Indonesian Journal Of Maritime Review (IJMR)
Vol. 1, No. 1, August 2023, pp. 21~27
ISSN: XXXX-XXXX, DOI: https://journal.siddiqinstitute.org/IJMR.v99i1.1❒

DISTURBANCE WITH TURBOCHARGER IN INDUCTION MOTORS

Jainuddin Jainuddin, Andi Ernie Zaenab Musa
[1,2]Politeknik Maritim AMI Makassar

Article Info

Article history:

Received sept 14, 2023
Revised sept 18, 2023
Accepted sept 27, 2023

Keywords:

Turbocharger,
Motors,
Ship Safety

ABSTRACT

Maintenance that involves attention, supervision, maintenance, repair and human power factors as the implementing operator in creating conditions ready for operation of a ship's main propulsion engine whose principles require good handling and maintenance is expected to support shipping operations that have been planned by shipping companies The purpose of this study is to study, solve the formulation of problems regarding turbo chargers on MT. CALAGUAS. This Scientific Writing research method is supported by some accurate data, facts, and information relevant to its title. The research methods that the writing uses are field research, observation, interviews, and library research. The results showed that Surging occurs because the air pressure in the rinse chamber is greater than the air pressure in the blower where this air pressure difference causes a backwave coming from the rinse chamber to the blower at that time. This backwave clashed on the side of the blower, which was marked by a sound like crying. Such conditions will last until there is an air pressure equation in the rinse air.

Corresponding Author: Jainuddin

Politeknik Maritim AMI Makassar
Email: jainuddintabbo1@gmail.com

1. INTRODUCTION

The diesel engine as the main propulsion of the ship has several supporting aircraft, each of which has its own task or function in supporting the unity of work of a main propulsion engine on board, one of which is the turbo chager (Cindy Diana Putri & Is Fadhilla, 2023). From the supporting aircraft in question, especially in 4-stroke diesel engines, medium rotation and high rev turbo press filling (TURBO CHARGER) is needed to get rinse and cool air during the flushing step and get enough air during the combustion process in the main drive engine cylinder. To achieve high ship operational value in the longest possible period of time, we are required to be able to maintain and repair turbo charge on board (Riocevin Herda Cahyono, 2023).

Turbo charger is an additional component to increase engine power without increasing the cylinder volume (cc) of the engine. Turbo utilizes the rotational energy generated by exhaust gases to supply more air into the cylinder (Klara et al., 2022).

In general, the air intake system into the cylinder is divided into 2 types, namely the natural air intake system (self-sucking) and the forced air intake system (Rachman et al., 2023). As for the advantages of many places, and do not require a lot of supporting equipment, such as rinse pumps, blowers, etc (Madyantoro et al., 2022).

The master has absolute power on board the ship over the operation of the ship at sea and in port, under the Act over all persons on board (Subekti et al., 2022). The master also has full responsibility and authority as a whole in the implementation, implementation of the ship safety management system (ISM Code), ship safety, personnel on board and for pollution prevention according to the standards required by the company and the international code of safety management for safe ship operation, seaworthiness, efficiency and economical operation of the vessel, implementing corporate policies in the field of safety and environment, motivation of crew to always pay attention to and comply with safety management provisions according to procedures in a clear and easy to understand, check and ensure that the requirements specified in the safety management system are considered and implemented and report deficiencies to the DPA and follow company procedures with duties in the event of pollution or structural damage to third parties or ship structures (Wibowo & Astriawati, 2021).

Maintenance that involves attention, supervision, maintenance, repair and human power factors as the implementing operator in creating conditions ready for operation of a ship's main propulsion machine whose principles require good handling and maintenance is expected to support shipping operations that have been planned by the shipping company PT. MULTI JAYA SAMUDERA.

