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Analysis of The Occurrence of Damage To Crane Operations on Board Km. Lotus Ungu

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Abstract: *The smooth maintenance and repair of diesel main engines requires complete and adequate equipment. Hoist cranes are equipment used to lift and move engine components that cannot be moved by human labor. With a hoist crane on board, the machinist on board is easier to lift diesel main engine components such as cylinder heads, pistons, and cylinder liners when carrying out maintenance and repairs. To support the process of lifting diesel main engine components during maintenance and repair, the hoist crane must be in good condition. The main point of a good hoist crane is that the hoist crane can lift loads up to 4 tons.*

The method that the author uses to make this scientific work is to use a qualitative descriptive method. In this scientific work, the instruments used to produce descriptive data are observation, interviews and documentation. Carrying out these steps is expected to find the problems that cause damage to the hoist crane. Hoist crane damage caused by high temperature electromotor can be prevented by performing maintenance according to the planned maintenance system.

Keyword: *High temperature electromotor , Hoist crane*

INTRODUCTION

In the world of shipping and maritime in modern times, especially Sea Transportation services are experiencing very rapid development. Consumers choose to use sea transportation services for their commercial business in terms of shipping goods and passenger transportation services because the price of consumption is relatively cheaper than other transportation. There are several tools that help operate on ships, one of which is the crane. Cranes have an important role as support in the operation of the ship, one of which is in the engine room, the existence of cranes greatly helps ease the workload in terms of lifting the workload. The crane in the engine room is placed on the main diesel engine. This placement is because the crane is a maintenance and repair support tool for the main engine. Under normal circumstances, cranes can lift loads that weigh no more than 4 tons and can certainly move goods from one place to another according to capacity. If the crane is not functioning properly then the operation on the ship will be disrupted, there are several problems that

make the operation of the crane not optimal and even cannot be used for example: seal leakage, lack of crane lifting power, high temperature electromotor. These abnormalities can be caused by many factors that make the crane not work properly according to the SOP (Standard Operating Procedure).

Literature Review

Crane : Crane is one of the material lifting and moving aircraft. This heavy equipment is used to move a large number of goods and heavy. This tool has a long shape and very strong lifting ability. Able to rotate up to 360 degrees with a range of up to tens of meters. Usually this tool is often used in project work, workshops, industry, ports, warehousing and many others. Pulleys or cranes are machines that will generally operate with oil or hydraulic systems and of course with the help of pneumatic or air systems. This tool lifts the load vertically and horizontally to lower the load to the place that has been determined by the mechanism. Therefore, there are several types of cranes that are tailored to the method of work. (Mevia, Farisa. 2020).

Based on the above opinion, a crane is a loading and unloading tool specially designed on a ship that is used to lift cargo vertically and move horizontally moving together and lowering cargo to a predetermined place with a crane movement mechanism.

Hoist Crane : According to English hoist means pulley. From this meaning we can conclude that the definition of a hoist is a tool that functions to move or lift goods. Hoist crane is also one type of crane that can be used indoors or outdoors. This type of crane can be used to lift goods or loads in an upright or horizontal position. Vivian, Alvin. (2021). Cranes can be operated manually and can also be operated with electricity. Many cranes today are driven by electric motors, so this hoist crane is known as an over head electric traveling crane. Hoist cranes are used in the engine room to assist in the maintenance and repair process of the main diesel engine.

