DOI: https://doi.org/10.31933/dijdbm.v3i6
Received: 3 October 2022, **Revised:** 26 October 2022, **Publish:** 14 November 2022

DINASTI PUBLISHER
DIJDBM
DINASTI INTERNATIONAL JOURNAL OF DIGITAL BUSINESS MANAGEMENT
https://dinastipub.org/DIJDBM
editor@dinastipub.org
0811 7401 455

THE EFFECT OF FLUSHING AND SURGING AIR TREATMENT ON THE TURBOCHARGER ON HIGH EXHAUST GAS TEMPERATURE ON MV SHIP. BEAUTIFUL FOOD

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Abstract: In supporting the process of monitoring high exhaust gas temperatures on the MV ship. Beautiful Food, still There were several problems with the company and crew related to the treatment of rinse air and high exhaust gas temperatures. The problem is the high level of non-optimal treatment of rinse air and frequent occurrence of surging on the turbocharger on board. Based on these problems, the authors conducted an analysis to determine whether there was an effect of rinse and surging air treatment on the turbocharger on the high exhaust gas temperature. The type of research used is quantitative method. Data was collected by using questionnaires distributed directly to 30 respondents, namely the third machinist who was taking ATT II class at the Jakarta Shipping Science College with a total of 20 statements. In looking for the results of the calculations the author uses the SPSS 25 program and performs several data analyzes, namely: multiple linear regression analysis, correlation test, validity test, determination test, f-test and t-test. Conclusions in this study were carried out by comparing the data obtained from the answers of existing respondents. Based on the acquisition of questionnaire data and data processing. The results showed that the rinse and surging air treatments on the turbocharger together proved to be positive and significant for the high exhaust gas temperature on the MV ship. Beautiful Food with F .value count > F table or 66.633 > 3.3. The author describes several solutions to improve monitoring activities for high temperatures exhaust gases, namely: the company and MV crew. Boga Indah must optimize air treatment rinse well, optimize cooling air temperature in performing rinse air maintenance, improve the cleanliness of the rinse air filter to obtain maximum rinse air quality, provide training to ship crews on proper and proper turbocharger operation can reduce the risk of surging, and the most important thing is to monitor the occurrence of surging on the turbocharger with a good strategy so that there are no obstacles and have a positive influence on the high exhaust gas temperature on the MV ship. Beautiful Food.

Keyword: Rinse Air Treatment, Turbocharger Surging, High Exhaust Gas Temperature

INTRODUCTION

In today's very competitive era globalization, the world of shipping in demanded is be more advanced and qualified in providing its services to users of sea transportation services as a means of sea transportation. The ship is a transportation which its the main choice for

service users as a means of business in a large capacity compared to other means of transportation. This will be achieved if the condition of the prime mover and auxiliary machinery is ready service, with the support of sophisticated system and equipment as well as reliable machinists and ready to operate according to the planned schedule and can reduce unexpected repair costs. The role of sea transportation in the economic development of a country is very large. Sea transportation as a means export import a country is a driver if trade activities. Therefore, the development od the shipping world must be improved in accordance with developments.

MV. BOGA INDAH is a bulk carrier ship owned by PT.Indomaritime operating in waters Ocean Go. Therefore, to maintain the smoots operation of the ship, engine permance must be maintained. Generator onboard MV. BOGA INDAH uses a diesel motor because it is more affective, safe and has a large thrust. This diesel motor works by utilizing the pressure of the the combustion explosion in the cylinder chamber, where the combustion explosion is the result of the accumulation of pure air supplied by the engine turbo charger to the cylinder chamber. So that the working conditions of the generator are always good, regular and planned maintenance is needed on all parts of the generator, especially on the generator part turbocharger.

Turbocharger is an aircraft capable of producing compressed air of more than 1 ATM which is needed for the process of burning fuel in the cylinder and in the diesel auxiliary engine round turbocharger driven by exhaust gas pressure from inside the cylinder before exiting to the chimney. Therefore round turbocharger need to be maintained for performance turbocharger remain optimal continuously. One of them that must be maintained is the maintenance of its components especially on turbine rotor always maintained so that the rotation remains optimal and the gas pressure does not decrease and maintenance on rinse air filter must also be done so that the supply of rinse air is sufficient in the combustion chamber.