PT. MULTI JAYA SAMUDERA was established in 1990, as a company engaged in oil chemical in Indonesia. To increase the growth and development of Indonesia positively from year to year, both in terms of acceptance and quality of service, the company decided to buy a Chinese-made ship with steel construction built in 1978 with a length of 104.2 m, Breadth 14.6 m, Deadweight 5615 tons, Gross Tonnage 3226 tons type tanker type A-class (Major). This tanker which plays an important role in the progress of the company from PT. MULTI JAYA SAMUDERA. This ship carries class A crude oil. This tanker is very instrumental in the world of oil development from PT. MULTI JAYA SAMUDERA this ship has routes Dumai, Belawan, Kijang, Pontianak, Kabil, Padang, Plaju to carry oil. as a need for industry and society in general.

2. METHOD

The place and time of research for this Scientific Writing is when the author conducts marine practice (prala) at MT. CALAGUAS. Due to the breadth of existing problems and the limitations of the author's knowledge and experience, the author limits the problem only to the maintenance of turbo chargers for this problem to provide direction for the author not to deviate from the main problems raised, as well as the ineffectiveness of making this scientific paper.

3. RESULTS AND DISCUSSION

Factors That Cause Surging

The existence of surging on turbocharge can have a major effect on the production of blower air so that the amount of pure air entering the combustion chamber is reduced. This condition also results in the combustion process in the main engine cylinder is not perfect and the engine output power is not optimal.

Surging is a jolt or jolt in the turbocharge characterized by a crying or screaming sound. Often surging results in damage to the turbocharger. Examples of such damage are bending or breaking the diffuser and damage to the ball-bearing blower. There are several circumstances that allow surging to occur. Due to problems when fogging the ingredients baker and the main machine operates only about 40 to 50 percent of the maximum load.

Conditions cause surging and turbochargers. One symptom is noise inside the blower that occurs repeatedly up to several times. To solve this problem, the main engine speed should be reduced until surging stops and ignition and combustion occur again in each cylinder.

Conditions like the above often occur when the ship is doing motion where the speed of the main engine when it changes so that it affects the speed of rotation of turbocharge. Changes in speed above normal frequency often lead to short life of ball bearing blowers or damage such as the destruction of ball bearings. In such conditions, good lubrication plays an important role. The obvious result can be seen from the faltering turbocharge rotation in other words, the rotation is unstable.

When air leaves the blower at high speed and pressurized, suddenly for some reason the amount of airflow and speed decreases until it reaches a pressure below delivery pressure. Then at the time the airflow will stop and followed by a return wave of air to the blower. This backwave will continue until the airflow returns to normal. Events like the above will be a reason why surging occurs. This condition often occurs when the ship is sailing in a bad weather area with waves that are above normal height. The load received by the mother engine fluctuates erratically because the propeller is sometimes above the surface of the water for a while and then sinks again. This load change has an impact on the rotation speed of the main engine and the rotation speed of the turbocharge. In case of surging for only a few moments. But at high rotation speeds, extending the surging is equivalent to damaging the blower, especially on the diffuser.

In this section, the air undergoes development, resulting in a bent diffuser or even a break. If the diffuser is broken or bent, it means that the airflow speed cannot be increased, in other words, it cannot be converted into compressed air.

Reduced Amount Of Pure Air In The Combustion Chamber

The occurrence of air in the cylinder is absolutely needed for use during the combustion and rinsing process. In the rinsing process, air is needed to clean the free gas from combustion in the cylinder. While in the combustion process, air is full of combustion itself in addition to bakery materials and heat. In fact, on board, the provision of clean air often experiences problems when operating the main engine. These constraints are as follows

a. Dirty intercooler

The intercooler serves to cool the air coming out of the blower side before further use. If this cooling process is not optimal, it will cause an increase in the temperature of the rinse air. Then temperature results in a decrease in the amount of air or its density.

One of these conditions is caused by the dirty intercooler. Some indicators or symptoms are an increase in air temperature, rinse from the side of the blower to the intercooler. The intercooler is composed of small pipes in which flows the cooling medium, namely sea water. These small pipes are often clogged with dirt, causing the heat exchange process to not take place optimally.

