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Operational Performance Of Oily Water Separator KI Sultan Hasanuddin 02 Pip Makassar In Protecting The Maritime Environment

* Jamaluddin, Suyuti, Musriady, Muh Jafar
Makassar Maritime Polytechnic
E-mail:raksapang@gmail.com

Abstract

Sultan Hasanuddin 02 Training Ship which is a place for learning theory and practice of students at the Makassar Maritime Polytechnic. So that in supporting its operations requires periodic maintenance management that will ensure smooth and optimal performance in all supporting aspects. Likewise in the implementation of regulations that have required all ships to operate to install an Oil Water Separator that can separate oil and water before being dumped / falling into the sea. The use of Oil Water Separator must be maximized so that it can work properly, so it is necessary to carry out periodic and regular maintenance, the importance of maintenance management aims to evaluate the performance and effectiveness of the Oil Water Separator (OWS) in managing oil waste on ships by improving and increasing effectiveness and productivity in the utilization process to support smooth ship operations. Before making preparations in the maintenance stage, it is better to first make a proper plan and in accordance with the guidelines and also pay attention to field conditions both in terms of human resources and supporting spare parts and appropriate equipment. This study aims to evaluate the performance and effectiveness of the Oil Water Separator (OWS) in managing oil waste on the Sultan Hasanuddin training ship. By looking at the ship's ability to manage oil waste properly which will provide a positive image for the ship's Officers and Crew who are responsible for the environment, support sustainable practices and can increase trust from regulators and customers. Based on the results of field observations, there is still effectiveness in OWS performance with routine maintenance showing better separation efficiency than those that are rarely checked. However, the level of cleanliness of the effluent of the maintained OWS ranges from 5-10 ppm, while the unmaintained OWS reaches 20-50 ppm. The availability of spare parts and the level of personnel training are significant challenges.

Keywords: Training Ship, OWS, Maritime Environment.

1. INTRODUCTION

Training Ship Sultan Hasanuddin 02 which is a place for learning theory and practice of students at the Makassar Maritime Polytechnic. So that in supporting its operations, it requires periodic maintenance management that will ensure smooth and optimal performance in all supporting aspects.

Likewise in the implementation of regulations that have required all operating ships to install an Oil Water Separator that can separate oil and water before it is dumped/falls into the sea. The engine room is the heart of the ship because of the machinery that operates in starting and controlling the ship's voyage to the destination port. The condition of the engine that has been turned on will automatically work and can have an impact on causing leaks in the lubrication system on the main engine, for example, seeping clean oil, dirty oil and fuel. Another cause of leaks is because there is a tank that does not function as a container for oil used to support the operation of various types of engines on the ship. As a result, the oil that is collected automatically flows into the bilge tank.

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performance and effectiveness of Oil Water Separator (OWS) in managing oil waste on ships by improving and increasing effectiveness and productivity in the utilization process to support smooth ship operations. Before preparing in the maintenance stage, it is better to first make a proper plan and in accordance with the guidelines and also pay attention to field conditions both in terms of human resources and supporting spare parts and appropriate equipment. Oil Water Separator (OWS) is a device used to separate oil from water, so that the oil content that comes out before being discharged into the sea does not exceed the provisions of 15 PPM, because of the importance of OWS, every engineer is required to be able to operate and check first and ensure good conditions. In its operation, OWS can be used for a very long period, considering the quality and quantity of oil filtered, the ability to filter oil decreases. This requires periodic cleaning and maintenance [1]. The utilization of Oil Water Separator must be maximized in order to work properly, it is necessary to carry out periodic and regular maintenance, the importance of maintenance management with the aim of improving and increasing the effectiveness and productivity in the utilization process to support the smooth operation of the ship. Before making preparations in the maintenance stage, it is better to first make a proper plan and in accordance with the guidelines and also pay attention to field conditions both in terms of human resources and supporting spare parts and appropriate equipment.

Based on previous literature from several oily water separator research, the author has made relevant reference sources in the article, as follows:

- a. The reason for the less than optimal performance was due to the minimal familiarization of the ship's crew at the time of the crew handover regarding the procedures for operating the oil water separator properly and correctly [2].
- b. That the high oil content of the oily water separator process is caused by several factors, namely dirty coalescer filters, bilge wells containing a lot of dirty oil and lack of maintenance and operating procedures that are not appropriate according to the instruction manual book. To overcome these factors, steps can be taken to clean or replace the coalescer filter, clean the bilge well and maintain the ows optimally [3].
- c. To carry out maintenance on the OWS on KM. Lawit, maintenance management is needed which includes planning, organizing, implementing and finally supervising during operation [4].
- d. The factors causing high oil content in waste water from the oily water separator process are the untimely implementation of the maintenance schedule, dirty coalescer filters, bilge wells containing a lot of dirt, and lack of knowledge [5].
- e. The possibility of reducing the occurrence of pollution originating from dirty oil and gutter water in the engine room is filtered first so that the gutter water waste that is discharged into the sea is completely sterile from oil mixtures and the oil content does not exceed 15 PPM [6].