On the generator installed turbocharger which is a tool that serves to enter as much air into the cylinder with a pressure of more than 1 atmosphere. Where the intent and purpose is that in the process of fuel combustion in the cylinder there is sufficient oxygen available so that a complete combustion will occur and have an impact or result in the power generated by a motor being greater than without using turbocharger. Where is part of turbocharger itself consists of 2 core parts, namely: the compressor which functions to suck outside air to supply clean air used in the combustion process in the cylinder. The other part is the turbine which is connected to the exhaust gas from the generator through the manifold then exits through the chimney. Therefore turbocharger has an important role for the smooth flue gas. Surging also causes incomplete combustion, which will result in high exhaust gas temperatures. height temperature exhaust gases caused by incomplete combustion in the combustion chamber create residual exhaust gases that stick to the turbine blade side, And the crust that sticks to rotor turbine blade.

This also makes the rotation unstable on the turbine rotor and cause friction in the house turbocharger. the weight of the inhaled air will increase. On the other hand, if the air pressure is lower and temperature higher, the weight of the inhaled air will decrease. Maintenance of the rinse air chamber is not carried out according to the turbocharger manual. no maintenance cleaning on the rinse air chamber according to the manual turbocharger and lack of availability of spare parts on turbocharger. Resulting in incomplete combustion so that there will be problems in the turbocharger and can reduce the power generated by the generator. Checks and changes are not routinely performed on the filter turbocharger. a turbocharger air filter is the part that is no less important when compared to the parts turbocharger other. Air Filter It consists of two parts, namely filter inside and filter the outside part. Filter the inside is made of copper fibbers arranged in a housing filter which consists of 4 parts, while vile don filter the outside is made of thin foam spoon that wraps

filter the inside part.

LITERATURE REVIEW

Rinde Air Treatment

According to P. Van Maanen, 1983. The provision of rinse air in the engine comes from the turbocharger which produces compressed air from the blower into the combustion chamber. Therefore, rinse air treatment is important for the crew to know. Rinse air treatment is an effort to maintain and maintainair in the process of rinsing or cleaning residual air combustion in the combustion cylinder. A turbocharger was also installed in an attempt to reduce the substantial exhaust losses of exhaust gases passing through the exhaust duct. In this case, the exhaust gas is used to drive the turbine to drive the compressor. The compressor pumps air into the cylinder thereby increasing the pressure and the amount of air entering the cylinder.

Motor exhaust gas flows directly to the turbine. The blower side of the turbo generates air and is cooled in a cooler (cooled with fresh water) and passed to an air rinse line. The coolant is very important because the desired air density is as high as possible so as to produce the largest cylinder filling and can also reduce the thermal yield of the motor. From an air duct, rinse with air supplied to the various cylinders.

Only at low load of the motor is when the rotational frequency of the turbine decreases rapidly. The rinse air pressure becomes too low to fill the cylinder. Then the compression energy is added through an electrically driven ventilator. At a high enough load, the ventilator motor can be stopped. This is possible on motors with longitudinal flushing because premature opening of the exhaust valve part of the expansion energy in the combustion gases is transferred from the working cylinder to the exhaust gas turbine. In the early opening of the exhaust period it cannot be held properly in the longitudinal flush, because the exhaust door must be made higher which results in slow closing of the door. This is undesirable due to cylinder fouling.

At the start of the motor (with the help of compressed air) combustion air is directly supplied. Because the turbine works with starting air flowing out of the cylinder. Press filling in a 2-stroke motor is an example of what is called a series-pressure system. On the exhaust side the motor works on the basis of the flat pressure system that has been discussed. The blower side produces air which is routed through a cooler to a collection duct. With the help of several suction pumps the air is sucked from the duct and further compressed. Saving air in the engine is used as an air source to be compressed when burning the main engine cylinder, The rinse air also functions to rinse the rest of the combustion from the cylinder to the exhaust manifold to clean the remaining combustion gases in the combustion chamber. The pressurized rinse air is generated from the rotation of the blower on the turbocharger when the engine is operating and assisted by an auxiliary blower when carrying out the manoeuvre or when the engine speed is less than 80 rpm.

The turbocharger in producing compressed air must be above 1 atm pressure and cold. When the air is cold, the air becomes denser and heavier, so the oxygen molecules (O2) increase. These many oxygen molecules will cause complete combustion, it affects the productivity of the air inhaled by the turbocharger, because the air from outside is not necessarily 100% clean, some small particles of dust and others fly. These particles do not have to supply blower, but the exhaust valve leak or exhaust gas manifold leak environment, especially on the filter turbochargers. The smoke that is in environment turbocharger will be sucked by turbocharger and will sticking in filter turbocharger.