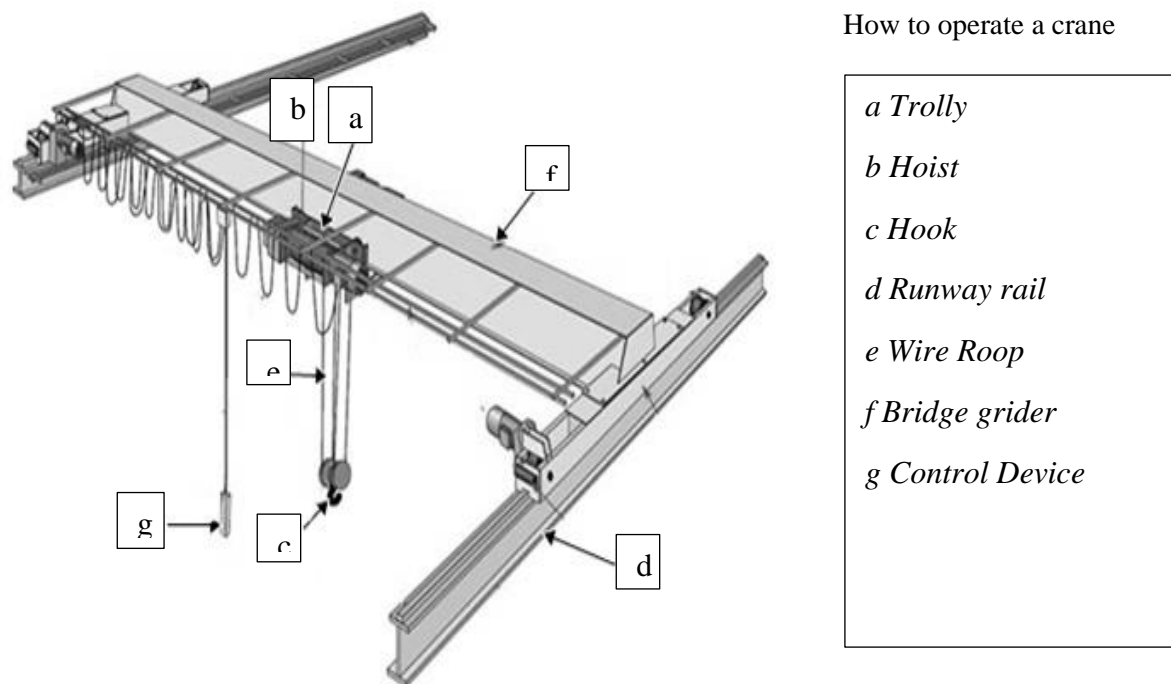
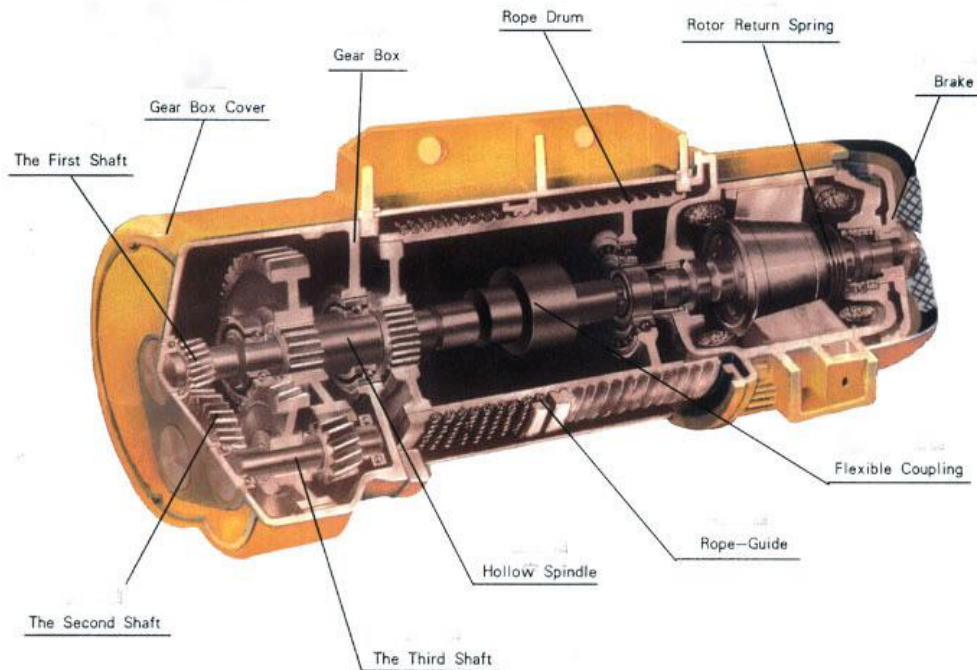


Figure 1: Hoist Crane (Source: Lit.3)

In this case the hoist crane has the following operating procedures Megajaya, Admin. (2020). a). Carrying loads that exceed the maximum lifting capacity of the hoist crane is prohibited. b). Operators must wear safety equipment such as helmets and safety shoes when operating the hoist crane.