In Budi Utomo et.al., (2022), it is stated that for the smooth operation of the Oily water separator, maintenance and repairs must be carried out periodically so as not to interfere with the operation of the ship. By using an experimental method to determine engine performance and assuming a correction assessment approach, it is stated that engine performance, engine working time is directly proportional to the volume of waste capacity so that the greater the volume, the longer the time required [7].

Oil Water Separator (OWS), is a ship tool where fluids that are not mutually soluble are separated from each other due to differences in density, in this case the fluids in question are water and oil, where the specific gravity of water is greater than the specific gravity of oil so that when the separation process occurs the water will be at the bottom and the oil will be at the top. the working principle of the oil water separator separation is done by changing the speed and direction of the fluid from the well, so that the fluid can be separated. Where the function of the Oil water Separator is used in handling water from the bilge where the water is still mixed with oil and must be separated before being discharged into the sea. The Oil water Separator uses Stokes' Law to define the floating speed of an object/particle based on its specific gravity and size. In this tool, oil will accumulate above the water surface.

Oil Water Separator (OWS) is a device on board a ship, where fluids that are not mutually soluble are separated from each other due to differences in density, in this case the fluids in question are water and oil, where the density of water is greater than the density of oil so that when the separation process occurs the water will be at the bottom and the oil will be at the top. The working principle of the oil water separator separation is done by changing the speed and direction of the fluid from the well, so that the fluid can be separated.

The function of the Oil Water Separator is used in handling water from the bilge where the water is still mixed with oil and must be separated before being discharged into the sea. Where the Oil Water Separator uses Stokes' Law to define the floating speed of an object or particle based on its specific gravity and size. In this tool, oil will accumulate above the water surface.



The existence of the Sultan Hasanuddin 02 training ship in its use as a means of practical learning for cadets of the Makassar Maritime Polytechnic, is an additional insight for lecturers and cadets in implementing several practical learning with competency courses, also as a new vehicle in the vocational education system that introduces participants earlier to have skills before carrying out prala and prada/internships on ships/shipping companies. Thus, in supporting the operation of the Sultan Hasanuddin 02 training ship, maintenance management is needed that will ensure smooth and optimal performance in all supporting aspects.

In the engine room, oil spills originating from seepage and leaks in pipes, and the discharge of water from cleaning tanks and other activities have the potential to become sources of pollution on board ships, if the spill enters the waters/sea. Another thing is the exploration and refining of petroleum, maritime transportation accidents can also cause pollution or contamination of waters that have an impact on the environment of the life of organisms from marine biota. According to Ministerial Regulation Number 21 of 2010 concerning Maritime Environmental Protection, activities on board ships can contribute to polluting materials/materials including, oil, toxic liquids, hazardous materials in the form of packaging, dirt, garbage, air, ballast water, and/or goods and materials that are hazardous to the environment on board the ship. So that every crew member is required to prevent and overcome pollution originating from parts of their ship [8].

The engine room is the heart of the ship because of the machinery that operates in starting and controlling the ship's voyage to the destination port. If the engine is turned on, all parts of the engine in the ship will automatically turn on for operation. This condition can then have an impact that causes leaks in the lubrication system on the main engine, for example, seeping clean oil, dirty oil and fuel. This is because the lubricating oil reservoir can be seen from the seepage of the damaged lubricating oil reservoir packing.

Another cause of the leak is due to the presence of a tank that functions as an oil reservoir used to support the operation of various types of engines on the ship. As a result of this leak, the oil that is collected automatically flows into the bilge tank. This incident will cause seawater pollution because if the sewage waste is not handled, it will be discharged into the sea without a filtering process so that the oil and water are separated according to the provisions of Marpol 73/78. This is one of the phenomena that causes seawater pollution from the operation of a ship. Oil pollution can cause water and ocean pollution, which has an impact on disrupting marine biota.

With this phenomenon, legislation emerged that functions to prevent seawater pollution, the aim of which is to maintain the sustainability and balance between seawater and the ecosystem in and around it. Therefore, every ship is required to prevent pollution, especially that which will be discharged into the sea. Waste disposal through gutters from ships is one of the largest contributors to seawater pollution. That is why the government has implemented regulations that require all ships in operation to install a complete aircraft with a tool that can separate oil and water or better known as an Oil Water Separator (OWS) where this tool is specifically intended for oil-fueled ships or ships transporting oil [9].

This study aims to evaluate the performance and effectiveness of Oil Water Separator (OWS) in managing oil waste on the Sultan Hasanuddin training ship. By looking at the ship's ability to manage oil waste properly, it will provide a positive image to the ship's Officers and Crew who are responsible for the environment, support sustainable practices and can increase trust from regulators and customers.