One way to do rinse treatment is to air make changes filter rinse air. The suction filter on the turbocharger compressor must be replaced periodically in order to obtain maximum rinse air results. The filter serves to filter rout particles or molecules in the air that is sucked

in by the compressor, ofteb the air sent to the intercooler has filtered out impurities. If left for a long time, it will have an impact on the intercooler and poor air quality. From the intercooler component side, it the air is dirty is allowed to settle on the fine dust filter particles will into the suction by the blower side and sousing the particles the settles in the intercooler, causing which will the air side of the intercooler dirty and inhibits the cooling process of the rinse air.

Therefore, it is important to maintain air quality in order to smooth the work process of the rinse air system components and make the main engine work more efficiently. The rinse air that has passed through the intercooler will be sent to the scavenging air trunk. Cleanliness of Scavenging air trunk also affects the treatment of rinse air. Therefore, the cleanliness of the rinse air storage room must be considered periodically. This will make the rinse air sent to the combustion chamber have the right composition and no longer contain impurities in the rinse air. Another way to treat rinse air is to clean the compressor and turbine sides.

Cleanliness of the compressor and turbine is an important thing that must be considered because the compressor and turbine are continuous tools to get the rinse air. The compressor and turbine sides have running hours in order to know the right time to clean it up. Solution chemical which commonly used to clean the compressor side and turbine side.

Based on the description above, it can be synthesized that prinse air treatment is an effort to maintain and maintain air in the process of rinsing of cleaning the remaining combustion air in the combustion cylinder. The rinse air treatment has dimensions, namely: a) Factors affection rinse air treatment: Rinse air filter, Cleaning on compressor and turbine side, and air temperature cooling. b) How to treat rinse air: change of rinse air filter and rinse air filter check.

Surging

According to Dough Woodyard (7:126). Surging is an incident where turbocharger experience over running then stop for a moment, then spin normally again, not how long over running return. When will happen surge, the compressor will rotate at a speed above its normal speed (overruns), this happens because the compressor does not produce compressed air that is supplied to the engine, so it seems turbocharger rotates without load.

Surging occurs due to a high-frequency vibration of impellers (rotor) which rotates under certain conditions and the air compressor must deliver air at a certain pressure according to the turbine rotation and for some reason the air pressure in the flushing chamber (scavenging air trunks) equal to or higher than the air pressure produced by the compressor blower, there is a tendency for the air pressure to reverse direction against the rotating blower blades.

One of the causes of surge in turbocharger due to incompetence diffuser to generate sufficient pressure to push air into the combustion chamber. The cause of surge does not always come from the turbocharger given that the turbocharger and the engine are a pair of interconnected and have strong interdependencies. We will see from three points of view the causes of surge, engine, turbocharger, and operating environment. Surging can be caused by imperfect engine combustion quality.

Combustion in the engine occurs because the fuel is sprayed into the cylinder which contains very high air pressure and has a high temperature as a result of the compression process. If at the time of compression the air pressure required for combustion is less then the combustion that takes place in the cylinder becomes imperfect and interferes with the operation of the turbocharger. In the presence of incomplete combustion, it can causes the life of the turbocharger to be shorter because the temperature of the exhaust gas in the engine with incomplete combustion is relatively higher, incomplete combustion also causes the turbocharger to turn abnormally, because the pressure of the exhaust gas wave does not

expand evenly on the turbine side blades so that it can resulting in surge in the main engine turbocharger because the rotation of the turbocharger becomes unstable.

In addition, the air conditioning system plays an important role in this case the intercooler which regulates the temperature of the air entering the main engine. If it is too hot then the air sent by the compressor also has a high temperature, so its density is reduced. If this happens, the composition of the air to fuel ratio in one stroke will not be optimal and will result in incomplete combustion, and the exhaust gas produced will contain a lot of carbon accompanied by an exhaust gas temperature that is too high. If the exhaust gas produced does not match the specifications required by the turbocharger, the turbocharger rotation will become unstable.