There are two possible problems with the intercooler. First, that the cooling water thermometer is damaged and the second is the obstruction of the flow of seawater entering the intercooler. Damage that occurs in the thermometer can be in the form of fractures or mismatches of the scale with the height of the pointing fluid (mercury). It can be said that not all seawater can flow into parts of the intercooler pipe. The cause is the obstruction of the flow of sea water due to the large amount of mud that comes with the sea water. Some of the mud is left in the pipes and forms small lumps on the walls. The mud plume will reduce the cooling water flow capacity that should be received by

the intercooler. Such conditions often occur when ships enter shallow waters and rivers. In addition to mud, marine animals can also clog intercooler pipes. Marine animals include small fish, clams or oysters and a type of sea grass. If the dirt gets into the pipe, it will be difficult to clean it.

The rinse air that has been cooled by seawater will go directly to the cylinder as a booster for exhaust gases left over from combustion or rinsing and then come out through the exhaust gas valve and cylinder head. Air cooling with an intercooler is expected to reduce the thermic yield of the main engine. A dirty intercooler will inhibit the heat exchange process between seawater and air.

b. Air leakage in the combustion chamber

The existence of air leaks in the cylinders is caused, among others, by exhaust valves that are not closed tightly, improper installation of seats or also packing on the deck that is no longer feasible. Improper packing installation and lack of strong fastening bolts can also be the cause of air leakage. The selection of packing quality needs attention. The air leaves the blower with a large volume and pressurized, therefore it is expected that there will be no leakage on the deck.

c. *Dirty air inlet filter*

A dirty air filter greatly affects the amount of air pressed into the combustion chamber. This causes a lack of air for rinsing as well as combustion as well as an increase in exhaust gas temperature. This filter serves to filter the air from dirt where the dirt is

Therefore, periodic cleaning of the air filter is held so that the cleanliness and durability of the filter is maintained. The tool used to clean it should be chosen according to the type of dirt. Liquid chemicals that are often used in cleaning are green soap solution, a mixture of *trichorethylene, cylohexanon* and fresh water and *alkaline clear*.

The mixture of air with impurities very quickly occurs due to the high air pressure produced by the *blower.* The higher the rotation of the blower, the faster the process of dirt accumulation. If this situation is left unchecked, it will later cause complicated problems because it will interfere with the combustion process and the motor output power is not optimal. The turbocharger air filter is divided into two parts, namely wire gauze and thin cork for the vileodon filter. If the gauze wire is damaged, it will affect the air filtration process where the air entering the combustion chamber is not clean. In addition to dirt, tears from thin cork can enter the combustion chamber and burn when the combustion process occurs.

Some things that are recommended in choosing an air filter in terms of quality include the following:

1. Small air pressure on the air trajectory does not require volumetric efficiency of the engine.
2. High efficiency is the dust-holding capacity with a design that ensures that particles from the filter cannot be released and sucked into the cylinder.
3. Its easy cleaning.
4. Ability to operate continuously.
5. Small and compact.
6. The cost of surgery is not expensive.

On board, damage can occur anywhere and anytime. Therefore we should be alert to the consequences of this corruption. Based on the facts and data that have been found, it can be known that the damage and problems that occur are caused by the lack of planned and periodic maintenance of the turbocharger which can cause damage to the compressed air filling system for the main engine. This condition resulted in disruption of ship operations.

There are several things related to maintenance on the compressed air filling system, which are as follows:

Maintenance on turbochargers

The implementation of maintenance on the turbocharger is usually carried out when the ship is at port for loading and unloading so as not to interfere with the smooth operation of the ship. The maintenance carried out on the turbocharger is to keep the lubrication and cooling system in good condition, cleaning the turbine blades from adhering dirt. Impurities attached to the turbine temperature can interfere with the performance of the turbocharger and result in a decrease in air suction power by the blower, considering that the turbine and blower are located on one shaft. Based on how the turbocharger works, it is also necessary to take a regular meter and then record it in a daily journal so that changes that occur can be observed and researched.