c). Before the lifting process begins, ensure the stability and balance of the load and lifting equipment used. d). The beginning of the load lifting should not be done suddenly e). After the lifting process is complete, make sure to remove the lifting equipment from the hook, the hook is at a height of two meters so as not to collide with workers, and only stop the hoist crane at a predetermined place. f). Conduct regular checks. These checks include: (Checking the operational function of the limit switch, Checking the operation of hydraulic and pneumatic components, Checking mechanical operation, Checking the condition of the hook and its components such as bolts, guards, and locking pins 4, Checking the hoisting rope, Checking various types of connections such as nuts and bolts, Checking of rail components, Checking of mechanical components, Peg component check, Drum strap component check, Motor component check, Chain component check, Checking electrical components such as the control panel), g). Conduct an overall function test at least once a year which is carried out at the time of re-certification of the equipment

Types of Crane Hoists

Hoist cranes can be classified into several types, namely Vivian, Alvin. (2021):

Eot Crane : EOT (Electric Overhead Traveling) cranes are a popular type of crane that can lift 20 to 500 tons. EOT cranes (also known as Overhead Cranes) are mounted on the ceiling of the factory but can be used indoors or outdoors. There are two types of EOT cranes: double girder and single girder. More explanation about Double Girder and Single Girder here. Hoist can move left and right. Crane girder can move back and forth. And the wire rope part can go up and down.

Gantry Crane : Gantry cranes are a series of hoists and cranes with support legs with wheels that are suitable for outdoor use. Gantry cranes run on a rail platform on the floor. However, its movement is the same as EOT Crane. Gantry cranes are available in 2 girder types, Double girder and Single girder. Both can be paired with cantilever on the left and right side of the girder.

Semi Gantry Crane : Semi Gantry cranes are a series of gantry cranes, but only have one support leg. Semi gantry cranes combine support legs using rail on the ground and elevated

runway on the other side. This crane is suitable for indoor and outdoor applications with limited space.

Rubber Tyre Gantry Crane (RTG Crane) : Rubber Tire Gantry cranes are a series of hoist cranes that use support legs equipped with tire wheels. RTGs have sufficient height to be used in industrial and maritime environments. Because it uses tire wheels, Rubber Tire Gantry cranes do not have a rail or ground. RGT's are suitable for outdoor use in all terrains, both land and sea with a certain depth. This type of hoist crane has been assembled using advanced technology, so it can be used in any terrain.

Jib Crane : A jib crane is a type of hoist crane that has a mast as the center and support. The mast of a jib crane is located at one end of the girder. The girder can rotate 180°-360° with the mast as the center point. The hoist section can move left and right and the wire rope can go up and down. There are 4 types of jib cranes, namely industrial jib crane, wall jib crane, column jib crane, and port jib crane. The four types will be adjusted to the lifting power requirements and production process in an industry.

Wall Running Crane : Wall running cranes are a series of hoist cranes that use a rail or platform on the wall. Wall running cranes are similar to overhead cranes. However, there is a difference in the rail. While overhead cranes have runway beams on both sides, wall running cranes only have one on one side. Wall running cranes are characterized by an inverted "L" shape with the runway beam attached to the wall.

Monorail Crane : Monorail crane is a type of hoist crane that does not use girders in its circuit. Mono rail cranes only move on the beam (rail) attached. Since monorail cranes do not use girders, they can only move forward and backward along the beam.

Underslung Crane : Underslung cranes are a series of hoists and cranes that move on a suspended rail. While overhead cranes have the rail on the top surface of the beam, Underslung cranes have the rail at the bottom of the beam so it moves in a hanging fashion.

Grab Crane : Grab cranes are a series of cranes with a claw-shaped hoist section. Grab cranes can be used for specific needs, tailored to the interests of each industry.

Polar Crane : Polar cranes are a series of hoist cranes with a circular beam. Polar cranes cannot move forward or backward like overhead cranes, but they can rotate. The hoist and wire rope also move the same, right, left and up, down.

Container Handling Crane : Container handling crane is one of the hoist cranes used to lift and move containers. This type of hoist crane is widely used in the port area for loading and unloading cargo or containers that have been carried by ships. The characteristic of this type of container handling hoist crane is that it has quite high "legs" with a special modeled hoist for containers.

