



ZONA LAUT

JOURNAL OF OCEAN SCIENCE AND TECHNOLOGY INNOVATION

Maintenance Of Winchlass Hydraulic Oil Pump In Supporting Mooring Un Mooring In KI Sultan Hasanuddin 02

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Abstract

Windlass machine is a tool on a ship that is used to pull and lower anchors and is usually also used to moor ropes when the ship is docked at the dock. In its operation, this windlass machine consists of an anchor, anchor chain, windlass, hydraulic pump, electric motor. The hydraulic pump functions to convert mechanical energy into hydraulic energy by pressing the hydraulic fluid in the system to drive the main shaft of the anchor machine, to make it easier for the crew to lego and hibob anchors. If in a less than optimal condition, it will disrupt the performance of the windlass and cause damage and shorten the service life. This happens because there is no maintenance and repair to avoid damage, especially to the hydraulic pump. This study aims to ensure that the performance of the windlass in its supervision and operation remains optimal in ship service.

Keywords: Windlass, Supervision, Maintenance.

1. INTRODUCTION

Makassar Maritime Polytechnic as a maritime college, has had the Sultan Hasanuddin Training Ship, DWT 1,200 Gross Tonnage, facilitating cadet practical activities that are always carried out in the laboratory/simulator, now can also be carried out on the training ship, 10 instructors and 100 passengers. With an overall ship length of 63 meters, a perpendicular length of 59 meters, a width of 12 meters, a height of 4 meters, and a water depth of 2.8 meters, a fuel tank capacity of 115 tons and a fresh water tank of 175 tons, a speed of 12 knots and a maximum power of 2x1000 HP.

Windlass machine is a tool on a ship that is used to pull and lower anchors and is usually also used to moor ropes when the ship is docked at the dock. In its operation, this windlass machine consists of an anchor, anchor chain, windlass, hydraulic pump, electric motor. The hydraulic pump functions to convert mechanical energy into hydraulic energy by pressing the hydraulic fluid in the system to drive the main shaft of the anchor machine, to make it easier for the crew to lego and hibob anchors. The windlass specifications are needed to pull each anchor and 60 chain links at an average speed of not less than 0.15 m / s, and must also be able to lower the anchor at low power by reversing the machinery and with gravity on hand control through friction brakes

If in a less than optimal condition, it will disrupt the performance of the windlass and cause damage and shorten the service life. This happens because there is no maintenance and repair to avoid damage, especially to the hydraulic pump.

When the ship is about to prepare for berthing un Berthing the anchor machine exceeds the classification limit which is more than 9 minutes, when operating the handle controller to heave up the anchor, the anchor chain cannot be lifted, then the hydraulic windlass pump makes an unusual sound and there is a very loud and unnatural vibration when heave up the anchor. So this condition requires periodic maintenance to ensure the performance of the windlass under supervision and its operation remains optimal.



In addition to theoretical learning taught in class, lecturers are also assigned to carry out practical learning/practicums to familiarize the knowledge delivered. Practical activities for cadets that are always carried out in laboratories/simulators can now also be carried out more optimally on training ships. Where the function of the training ship is as a class for educational and teaching process activities that produce, develop and advance knowledge, skills, understanding and experience and attitude in the field of science and technology of merchant shipping. In general, a fairly clear comparison between the Simulator and the Training Ship is that cadets will be more sensitive to the atmosphere and environment created on the training ship, rather than just the simulator atmosphere which is less actual and realistic.

In this way, the output produced from the performance of this Training Ship is also expected to maximize the operation of all activities that support student/cadet learning. Where one of the vital needs of the ship is a windlass engine which is a tool for pulling and lowering anchors and is usually also used to moor ropes when the ship is processing berthing unberthing movements. The windlass engine power source can also be operated with electrical energy, steam energy, and hydraulic system energy and consists of anchors, anchor chains, windlasses, hydraulic pumps, electric motors (Fajar Tyas Adi, et.al. 2022) [1].

The hydraulic pump functions to convert mechanical energy into hydraulic energy by pressing the hydraulic fluid in the system to drive the main shaft of the anchor machine (Aditya, 2020) [2]. The lack of maintenance on the windlass and the impact that occurs is that the gears are damaged, namely rust, worn and blunt van pumps. So the recommended effort is to carry out periodic maintenance on the windlass (Rama Maulana Putra, 2020) [3]. For maintenance, it really must be considered and must not be exposed to water according to 20th century standards to make it easier for the ABK to do let go and hibob anchor. (Rizaldi, Achmad Rizki, 2019) [4].