According to (Raunekk, 2009) surging is a phenomenon that occurs when the air pressure after passing through compressor wheel higher compared to with pressure in the compressor. This cause a back pressure on the compressor wheel. In other words, if the air supplied by turbocharger does not have sufficient pressure, then the air pressure inside intercooler higher will push the air towards the compressor. That urge that causing turbocharger pause during operation and its as if jolted (Ditra ayi Kurniawan, 2010). After therefore, the compressor will return to rotating outside of normal rotation, so this causes excessive noise and vibration, because of the sound and vibration produced, many components of the turbocharger must be considered to minimize the occurrence of surges, namely: regular inspection of the turbocharger bearings and measurement of the mounts on the rotor. This is done so that the turbocharger can work optimally and the results of the turbocharger can produce complete combustion in the combustion chamber.

Phenomenon surge can be classified into 2 based on the main cause of occurrence. First is surge caused by operating errors by crew a ship, for example, when a ship is about to enter a port, initially the ship sails with power at a certain speed, suddenly the power is suddenly lowered with a very drastic difference in power drop. This can immediately cause loud noises and vibrations on theturbocharger. The second cause is the designer's error in the selection turbocharger for a engine where in fact this is very often the case in the field.

History of Turbochargers

Aircraft turbocharger This is a spectacular innovation idea discovered by Alfred Buchi,an engineer from Switzerland who managed to perfect Turbocharger The first discovery was in 1905. The creative idea was to utilize exhaust gas auxiliary machine to play a turbine and pushing pure air by using blower which relates to one axis with turbine so that pure air enters the combustion chamber which increases the auxiliary machine. Then BBC Boveri Company which is now ABB (Asean Brown Bowy) invite brown Becomes herself join with they and help develop the project. Until finally this company became a giant company that is skilled and experienced in construction turbine and compressor (ABB turbocharger).

Research development to improve it. Engineers in Switzerland set out to thinking and increase excellence with its turbocharger high level of efficiency better. Turbocharger used for increasing the density of air (the air produced by its density will increase so that combustion becomes complete which results in power machine increase). Thus, the amount of fuel that is inserted into the cylinder can be multiplied so that the power machine can be enlarged. With turbocharger it is approx. 8-10% of number of calories burning materials can burn saved. Therefor, installation turbocharger an assist moter diesel will increase power. Turbocharger increase usability diesel auxiliary engine to be able to increase the power generated up to 35-40% (ABB turbocharger).

Definition of Turbocharger

According to Sukoco and Zainal Arifin in his book entitled technology assist motor

(chapter 5 : 127-128) which explains about the charging system and turbocharger explained that turbocharger is a part of diesel auxiliary engine which serves to increase the amount of air that enters the cylinder by utilizing exhaust gas energy. And according to MAN Diesel Turbocharger on Manual Book explain that Turbocharger is Turbine which is driven by the Exhaust Gas and provides power to the compressor which is positioned on the same shaft as turbine. This allows more air into normal aspiration. Normal aspirations about air pressure 1 bar. Turbocharged "aspiration" 3.8 bar air pressure. Turbocharger is a device to change the air intake system naturally with a forced system. Previously, air intake relied on vacuum formed by movement piston on the suction stroke, then with turbocharger air is forced into the cylinder use blower played by turbine exhaust gas. Air intake system using turbocharger this is very beneficial for diesel auxiliary engine because it will increase the amount of rinse air volume so that increase the compression pressure and temperature which will shorten ignition delay so that all the fuel that is sprayed in the form of a mist by the injector will burn completely which will Couse complete combustion in the cylinder chamber, this will increase the powered diesel auxiliary motor.

The amount of oxygen in the cylinder during the combustion process will determine the combustion efficiency. The more the less the amount of fuel that is not burned because it does not get oxygen, so that combustion efficiency increases or the amount of heat produced by combustion will be more. The result is energy motorcycle Will increase. In addition, the increased amount of oxygen will increase the compression process temperature, this result will shorten the ignition delay and the combustion process will get better. Another result with the addition of the amount of oxygen is the increase in pressure at the end of the compression stroke, this will increase the peak pressure at the end of the combustion. Final pressure impact power higher combustion is energy motorcycle will increase.

Based on this rationale, it means that increasing the amount of air will increase the power diesel auxiliary motor. Therefore, developing technology diesel auxiliary motor with additional equipment, called with turbocharger. Turbochargers a device to increase the amount of air into the cylinder by utilizing exhaust gas energy. In subsequent developments, technology emerged turbocharger intercooler.

Turbocharger System

A system is a group of components and elements that are combined into one to achieve a specific goal. The system comes from the Latin (system) and Greek (sustma) is a unit which consists of components or elements that linked together to facilitate the flow of information, material or energy to achieve a goal. The turbocharger also has a system in its working process, a turbocharger basically an air pump. The hot exhaust gases that leave the engine after combustion are directed directly to the wheels turbine beside turbocharger to make turbine in rotates up to speed RPM. Turbine compressor also spins fast. With round compressor it encourages the flow of air and compresses the air before it is pumped into the chamber engine combustion.

