder.
   3) white or black exhaust fumes

b. Indication of injector nozzle malfunction during monthly maintenance.
   1) Fuel rack in pull and no combustion reaction

c. The effect caused on the injector nozzle damage.
   1) injector Nozzle may break
   2) the cylinder does not generate power due to the absence of combustion
   3) fuel consumption becomes more wasteful
   4) stuck due to Flake nozzle enters the combustion chamber.

After carrying out the analysis, the indications of injectors that run abnormally, among others:

a. Engine difficult to start

The first symptom when there is damage to the injector is a difficult engine to start. This symptom appears when the gasoline supplied from the injector is less than the ideal
amount, resulting in a thin mixture.

b. Flue gas smoke color changes

Exhaust gas smoke turns pitch black, due to incomplete combustion

![Figure 1. Black smoke in the chimney](image)

C. Exhaust gas temperature is much higher

The next symptom is the exhaust gas temperature is much higher which causes compression down in the parent engine (P) cylinder number 2

![Chart 1. Changes In Exhaust Gas Temperature](image)

On the way from Merak to Bakauheni, it was found that the exhaust gas temperature was initially 360°C rising high to 440°C which from this could result in the engine not reaching maximum speed and irregular exhaust gases. After making repairs, on December 11, 2021, the exhaust gas temperature returned to normal.

1. O-ring

The main function of this O-ring is to prevent fuel leakage in the injector. Like other gaskets in general, the O-ring injector over time will become worn and damaged. If the O-ring
injector is damaged, then replacement must be done immediately to prevent gasoline leakage which will waste fuel consumption.

2. Spring

The needle pressure spring does not work properly. The pressure spring serves to adjust the density of the needle against the atomizer mouth. If the spring is weak due to reduced elasticity, then the needle density adjustment can not be perfect or less fitting so that the pressure of the atomized fuel becomes not maximum, this is due to wear and tear of the spring that works too long so that material fatigue occurs and therefore must be replaced with a new spring.

3. Nozzle (Atomizer Mouth)

Atomizer mouth serves to mengabutkan fuel into the combustion chamber. At the end of spraying the pressure is urged to decrease and the needle is pressed back on the plane of the cover. The opening and closing of the atomizer needle can be monitored with a probe needle. In this way of fogging the fuel pump is urgent, if spraying must be started and the pump stops if spraying must end.

The observation data of pressure Injector Main Engine (P) number 2 during running hours 1000 as follows:

<table>
<thead>
<tr>
<th>Injector Cylinder Main Engine</th>
<th>Running 0 Hours</th>
<th>Observation Results Running 1000 Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>200 Kg/cm²</td>
<td>170 Kg/cm²</td>
</tr>
<tr>
<td>2</td>
<td>200 Kg/cm²</td>
<td>140 Kg/cm²</td>
</tr>
<tr>
<td>3</td>
<td>200 Kg/cm²</td>
<td>170 Kg/cm²</td>
</tr>
<tr>
<td>4</td>
<td>200 Kg/cm²</td>
<td>170 Kg/cm²</td>
</tr>
<tr>
<td>5</td>
<td>200 Kg/cm²</td>
<td>180 Kg/cm²</td>
</tr>
<tr>
<td>6</td>
<td>200 Kg/cm²</td>
<td>180 Kg/cm²</td>
</tr>
</tbody>
</table>

The biggest suspected cause of injector nozzle damage is a dirty environment and the presence of foreign materials. This is because the spray tip nozzle is in the combustion chamber which makes the spray tip become crusty, and the possibility of foreign material entering the nozzle channel which can clog the flow of fuel that will enter the combustion chamber. Given the importance of the role of the injector nozzle for the ignition system on the main engine, it is necessary to perform maintenance on the injector nozzle.

4. Closing

a. Conclusion

1) Based on the results of the study it can be concluded that the cause of the imperfection of the injector ignition process on the main engine on board the KMP. Trimas Laila is not normal injector nozzle, it can also make the performance of the injector less than the maximum less than optimal, too much sediment produced from the fuel filter. So over time the pipe for the path into the fuel pump will be less than optimal, clogging of the filter on the fuel pump caused by too much garbage and sludge that stops at the fuel
pump filter, less optimal plunger in the injector because the fuel supply from the pipe is less.

2) How to overcome the cause of imperfect injector ignition process of the parent engine. Check all components of the injector. Check the pipes of the fuel flow path, both the path to the fuel pump and from the Daily tank.

b. Suggestion

1) From the above analysis, the fuel flow from the service tank needs to be added to the filter so that the fuel is not dirty and the need for a pump from the service tank to the separator to maximize fuel flow so as not to rely on gravity alone. So, it must still be considered and read any warnings and other rules related to the machine and do not forget to always coordinate with The Machinist or crew of the guard service.

2) Injector nozzle must be cleaned of scale found on the tip of the injector nozzle if the damage is severe or the nozzle can no longer ignite the fuel must be replaced with a new one. If it can still be used simply by cleaning the injector nozzle from scale. Given the importance of the role of the nozzle injector for the ignition system on the main engine, it is necessary to perform maintenance on the nozzle injector.

5. References