According to Hutama et. al. (2016), windlass pumps have various types, for example, steam systems have great capacity and are free from short-circuit hazards, but ships must have a steam boiler, usually for large ships such as tankers, in addition to steam power, there are hydraulic pumps [5]. The pump works by utilizing lubricating oil pressure to move the piston which is connected to the eccentric shaft of the anchor engine drive so that it can pull or release the anchor. Therefore, the pump must be in good condition and with the correct operating method according to existing procedures.

One of the auxiliary machinery in ship operation during hibob and let go anchor is anchor machine and so that the ship can operate well and smoothly. Windlass is an important part that functions to pull and lower anchor and is usually also used to moor ropes when the ship docks at the dock. Windlass can be operated with electrical energy, hydraulic system energy, with the ability to lift anchor at an average speed of 5-6 fathoms/minute from a depth of 30-60 fathoms and also has a normal pressure of 5-6.5 bar (500-650 kPa). On some ships, windlass is used as an emergency tool and can be combined with mooring winch and warping head on the container. According to Smith (2009:238), windlass is an anchor winch installed on a ship for the purpose of heave up and let go anchor and anchor chain through the anchor tube (hawse pipe). Windlass is one of the supporting tools in arranging the basic tack [6].

According to Suspendi & Fitri (2022), the windlass works based on Pascal's law where the windlass can pull or lift heavy loads using a small actuator with high-pressure hydraulic oil media. To lift and pull the load, the windlass uses a hydraulic circuit system [7].

Hydraulic pump generates high pressure hydraulic oil, actuator/driver in the form of hydraulic cylinder and motor, and directional control valve as the controller of actuator movement. So the summary of the main parts in the hydraulic windlass system is 4, namely:

- a. Hydraulic oil tank
- b. Pump oil
- c. Directional control
- d. Valve actuator

In the main section above it is explained that, the hydraulic oil suction pump stored in the oil tank and pushes it towards the actuator (driver). The directional control valve functions to change the direction of the hydraulic oil flow towards the actuator, so that the actuator can move back and forth (forward and backward) on the cylinder boom, rotating clockwise - counterclockwise if the actuator is a motor on the windlass system. If the directional control valve is in the neutral position (handle in the middle position) then the oil will be discharged back to the oil tank and not to the actuator.

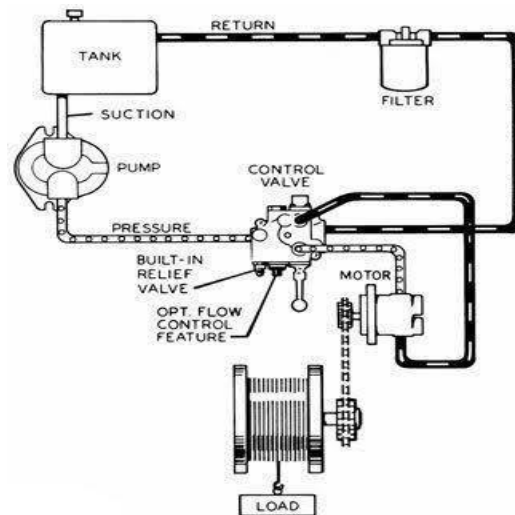


Figure 1. Windlass Components

The windlass specification is very important to pull each anchor and 60 chain links at an average speed of not less than 0.15 m/s, and must also be able to lower the anchor at low power by reversing the machinery and with gravity on hand control through friction brakes. If the windlass is in a less than optimal condition, it will disrupt the performance of the windlass and cause damage and shorten the life of the windlass. This happens because there is no maintenance and repair to avoid damage.