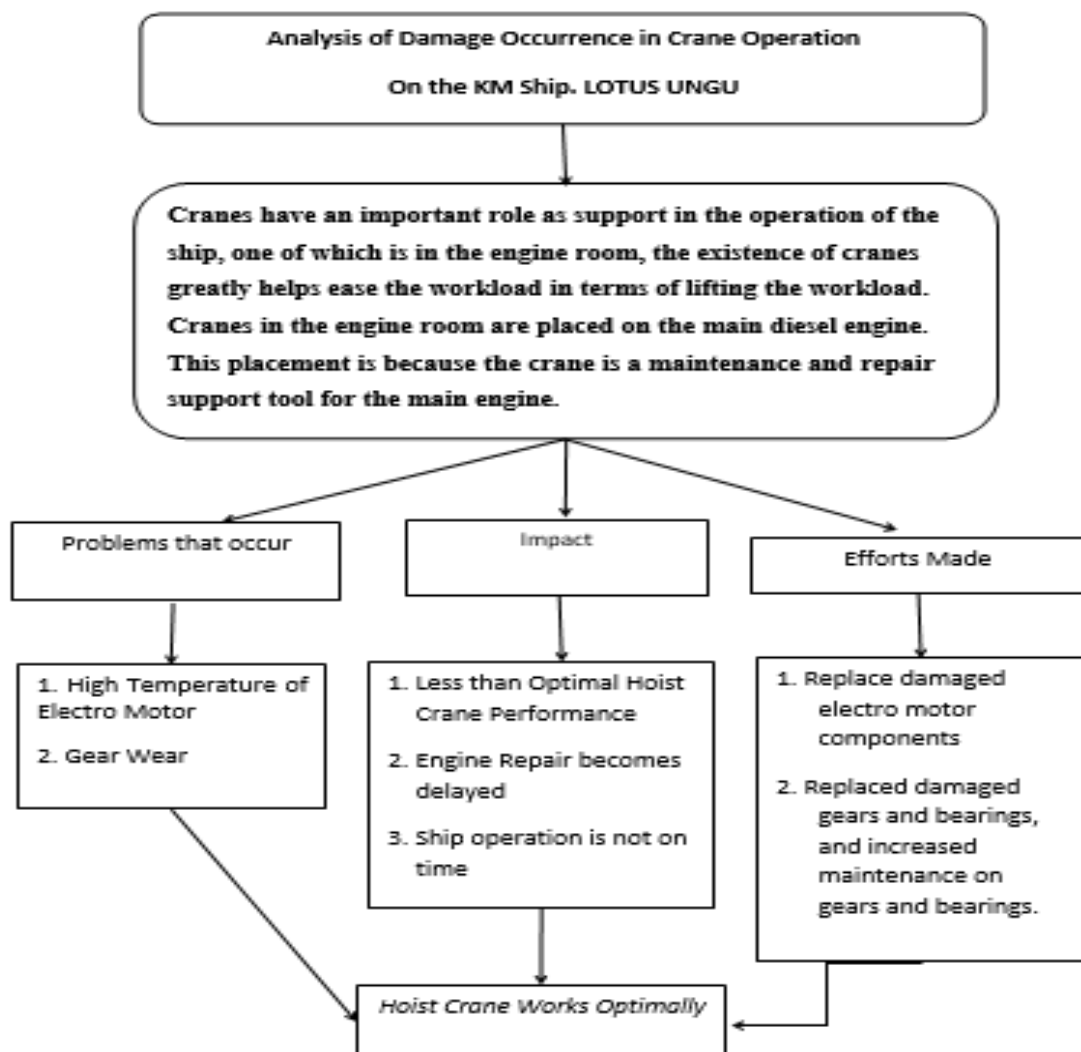
Foundry Crane : Foundry cranes are one type of circuit that can be used for foundries with the advantage of pouring features. Hoist cranes are an important part of any factory or construction site. Choosing the right type of hoist crane will simplify tasks and work during the production period. With a quality and strong hoist crane from PT Wira Griya, production activities will run more helpfully.

