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Analysis of Viscosity of Lubricating Oil on Generator Machine Working Hours at KP. Macan Tutul 4203

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ABSTRACT

Lubricating oil is a liquid used as a lubricant in a machine to reduce wear due to friction, and as a coolant and silencer, but high temperatures on the engine will damage the lubricant. When the lubricant power is reduced, the friction will increase and then the heat will arise more and more so that the temperature continues to increase. Engine oil should have high viscosity or viscosity, not inflammable not easy to oxidize and not frothy due to high rotation that occurs inside the machine. other than that lubricating oil serves to protect the inside of an engine parts from rust or corrosion caused by liquids in lubricants and acid properties which are the result of high temperature combustion in the machine. The purpose of this research is to know the viscosity and content contained in lubricant oil of Meditran sx plus SAE 15W-40 in hours of use 50,100,150 and 200 hours of machine work with laboratory test method. The results obtained in the laboratory test viscosity of new lubricant oil is 14.55 cSt to the use of lubricating oil 50 hours of machine work, then the use of lubricating oil 100 hours working machine, there has been a decrease in viscosity from 13.15 cSt to 12.85 cSt and on usage lubricating oil 150 working hours fixed viscosity of 12.85 cSt then on the use of lubricating oil 200 hours of work decreased viscosity to 12.62 cSt.

INTRODUCTION

Supervision of marine and fishery resources is very important, to ensure sustainable and sustainable management of marine and fisheries resources, for this reason, the Directorate General of PSDKP fielded a fleet of supervisory vessels to combat illegal fishing and destructive fishing. So the maintenance and maintenance of the machinery on the ship is needed to support the economic value and lifetime of the vessel, one of the treatments for the vessel is about lubricants [1].

Lubricants are chemicals, which are generally liquids, which are given between two moving objects to reduce friction. The lubricant functions as a protective layer (phylum) that separates two related surfaces [2]. Lubricating oil is one of the four phases of an object whose volume remains under conditions of constant temperature and pressure. Four phases of matter are liquid, solid, gas, and density, liquids including a class of fluids called liquids. In the law of viscosity flow, Newton states the relationship between the mechanical forces of a viscosity fluid flow constant in relation to friction. Oil has different viscosity, the viscosity of lubricants is classified specifically by the International Organization for Standardization (ISO).

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An important factor in lubrication, namely: the temperature of lubricating oil, because the temperature of the lubricating oil that is too high will result in a lack of efficiency from lubrication. The normal lubrication temperature is 45 ° C-80 ° C and the temperature is not normal 82 ° C-100 ° C [3]. Rising oil temperatures can be caused by several things, such as the lack of heat absorption in the lubricating oil cooler and this can be caused by several factors such as the blockage of the capillary pipes on the lubricating oil cooler and can also be caused by the volume of cooling media entering lubricating the oil cooler is not comparable to the lubricating oil that is cooled. In addition to temperature, cooling media that is too high can also cause an increase in oil temperature. Other factors that can cause an increase in the temperature of lubricating oil such as the occurrence of combustion leaks that enter the crank case, and the use of lubricating oil that has exceeded working hours or oil that is not suitable for use will experience a rapid rise in temperature if continuously used.

In engineering design one of the important things is to what extent the machine will survive the repeated use in a certain period of time or in other words to what extent the machine made will last long. Of course there are many factors that influence it, especially in intersecting components, for example, ball bearing, friction of the cam shaft against the valve in the combustion motor, piston friction against the cylinder wall in the combustion engine, micro-sized machines that are in contact with each other and others so. One of the factors that influence is the presence of friction with each other that occurs when the components in the machinery are in contact with each other, giving rise to the erosion of the component surface. Scrape or in other words we call wear and tear. This wear is one of the main factors in the age of the components in machinery. Wear will still occur in the machines that are in contact with each other, and we cannot eliminate the wear factor.

So for that the viscosity of lubricating oil is very important to maintain the performance of the engine that rubs against each other, so as to create more efficient lubrication and engine components that move or rub against more minimal wear and damage, and the engine can operate more long and in the long run it can be operated continuously [4-5].