According to Suwanto (2019), an anchor machine is an anchor winch machine that utilizes a hydraulic system for the purposes of heave up and let go anchors and anchor chains through the anchor tube (hawse pipe) to the chain locker as a storage for ship chains [8]. Based on www.winchmachines.web.id the anchor machine must be able to pull the anchor from the seabed, at an anchor lowered 82.5 m it must be no more than 9 minutes. However, when the ship is about to prepare for berthing, the anchor machine exceeds the classification limit, which is more than 9 minutes, when operating the handle controller to heave up the anchor, the anchor chain cannot move up, then the hydraulic windlass pump makes an unusual sound and there is a very loud and unnatural vibration when heave up the anchor. The factors causing the hydraulic windlass pump to break are as follows:

- a. Improper implementation of maintenance schedule
- b. Operation does not comply with the instruction manual book
- c. Dirty pump filter
- d. Dirty hydraulic windlass tank
- e. Corrosion on the cylinder block
- f. Bad weather.

So this study aims to ensure that the performance of the windlass in its supervision and operation remains optimal in the service of the Sultan Hasanuddin 02 Makassar training ship.

2. METHOD

In this study, the research team used a qualitative approach, using the object of the winchlass pump oil hydraulic on the Sultan Hasanuddin 02 Makassar training ship. Then by collecting data, from research instruments: interviews with crew members, observations at the winchlass location and documentation by focusing on case studies on the ship which will be explored in detail and intensively. To obtain accurate data, it is necessary to determine informants who have competence and are in accordance with data needs (purposive).

The data analysis technique used in this study is to use the steps as stated by Burhan Bungin (2003:70) [9], namely as follows: Data collection is an integral part of data analysis activities. Data collection activities in this study are by using interviews and documentation studies. Data reduction, interpreted as the process of selecting, focusing on simplifying and transforming raw data that emerges from written notes in the field. Reduction is carried out since data collection begins by making summaries, coding, tracing themes, making clusters, writing memos and so on with the intention of setting aside irrelevant data/information. Data display is a description of a set of structured information that provides the possibility of drawing conclusions and taking action. Qualitative data presentation is presented in the form of narrative text. The presentation can

also be in the form of matrices, diagrams, tables and charts. It is the final activity of data analysis. Drawing conclusions is in the form of interpretation activities, namely finding the meaning of the data that has been presented.

Winchlass or anchor winch is a mechanical device used on the Sultan Hasanuddin training ship to assist in the process of raising or lowering the anchor, as well as to adjust the anchor chain during docking and undocking. Good winchlass operating performance is very important in ensuring the safety and smoothness of the docking process, especially in holding the ship's position in a safe place when the anchor is lowered and in facilitating the activity of moving heavy loads.

Technically, a winchlass consists of a large drum that is operated manually or automatically using electric, hydraulic, or steam power, depending on the type of ship and its needs. The working mechanism of the winchlass involves a chain or cable attached to the drum, which can be adjusted to pull or release the rope or anchor chain as needed.

3. RESULTS AND DISCUSSION

The Sultan Hasanuddin training ship has an anchor machine equipped with a chain stopper that is firmly attached to the forecandle deck, to support the anchor chain mooring when anchoring, then this tool must have a breaking load capacity of 80% of the chain breaking load. If the chain stopper is not installed, the anchor machine must be able to withstand the pull with a breaking load of 80% of the chain breaking load without any deformation on the equipment also slips on its braking system. So that it can make the winchlass tension at a certain time or weather, by current, water bottom and ship conditions. So that at the time of testing, the anchor machine which has two drums must be able to lift the anchor chain which is lowered along 55 m simultaneously from the depth of the sea in no less than 6 minutes.

For separate anchor engines between the left and right anchor engines, each must be able to lift the anchor chain lowered along 82.5 m from the sea depth in no less than 9 minutes. This is a provision of the classification society regulations. Maintenance is a method that involves the implementation, attention and supervision of work carried out for smooth operations. Anchor engines with electric motor power, usually used for medium-sized ships, this system is widely preferred by cruise ship owners because it is clean. However, the ship must have a special power plant (special generator) to drive the anchor engine (must be separated from other electrical installations) the driving force above through the worm gear will drive the main shaft of the anchor engine, in addition the anchor engine is equipped with a clutch system to release and activate the work of the driving force with the main shaft. The anchor engine must be placed in a position on the deck.