Component components Hoist Crane : Vivian, Alvin. (2020). The components of a hoist crane are as follows: A) Electric hoist serves to regulate hoist movement by using an electric power source. B) Electric motor serves to drive hoists and cranes by utilizing the electric hoist work system. C) Chain (manual hoist chain) serves to rotate and pull a pulley on the hoist. D) Motor brake serves to hold or stop the motor drive when a lifting system is running. E) Steel wire rope serves to lift cargo or load at a certain capacity. F) Drum serves for a place for winding steel wire or rope. G) Drum brake serves for part of the drum system that serves to hold the drum rate. H) The rope guide serves to organize or direct the motion of the steel wire rope.

Crane Hoist Component Maintenance : There are several types of maintenance for hoist crane components, as follows: To perform maintenance on hoist crane components, Predictive Maintenance and Periodic Maintenance can be performed. Predictive Maintenance is predictive maintenance, in this case an evaluation of periodic maintenance. Predictive Maintenance uses direct monitoring of mechanical conditions, work system efficiency, and other indicators. Predictive Maintenance will predict when damage will occur to certain components on the machine by analyzing the behavioral trends of the machine / work equipment. In contrast to Periodic maintenance which is carried out based on time (Time Based), Predictive Maintenance focuses more on Machine Conditions (Condition Based). The output of maintenance from the predictive program is data.

This maintenance is a type of "condition-based maintenance" where changes in the condition of the machine or equipment can be detected so that proactive actions can be taken immediately before machine damage occurs. Predictive maintenance is carried out based on the condition monitoring process carried out on the desired equipment. The result of this process is measurement or test data which is then compared with previously known reference data to determine the operating condition of the equipment. Monitoring techniques commonly used in predictive maintenance include vibration monitoring, process parameters, tribology, thermography methods, visual inspection and nondestructive testing methods such as ultrasonic methods. Vivian, Alvin. (2020).

Conceptual Framework



METHOD

Qualitative research methods according to Sugiyono (2018: 15) are research methods based on the philosophy of postpositivism which are usually used to examine the conditions of natural objects, where research acts as a key instrument and describes a situation objectively or based on visible facts. Qualitative research is a form of research with a case study method or approach Sugiyono. (2017).

In addition, qualitative research methods according to other experts include the opinion of Sukmadinata. (2017) is a method used to describe and describe existing phenomena, both natural and human engineering, which pay more attention to the characteristics, quality, interrelationships between activities.

Based on experts, qualitative research methods are a scientific way to obtain data with specific purposes and uses based on the philosophy of postpositivism which can be used to examine natural object conditions, where research acts as a key instrument and describes a situation objectively or based on facts that appear in accordance with conditions in the field.

RESULTS AND DISCUSSION

Causes of damage to hoist cranes:

There are several studies that discuss hoist crane damage, one of which is research conducted by Hanafi Setya Kuswara conducted in 2020 on Decreasing Hoist Crane Lifting Power Affecting the Implementation of Over Houl in the MV Engine Room. Sri Wandari Indah, in this study there are causes of damage to the hoist crane, namely: damage to the rubber clutch, bearing damage to the electromotor and damage to the reduction gear. As with the damage that researchers find in the field, researchers find the causes of damage to hoist cranes as follows:

High temperature of the electro motor.

The electro motor becomes hot usually because the cooling fan is damaged and the load received is not balanced due to wear on the bearings, as well as damage to the gears. So all of that will be continuous. The high temperature of the electromotor is the increase in temperature on its surface due to the lack of cooling. The normal 80 ° C (176 ° F) rises to 100 ° C (212 ° F). This condition if it occurs for a long period of time will cause damage to the rotor surface. Efforts to overcome the occurrence of high temperatures from the electromotor by replacing damaged components, namely the bearing and cooling fan on the electromotor. The steps for replacing the bearing and cooling fan of the electromotor are as follows:

1. repair spare parts, namely bearings and cooling fans and keys such as ring wrenches, spanners, cracks and others.
2. Open the casing or cooling fan penutup.
3. Then open the cooling fan, after the fan is open then open the bearing with a creker.
4. If everything is open, install a good bearing for its replacement by hitting with a large pipe iron from the electromotor shaft so that the bearing enters perfectly.
5. Then install the replacement cooling fan.
6. After that, reinstall the casing or cooling fan cover.