Multiple system turbo which add cooler (intercooler) among compressor and cylinders, because the compressed air and rotates so fast it can reach extreme high temperatures. The baseci principle behind the use turbocharger quite simple, but a turbocharger is a very complex machine component. Not only components.

Advantages of Using a Turbocharger

The following are some of the advantages of the rinse air filling system perfomed by turbocharger is a follows:

1) Egine power can be increased up to 35-40%
2) Combustion is more complete.

3) Small compression ratio
4) The amount of air entering the cylinder is more.
5) How to reduce surge on turbocharger: regular inspection of turbocharger bearings; periodic measurement of the mounts on the motor.
6) Cleaning regularly dirt build up on compressor.

High Exhaust Gas Temperature

Exhaust gas temperature is the residual temperature of the fuel combustion in the internal combustion engine, which is released through the engine exhaust system. The combustion process occurs in the combustion engine itself so that the combustion gas that occurs simultaneously functions as a working fluid. In a diesel motor there is a piston that uses several cylinders in which the piston can work back and forth (translation). In the cylinder there is combustion between fuel and air produced from the gas turbocharger.

The gas produced by the combustion process is able to move the piston which is connected to the crankshaft by the drive rod. The concept of combustion in a diesel motor is through the process of ignition of compressed air at high pressure. This combustion can occur because the air is compressed in a room with the compression ratio is much greater than that of a gasoline engine (7-12), which is between (14-22) as a result, the air will have a pressure and temperature that exceeds the ignition temperature and pressure of the fuel The rest of the combustion produces a gas called exhaust gas and will exit through the gas manifold then passed to the turbine and brought to the economizer which eventually exits through the chimney. This exhaust gas pressure is used as the main driving source of the turbine to turn the blades.

Spoon on turbine as distributor exhaust gas result of burning should also pay attention to cleanliness. The result of incomplete combustion often leaves residual carbon from combustion. The remaining carbon from the combustion is also wasted with exhaust gases that pass through the turbine. Therefore, if incomplete combustion will cause the turbine blades to be filled with carbon attached to the surroundings.

Framework

In order to explaining the discussion of this research, the author makes a frame of mind on the things that are the main discussion, namely “rinsing air treatment and surging on a turbocharger”.

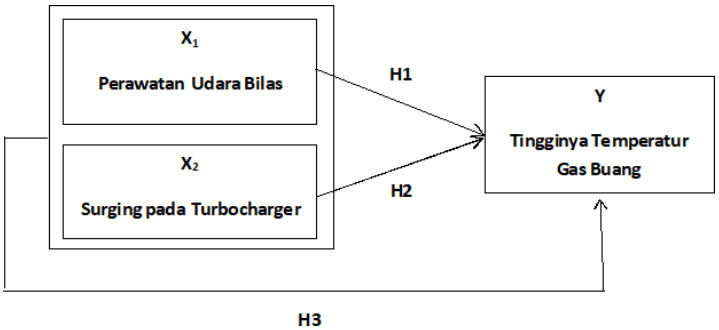

Figure 1. Line of Thought

Hypothesis

Ho1 : There is no affect between the rinse air treatment on the height exhaust gas temperature
Ho1 : There is an effect between the treatment of rinse air on the high temperature of the flue gas
Ho2 : There is no effect between surging on the turbocharger to the high exhaust gas temperature

Ho2 : There is an effect between surging on the turbocharger to the height exhaust gas temperature
Ho3 : there is no effect of rinse and surging air treatment on the turbocharger on the high exhaust gas temperature
Ho3 : there is an effect of rinse and surging air treatment on the turbocharger on the high exhaust gas temperature

RESEARCH METHOD

In this research, this writing uses the data approach method quantitative. Data is information used in research, in order to provide on overview of the object being studied researched, so that the problem under study can be discussed. In this study the data obtained and analysed in the form of primary data and secondary data is recording information directly from various sources about the object under study on problems that occur in the auxiliary engine turbocharger on the MV ship. Secondary data is obtained through manual books that discuss turbochargers or through literature related to the object under study. To see the reliability of each instrument used, the authors use the Cronbach alpha coefficient (α) using the SPSS 24 program (Statistical Program Science and Social).