The cleanliness of the turbocharger must also be maintained. There are several things that must be considered in connection with cleanliness, namely:

a. Avoid sucking contaminated air

In the engine room, dust, small and fine particles are usually found from clothes or vaporize oil. Sometimes these objects cause adverse effects for blowers and air filters. In this condition, if possible the sucking of air should come from water

Clean duct. In addition, the location of the air duct is tried to be as close as possible to the turbocharger. This is intended to increase the amount of air that the blower can suck in and get as clean air as possible as well as reduce the heat load received by the turbocharger.

b. Keep the combustion process in good condition.

The carbon attached to the back of the impeller blower likely comes from the turbine side of the backflow. To prevent this condition, it is very important to keep the combustion process always in good condition. This problem needs to be considered because it can result in changes in the turbocharger load so that the rotation is below normal.

c. Improve the workability of the air filter

To improve filtration ability, the filter should be made of polyurethane, which is a material that easily absorbs dust, other small particles, water spots and vaporized oil.

Care on the air filter

A dirty air filter cleaner is that there is a turbocharger air sucking part. Filter maintenance steps in the form of wire gauze are to soak in kerosene or a mixture of water with oil remover chemicals. This method can dissolve oily impurities attached to the filter wire. As for thin cork or viloedon filters can be cleaned by soaking in a mixture of alkaline cleaner chemical solutions with water.

Care on the blades of the air suction blower

Maintenance on the blades of the air suction blower is by cleaning the dirty side of the blower. This dirt can reduce the suction power of air that will enter the cylinder. Cleaning of the blades of the blower can use diesel oil and brushes. As for drying can use cloth.

Care on the intercooler

In order for the intercooler to get sufficient cooling from seawater, routine maintenance is carried out on the cooling installation, especially in the condition of the seawater cooling pump. If the pump runs well and the pressure is sufficient, this treatment is carried out is cleaning filters from dirt which can be in the form of mud or sea animals and

checking pipes that are clogged with dirt that makes heat transfer will be blocked, therefore pipes must be cleaned regularly.

Care on the exhaust valve

To perform maintenance of the exhaust valve, it should be based on existing instructions. The purpose of maintenance of the exhaust valve is to keep the exhaust valve from leaking because with a leak in the exhaust valve, it will affect the compression of the air in the cylinder. Leaking exhaust valves can be ground on the spindle and exhaust valve seating or replaced with another exhaust valve, which has been prepared beforehand.

Prevention of surging.

Surging is one of the abnormalities in turbocharger operation. If surging only occurs for a moment, it may be limited to the sound of crying or shouting. But at high speeds, surging that occurs long enough and continuously will cause serious damage to the turbocharger, especially the blower. Therefore, conditions like this must be prevented from serious damage that can affect the operation of the turbocharger. Surging occurs due to excessive pressure in the combustion chamber which then causes a wave of return air. In other words, to prevent it is to reduce or discard.

4. CONCLUSION

Based on the discussion that has been stated in previous chapters, in this chapter will be put forward some conclusions that can be drawn regarding the factors that cause surging and lack of pure air into the combustion chamber that often occurs in ships. From the discussion above, it can be concluded that urging occurs because the air pressure in the rinse chamber is greater than the air pressure in the blower where this air pressure difference causes a backwave coming from the rinse chamber to the blower at that time. This backwave clashed on the side of the blower, which was marked by a sound like crying. Such conditions will last until there is an air pressure equation in rinse air. Furthermore, there are several factors that result in a lack of air in the combustion chamber, one of which is a dirty intercooler. Because the air coming out of the blower will be cooled in the intercooler. This aims to increase the density of air and reduce the temperature of rinse air

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