Gear wear

Gear wear occurs due to bearing damage. Bearings wear out due to lack of grease lubrication which causes the bearing to become hot and unable to withstand the rotation load. Then the electromotor shaft will bend due to incomplete rotation. If the shaft is bent, the reduction gear will collide with the other reduction gear and cause wear on the reduction gear. Efforts to overcome wear on the gears by replacing gears that are not suitable for use anymore. The hoist crane gear replacement steps are as follows:

1. Prepare spare parts and keys to open the gears.
2. Opening the crane hoist gearbox.
3. Once the gearbox is open, then open the damaged gear.
4. After that, install good spare parts.
5. Then apply grease, after that reinstall the gearbox.

To prevent further damage, care and maintenance must be carried out. Maintenance and maintenance are not the same, where maintenance is an action taken against a machine so that the machine does not experience damage. Maintenance can be done by covering adjustment, lubrication, and replacement of components that have experienced wear or are not suitable for use. Maintenance also means performing routine actions to maintain component equipment or prevent breakdowns. Ongoing routine work performed to keep a component facility in such a condition that it can continue to be used for its intended purpose. Various activities such as testing, measuring, replacing, adjusting, and repairing that aim to maintain or restore the function of components or units in or to a particular system.

Impact if a malfunction occurs in the operation of a hoist crane

There are several studies that discuss hoist crane damage, one of which is research conducted by Hanafi Setya Kuswara conducted in 2020 about. Decreased Hoist Crane Lifting Power Affects the Implementation of Over Houl in the MV Engine Room. Sri Wandari Indah, in this study there is an impact of damage to the hoist crane, namely: repair and maintenance of the main engine is hampered, and the operation of the ship is not on time. As with the impacts that researchers found in the field, researchers found the impact of damage to the hoist crane as follows:

1. Less than optimal hoist crane performance
2. Main engine over houl will be hampered
3. Ship operation will be disrupted

Efforts made to prevent damage to hoist crane operations

There are several studies that discuss hoist crane damage, one of which is research conducted by Hanafi Setya Kuswara conducted in 2020 on Decreasing Hoist Crane Lifting Power Affecting the Implementation of Over Houl in the Engine Room MV. Sri Wandari Indah, in this study there are efforts to prevent damage to the hoist crane, namely: perform regular maintenance on the hoisting electromotor. Similar to previous studies, researchers found efforts made to prevent damage to hoist cranes as follows:

1. Perform maintenance according to the PMS (Planned Maintenance system) procedure.
2. Do not force the Hoist crane
3. Implement the SWL (Safe Working Load) procedure
4. Pay attention to the quality of spare parts

CONCLUSION

Based on the results of data processing that has been obtained through research and discussion in the previous chapter, then analyzed and reviewed further, the authors make a conclusion in this applied scientific work on the analysis of the occurrence of damage to the operation of hoist cranes on board KM. Lotus purple. The causes of damage to the operation of the hoist crane include:

1. High temperature of the electromotor is caused by a broken cooling fan, and the load received is not balanced due to the presence of keasuna in the bearing. High temperature of the electromotor is an increase in temperature on its surface due to lack of cooling. The normal temperature of 80°C (176°F) rises to 100°C (212°F). This condition if it occurs for a long period of time will cause damage to the rotor surface. Efforts to overcome the

occurrence of high temperatures from the electromotor by replacing damaged components, namely the bearing and cooling fan on the electromotor.

2. Wear on the gears due to lack of grease lubrication which causes the bearings to become hot and unable to withstand the rotation load. Then the electromotor shaft will bend due to incomplete rotation. If the shaft is bent, the reduction gear will collide with the other reduction gear and cause wear on the reduction gear. Based on the data obtained from the field, the cause of the problems that occur in the operation of the hoist crane is due to the absence of a clear implementation of PMS (planned maintenance system) procedures on board, which causes damage to the hoist crane. To prevent further damage, it is necessary to have clear care, maintenance and procedures regarding the hoist crane. Maintenance and maintenance are not the same, where maintenance is an action taken on a machine so that the machine does not experience damage. Maintenance can be done by covering adjustment, lubrication, and replacement of components that have experienced wear or are not suitable for use.

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