RESULT AND DISCUSSION

Rinse Air Treatment (X1)

Table 1. Treatment Variable Reliability Test Result Rinse Air (X1)

Cronbach's Alpha	N of Items
. 816	5

Based on table 4.38 above, it can be concluded that the Cronbach Alpha value is 0.816 > 0.60, so the questionnaire is declared reliable.

Surging On Turbocharger (X2)

Table 2. Surging Variable Reliability Test Result on Turbocharger (X2)

Reliability Statistics	
sAlpha	N of Items
. 803	8

Based on table 4.39 above, it can be concluded that the Cronbach Alpha value is 0.803 > 0.60, so the questionnaire is declared reliable.

High Exhaust Gas Temperature (Y)

Table 3. Variable Reliability Test Result High Exhaust Gas Temperature (Y)

Reliability Statistics

Cronbach's Alpha	N of Items
. 754	7

Based on table 4.40 above, it can be concluded that the value of Cronbach Alpha of 0.754 > 0.60 then the questionnaire is declared reliable.

Regression of X1 Against Y (simple)

Based on the results of the calculations carried out, it is obtained that a is 6.219 and b is 1.133 in the form of a simple linear regression equation as follows: = 6.219 + 1.133 X1 From the regression equation, it can be seen that the effect of rinse air treatment on the high exhaust gas temperature is unidirectional (positive), it is shown in the regression coefficient or the value of b in the regression equation which shows the number. positive of 1.133 which means that every 1 unit increase in rinse air treatment will be followed by an increase in the high exhaust gas temperature of 1.133 units. Vice versa, if the rinse air treatment decreased by 1 unit, the high exhaust gas temperature would tend to decrease by 1.133 units. And the value of the coefficient a (intercept) is 6.219 which means that if there is no rinse air treatment (X1=0), it is estimated that the high exhaust gas temperature is 6,219 units.

Regression of X2 Against Y (simple)

Based on the results of the calculations carried out, it is obtained that a is 1.678 and b is 0.834 in the form of a simple linear regression equation as follows: = 1.678 + 0.834 X2 From the regression equation, it can be seen that the effect of engine maintenance on the smooth departure of the ship is unidirectional (positive), this is shown in the regression coefficient or the value of b in the regression equation which shows a positive number of 0.834 which means that every increase in surging on a 1 unit turbocharger will followed by an increase in the flue gas temperature of 0.834 units. Vice versa, if the surging on the turbocharger decreases by 1 unit, the high exhaust gas temperature will tend to decrease by 0.834 units. And the value of the coefficient a (intercepts) is 1.678 which means that if there is no maintenance schedule (X=0), it is estimated that the smooth departure of the ship is 1.678 units

X1 and X2 Regression Against Y (simple)

Based on the results of the calculations, it is obtained that a is 0.260; b1 of 0.592 and b2 of 0.453 the form of multiple linear regression equation as follows: = 0.260 + 0.592X1+ 0.453X2

From the regression equation, it can be seen that the effect of the rinse air treatment on the high temperature of the flue gas is unidirectional (positive), this is shown in the regression coefficient or the value of b in the regression equation which shows a positive number of 0.592 which means that every increase in rinse air treatment is 1 units will be followed by an increase in the flue gas temperature of 0.592 units. Vice versa, if the rinse air treatment decreased by 1 unit, the high exhaust gas temperature would tend to decrease by 0.592 units.

From the regression equation, it can be seen that the effect of surging on the turbocharger to the high exhaust gas temperature is unidirectional (positive), it is shown in the regression coefficient or the value of b in the regression equation which shows a positive number of 0.453 which means that every 1 unit increase in surging on the turbocharger will be followed by an increase in the exhaust gas temperature of 0.453 units. Vice versa, if the surging on the turbocharger has decreased by 1 unit, the high exhaust gas temperature will tend to experience a decrease of 0.453 units. And the value of the coefficient a (intercepts) is as big as 0.260 which means if there is no rinse and surging air treatment on the turbocharger (X 1 and X2 = 0), it is estimated that the high flue gas temperature is 0.260 units

Coefficient of Determination X1 against Y

By looking at the calculation results above where R square is 0.677 or 67.7%. This shows the magnitude of the positive influence of rinse air treatment to the high exhaust gas temperature of 67.7% while the remaining 32.3% is the influence of other factors

Coefficient of Determination X2 against Y

By looking at the results of the above calculation where R square is 0.790 or 79.0%. This shows the magnitude of the positive effect of surging on the turbocharger to the high exhaust gas temperature of 79.0% while the remaining 21.0% is the influence of other factors.