Viscosity

Viscosity is the most important characteristic of a lubricating material because this characteristic generally shows the ability to lubricate something. Or in other words that viscosity is the ability of a lubricating material to resist the shear stress that occurs when moving. The viscosity of lubricating oil changes according to changes in temperature [6-8].

Relationship between Viscosity Against Temperature

At low temperatures the molecules in the liquid are very tight with each other in other words free volume is limited. At high temperatures free volume increases, the thickness of the fluid drops and the size, shape of molecules and so on are not so important. In lubricating oils, the sizes of their molecules will increase while increasing the boiling point, freezing point, mass density and thickness while decreasing volatility.

Table 1. Multiple Fluid Viscosity against Room Temperature

Fluid	Dynamic thickness In cP	Kinematic viscosity In cSt
Air	0,018	15
Fuel	0,5	0,7
Water	1	1
Olive oil	84	93
Glycerol	1500	1250
Lubricant	8-1400	10-1500

Decreasing Work and Machine Quality

Oil has a function to help optimize engine work. If it is not routinely replaced, the quality of engine oil will decrease, viscosity decreases and also blackens. Thus, the function of oil as a lubricant to help the engine work properly will also decrease. The impact is that friction in engine components will also increase

and can reduce work and engine quality. A decrease in engine performance can also be caused by several factors that affect viscosity, namely temperature, solution concentration, dissolved molecular weight, and pressure. So viscosity is inversely proportional to temperature. If the temperature rises, the viscosity will decrease, and vice versa. All lubricating oils if high temperatures are heated will become more watery and at low temperatures will become thick. Measurement of viscosity of lubricant oil by SAE standard. The concentration of the solution is viscosity proportional to the concentration of the solution. A solution with a high concentration will have a higher viscosity too, because the concentration of the solution states the number of particles of the substance dissolved in each unit of volume. The more particles are dissolved, the higher the friction between particles and the higher the viscosity. Soluble molecular weight is that viscosity is directly proportional to the weight of the dissolved molecule [9].

EXPERIMENTAL METHOD

Research methods are performed as in Fig. 1.

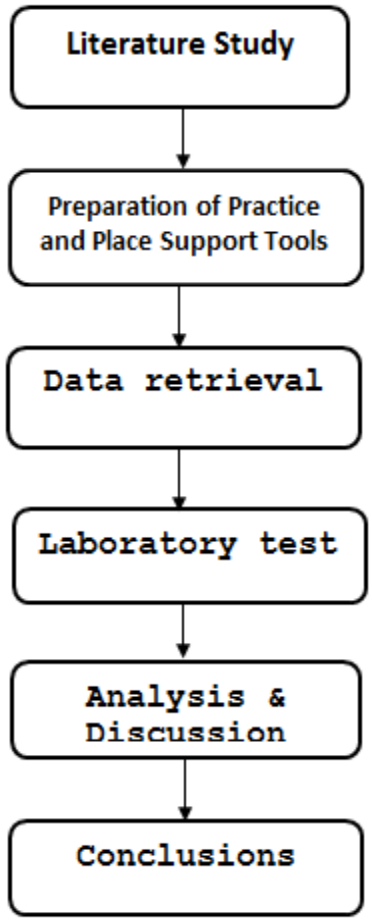

Fig. 1. Flow chart this research

RESULTS AND DISCUSSION

Generator Specifications Data

KP. Hiu Macan 4203 has two main generators in the engine room which have the following generator drive engines.

The engine driving the generator I

The engine driving the generator II

Lubricant Specifications at KP. Hiu Macan 4203

Meditran SX plus is a diesel engine oil SAE 15W-40 produced by Pertamina which has been standardized for marine diesel use because it has specifications and characteristics that are very possible for the use of diesel motors.