Table 1. Results of Field Observations on the Winchlass of the Sultan Hasanuddin Training Ship

No.	Description of Observation	Description of Observation Results
1.	Anchor Machine	It is an anchor winch installed on a ship for the purpose of lifting and extending the anchor and anchor chain through the anchor tube. It has steam, hydraulic and electric power as its driving force, which is driven by hand power.
2.	Driving force	Different types of propulsion have different advantages, for example, steam systems have greater capacity and are free from the danger of short circuits, but ships must have a steam boiler, usually for large ships. Hydraulic power is very sensitive and does not require a large unit, but the hydraulic pipe installation must be protected to avoid damage and leaks, because it has very high pressure, so if it leaks it is very dangerous.

Data processed, 2024.

The bow of the ship so that it is easy to operate the lowering and raising of the anchor. When installing the anchor machine on the deck of the ship, the deck plate in the area of the anchor machine foundation must be reinforced with plate thickening and strong foundation construction. The anchor machine must be equipped with a brake system, to slow down the rotation of the shaft and stop the lowering of the anchor chain and anchor.



Table 2. Findings from Observation Results and Unstructured Interviews on the Sultan Hasanuddin Training Ship

No.	Data Collection Time	Objects On Ship	Research Team Findings
1.	July 2024	Bow Windlass	There is seepage of engine oil/lubricant There is some grease/grease spilled in the windlass area Notes on the use of oil and grace oil are not available Windlass maintenance schedule and journal are not available.
2.	August 2024	Stern Windlass	It is not used very often There is no instruction manual on the windlass Maintenance schedule not available

Data, processed 2024

Efforts to develop monitoring and preventive maintenance systems also have the potential to support the creation of a safer and more environmentally friendly maritime environment. Thus, proper windlass maintenance not only improves equipment performance but also contributes to better and more sustainable overall ship operations.

The parts and functions of the anchor machine on the Sultan Hasanuddin training ship, consist of several parts which were observed by the research team,

- a. Ship anchor (anchor) anchor is a device for mooring a ship to the bottom of the water, in the sea, river or lake so that the ship cannot move due to wind, current or waves. Anchor is also one of the mandatory tools on board considering its function as a tool to hold the ship so that it does not move and remains in position.
- b. Ship anchor chain (anchor chain) besides anchors, what we need to know is the anchor chain. Anchor and anchor chain maintenance can be done when the ship is docked or during the voyage.
- c. The hawse pipe is a tube through which the anchor chain passes. In general, the hawse pipe is located in the ship's hull on the left and right sides of the ship's bow to the front deck.
- d. Anchor chain locker is a place to store anchor chains, the best placement is according to the position of the anchor engine. The chain locker is located at the front of the ship in front of the collision bulkhead and above the forepeak tank. If the number of ship anchors is 2 sets, the chain locker must consist of two separate chain locker spaces with left and right bulkheads.
- e. Anchor chain pipe is a tube through which the anchor chain passes, located between the forecastle deck and the chain locker. Its construction is almost the same as the hawse pipe made of steel pipe with reinforcement at the top or made of cast iron. The lower part facing the chain locker can be widened and the edge of the pipe is installed in a half-round shape. The position of the anchor chain pipe is right in the chain hole under the anchor machine, which is what must be considered in placing the chain pipe.
- f. An anchor windlass is an anchor winch installed on a ship for the purpose of lifting and releasing the anchor and anchor chain through the anchor tube.
- g. These wire ropes function as a replacement for anchor chains. Wire ropes can be used on certain ship sizes with certain conditions.
- h. Brake lining (chain stopper) is generally installed between the anchor engine and the hawse pipe which is useful for holding the chain and anchor pull when the ship is anchored. The chain stopper must have a breaking load capacity of 80% of the chain breaking load, and be installed properly and in the right position above the deck (forecastle deck), and the deck in this area must also be reinforced. With the same use, sometimes several chain links are tied to the anchor chain in the hawse pipe area to hold the chain and anchor load, however this tool cannot be considered a chain stopper.

4. CONCLUSION

The maintenance and performance of the windlass on the Sultan Hasanuddin training ship shows that maintenance has been carried out properly and periodically to ensure the safety and operational efficiency of the ship, but there are still several things:

- a. There is still irregular maintenance on certain parts, so the risk of damage cannot be minimized, which in turn reduces performance and will increase repair costs.
- b. Damage or leakage to the windlass oil tank could potentially pollute the sea, due to uncontrolled



handling by officers.

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