Coefficient of Determination X1 and X2 against Y

By looking at the results of the above calculation where R square is 0.832 or 83.2%. This shows the magnitude of the positive effect of rinsing and surging air treatment on the turbocharger on the high exhaust gas temperature of 83.2% while the remaining 16.8% is the influence of other factors.

Hypothesis Testing

t-test Count

Variable rinse are treatment (X1) where is the value of t-count of 2.594 and a significant value of 0.015. in this result, the significant value is less than 5% (α =0.05) and the t-value count 2,594>t-table as big as 2,052. This means that the hypothesis is accepted because there is a positive effect of rinse air treatment on the high exhaust gas temperature.

Surging variable on turbocharger (X2) where is the value of t-count of 4.977 and a significant value of 0.001. in this result, the significant value is less then 5% (α =0.05) and the t-value count 4,977.t-table of 2,052. this means that the hypothesis is accepted because there is a surge in turbocharger to the high exhaust gas temperature.

Test f-count

The results of data processing on it is known that the value of F-count of 66,633 greater than F table of 3.35 with a significance value of 0.001 then the hypothesis is accepted. This means that the rinse and surging air treatment variables in the turbocharger have a positive effect on the high exhaust gas temperature.

Discussion

Partial Effect of Flush Air Treatment on High Exhaust Gas Temperature

X1. Regression against Y (simple) the value of = 6.219 + 1.133 X. is obtained1. From the simple linear regression equation, it means that if the accuracy of the rinse air treatment increases by one unit, the higher the exhaust gas temperature on the MV vessel. Boga Indah will be followed by a value of 1.133 units. Coefficient of Determination X1 to Y. The amount of contribution (contribution) of the rinse air treatment variable to the high exhaust gas temperature on the MV vessel. Boga Indah is 67.7% while the remaining 23.3% is the influence of other factors such as cleaning factors on the compressor and tubin side, cooling air temperature, and so on. The first hypothesis in this study examines whether the rinse air treatment partially affects the high exhaust gas temperature on the MV ship. Beautiful Food. The results of this study indicate that the rinse air treatment variable has a significance value of 0.015 <0.05. This is also evidenced by the magnitude of tcount 2,594 > ttable of 2,048 which means that the rinse air treatment has a positive effect on the high exhaust gas temperature on the MV ship. So the hypothesis received. Besides that answer respondent on every question indicator, maintenance air rinse take effect to high gas temperature dump on the MV ship. Boga Indah because it hasi the highest average score of 4.4, the answer to this

highest indicator os found in the answer to the rinse air filter replacement indicator, while the lowest indicator answer is the cooling air temperature indicator.

This research study that the rinse air treatment showing study that the rinse air treatment take effect was positive and significant for high exhaust gas temperature on the MV ship.

The Effect of Partial Surging on the Turbocharger on the Height

X2 Regression against Y (simple) the value of 1,678 + 0.834. X2 from the simple linear regression equition, it can be seen that if the sirging on the turbocharger increases bt one unit, the higher the exhaust gas temperature on the ship MV. Beautiful Food will be followed by value 0.834. coefficient of determination X2 to Y, the amount of contribution (donation) of the surging variable on the exhaust gases on the MV Beautiful Food as big as ship. 79% while the remaining is an influence 21% other factors for example error factor crew operation, vibration on the impeller unstable turbocharger rotation, etc. the second hypothesis in this study examines whether surging on the turbocharger partially affects the high exhaust gas temperature on the MV ship. The results of this study indicate that the engine maintenance variable has a significant value of 0.001>0.05. this is also evidenced by the magnitude of t-count 4.977 > t-table 2.048 which it means surge on turbocharger take effect positive for height gas temperature dump on the MV ship, so the first hypothesis is accepted.

This study is ini accordance with the results of the study which showed that surging on the turbocherger had a positive and significant effect on the high exhaust gas temperature on the MV ship. Beautiful Food. In addition, respondents' answers to each indicator question, surging on the turbocharger have an effect on the high exhaust gas temperature on the MV ship. Boga Indah because it has the highest average score of 4.46, the answer to this highest indicator is in the answer to the decreased air compression indicator, while the lowest indicator answer is the back pressure indicator from the flushing chamber. This study is in accordance with the results of the study which showed that psurging on the turbocherger had a positive and significant effect on the high exhaust gas temperature on the MV ship. Beautiful Food.