Analysis of Lubricating Oil Based on Engine Working Hours

Lubricating oil will change its structure and texture according to usage hours, therefore the use of lubricating oil is highly recommended according to the operational standards that have been determined, the following are the results of laboratory tests for lubricating oil according to the hours of use:

Fig 2. Use of lubricating oil 50,100,150 and 200 hours of engine work

From the laboratory oil test with a period of usage of 50, 100,150 and 200 hours above, the viscosity and Total Base Number (TBN) can be analyzed.

Viscosity

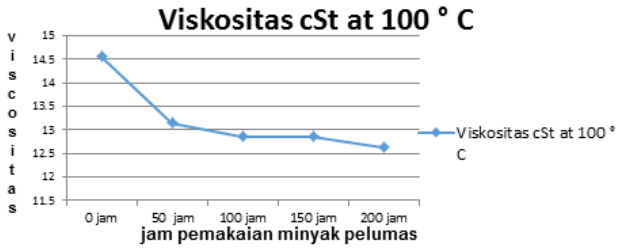

Fig 3. Graph of viscosity in Meditran SX plus 15W-40 at a temperature of 100 ° C

From the graph above it can be seen that there is a decrease in the viscosity of the new lubricating oil which is 14.55 cSt to use lubricating oil 50 hours of engine work, then the use of lubricating oil 100 hours of engine work, there has been a decrease in viscosity from 13.15 cSt to 12.85 cSt and the use of lubricating oil 150 hours of fixed viscosity ie 12.85 cSt then on the use of 200 hours of lubricating oil there was a decrease in viscosity to 12.62 cSt from the graph above the viscosity of lubricating oil had not reached the minimum limit of 12.5 cSt the decrease in viscosity occurred due to clock usage and temperature factors.

TBN (Total Base Number)

Total Base Number (TBN) is a measure of the amount of base (alkali) that neutralizes the acid level in lubrication on the engine. That is as neutralizing acid levels in lubricating oil, so if the Total Base Number (TBN) decreases, the acid level will rise and acid levels will cause corrosion of metal component parts. Graph of decreasing total lubricant base number, which is:

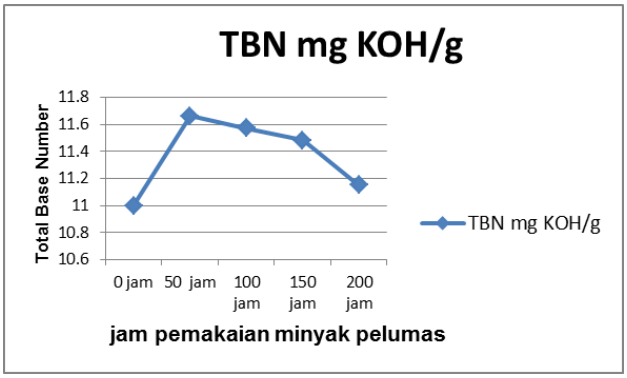

Fig. 4. Graph of Total Base Number on Medittran sx plus 15W-40

From the graph above, it can be seen that there was an increase in TBN from new lubricating oil 11 mg KOH / g to 50 hours of use to 11.66 mg KOH / g and the use of 100 hours lubricating oil decreased TBN to 11.57 mg KOH / g then at 150 hours of TBN usage time has decreased to 11.48 mg KOH / g and so is the 200 hour usage time the TBN value has decreased which is to 11.15 mg KOH / g, from the graph above it provides information about the increase and decrease in TBN (Total Base Number).
test results of TBN (Total Base Number) decreased in the use of 150 hours of work while the viscosity remained at 150 working hours.

The impact of the total base number decreases is that the acid level becomes higher and it is likely that corrosion will occur to metal components because the function of TBN is to neutralize the acid level in lubricating oil, therefore if the TBN decreases the acid level will rise, and the acid level will cause corrosion of metal component parts

CONCLUSION

From laboratory test data the viscosity in usage of 50 hours is 13.15 cSt, 100 working hours is 12.85 cSt, 150 hours is 12.85 cSt and 200 working hours are 12.62 cSt and the laboratory

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