Partial Effect of Flushing and Surging Air Treatment on Turbocharger on High Exhaust Gas Temperature

Regression X1 and X2 against Y (double) the value of = 0.260 + 0.592X . is obtained1+ 0.453X2. From the regression equation, it can be seen that if the treatment velocity of the rinse air increases by one unit, the temperature of the flue gas on the MV vessel is high. Boga Indah will be followed by a value of 0.592 units or if the surging on the turbocherger increases by one unit, the high exhaust gas temperature on the MV ship. Boga Indah will be followed by a value of 0.453 units. Coefficient of Determination X1 and X2 together with respect to Y (double). The amount of the contribution (contribution) of the rinse and surging air treatment variables on the turbocherger together to the high exhaust gas temperature on the MV ship. Boga Indah is 83.2% while the remaining 16.8% is the influence of other factors in this study, for example the engine room temperature is too hot, there is carbon in the turbine, the intercooler is not working optimally, etc.

Based on the F test the significance value is 0.001 < from 0.05 means that the rinse and surging air treatment variables on the turbocherger together have a positive effect on to the high temperature of the flue gas on the MV ship. Beautiful Food. This is also evidenced by the magnitude of Fcount 66.633 > F >table of 3.35 which means that the rinse and surging air treatment on the turbocherger has a positive effect on the high exhaust gas temperature on the MV ship. Boga Indah, so the third hypothesis is accepted. In this case, if the rinse air treatment process is carried out on time and in accordance with the needs of the turbocherger

and the level of surging on the turbocherger which can be monitored so that it is always in good condition, it can increase the high exhaust gas temperature on the MV ship. Beautiful Food. From the information above, it can be interpreted that the conditions in the period under study were that the rinse and surging air treatment on the turbocharger had a significant positive relationship either individually or together with the high exhaust gas temperature on the MV ship. Beautiful Food.

CONCLUSION

Procurement The rinse air treatment proven has a positive and significant effect to high exhaust gas temperature with tcount > ttable (2,594 > 2,048). The regression equation for the rinse air treatment relationship (X1) against the high temperature of the rinse air (Y) obtained = 6.219 + 1.133 X1, This equation means that every increase or decrease of one unit score in the rinse air treatment will be followed by an increase or decrease in score high exhaust gas temperature on the MV ship. Beautiful Food. The amount of increase orthe average decrease is 1.133 at constant 6,219. It can be concluded that the higher the accuracy of the rinse air treatment process, the higher the fluency of the flue gas temperature on the MV ship will be. Beautiful Food. So it is proven that the rinse air treatment has a positive and significant effect on the high exhaust gas temperature, especially at the highest indicator with a total of 133, namely the indicator clean rinse air filter in necessart to for get maximum rinse air quality and which air filter change rinse support the smooth operation of the turbocharger. The lowest indicator with a total of 129 is an indicator of the need for cooling the air temperature in performing rinsing air treatments.

Surging on the turbocharger proved to be positive and significant to high exhaust gas temperature with tcount > ttable (4.977 > 2.048) Regression equation for surging relationship on turbocharger(X2) to the high exhaust gas temperature (Y) obtained = 1.678 +0.834 X2, this equation means that every increase or decrease of one unit of surging score on the turbocharger will be followed by an increase or decrease in score high exhaust gas temperature on the MV ship. Beautiful Food. The average increase or decrease is 0.834 at a constant of 1.678. So it can be concluded that the surge on a turbocharger that is done properly will increase the high exhaust gas temperature on the ship MV. Beautiful Food. So it is proven that surging on the turbocharger has a positive and significant effect on the high exhaust gas temperature, especially at the highest indicator with the number 134, namely the vibration indicator from the impeller producing a pounding sound from the turbocharger and decreasing air compression occurs because the diffuser does not work optimally. The lowest indicator with a total of 128 is an indicator of back pressure from the rinse air chamber increasing the risk of surging.

The variables of rinse and surging air treatment on the turbocharger were jointly proven to be positive and significant to high exhaust gas temperature on the ship MV. Beautiful Foodwith F count > F table or 66,633 > 3.35. The most influential variable is the surging variable on the turbocharger with a correlation coefficient (R) of 0.889. So that it is proven that the rinse and surging air treatments on the turbocharger have a joint or simultaneous effect on the high exhaust gas temperature on the MV ship. Beautiful Food.

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