2. METHOD

This study uses qualitative descriptive analysis, by looking at the symptoms and phenomena in the field, especially the Sultan Hasanuddin 02 PIP Makassar training ship and other ships, by collecting data which will be carried out in 2 (two) ways, namely collecting primary and secondary data.

The data source is direct observation that is observational in nature in cases that have an influence on the performance of the oily water separator. Thus, the process of collecting questionnaire/interview data and analyzing data that is case/fact/event in the field. to study intensively about the background of the problem, the state and position of an event that is currently taking place, as well as the interaction of the environment of certain social units that are as they are.

In this qualitative descriptive research, an analytical observational approach was used, which observed the actual conditions on board the Sultan Hasanuddin training ship, during the operational activities of the ship that was the research site. This approach began by analyzing several relevant regulations in handling oil spills and procedures in accordance with the regulations in handling them.

In this way, the research team will obtain data that is believed to be true, through 3 methods, as follows:

a. Interview Method



- b. Observation Method
- c. Documentation and literature study

In this study, the research team conducted data collection on the Sultan Hasanuddin training ship, which is a very important activity to collect relevant data and information related to a more detailed explanation of the Oily Water Separator (OWS) maintenance observation process on the Sultan Hasanuddin training ship which is an important part of maintaining the performance of the water and oil separation system, as well as complying with strict environmental regulations. The following is a general description of OWS maintenance on ships:

- a. Routine Inspection OWS should be checked periodically to ensure all components are functioning properly, including pumps, valves, filters, and sensors. Minor leaks or damage should be repaired immediately.
- b. Filter Cleaning in the OWS system needs to be cleaned regularly to prevent clogging of the oil and water flow. Clogged filters can reduce separation efficiency and damage the system.
- c. Sensor Calibration in the OWS system, such as the oil content sensor, must be calibrated regularly to provide accurate readings. Incorrect calibration can result in the release of contaminated water exceeding the permitted threshold.
- d. Replacement of worn components, parts such as seals, gaskets, and pumps should be replaced if they show signs of wear. This preventive maintenance is important to prevent greater damage in the future.
- e. Functional Testing, after maintenance, functional testing of the OWS system must be carried out to ensure that the system is capable of separating oil from water according to international standards (such as MARPOL). This also includes ensuring that the alarm works properly if the oil content is above the threshold.
- f. Maintenance and operation records, every maintenance and operation of OWS must be properly recorded in the ship's log book as part of compliance with international regulations and audits by maritime authorities. With proper maintenance, OWS can function optimally, prevent marine pollution, and help ships remain compliant with international environmental regulations.

OWS standards are crucial in preserving the marine environment. By complying with regulations set by IMO and authorities, and performing proper maintenance, ships can operate efficiently without compromising the health of the marine ecosystem. Effective implementation of OWS not only protects the environment but also helps ships to operate in accordance with the law.

3. RESULTS AND DISCUSSION

Marine pollution from oil waste is a global concern, so ships operating at sea are required to comply with strict standards in oil and water management. One of the devices used to meet these standards is the Oil Water Separator (OWS). OWS functions to separate oil from bilge water before being discharged into the sea, thereby helping to protect the marine environment from pollution. Where OWS regulations and standards are regulated by several International and National regulations, namely:

- a. MARPOL Annex I: This convention was established by the International Maritime Organization (IMO) and sets limits on the amount of oil that may be discharged into the sea from ships. The OWS must be able to ensure that the concentration of oil in the discharged effluent does not exceed 15 parts per million (ppm).
- b. ISO 14956 Standard: This standard provides guidelines for performing OWS efficiency testing, including methods for determining oil content in water.
- c. Environmental Impact: OWS must be designed and maintained so as not to produce hazardous waste that can pollute the marine ecosystem. Therefore, its operation and maintenance must follow the guidelines set by environmental and maritime agencies.

This qualitative research data collection is through observation, by collecting information directly, namely observing the entire series of activities of Officers and other ABK, starting from the behavior or phenomena that are the focus of the research, in the form of notes. Researchers and teams play a role in observing, recording everything relevant in the field. The following are the results of field observations that the research team conducted on the Sultan Hasanuddin training ship.



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

No.	Time	Field Observation	Information
1	7 June 2024	Filter Coalescer	Dirty filter tube
2	3 July 2024	Bilge Well	Contains a lot of dirt
3	July 20, 2024	Water disposal process	High oil content in waste water from the oily water separator process.
4	August 18, 2024	Maintenance	Irregular maintenance can cause unexpected problems experienced by a machine.
5	10 October 2024	Knowledge	Information that a person has for a particular field

Data processed, 2024.

The OWS operational process on the Sultan Hasanuddin training ship consists of main components such as

- Separation chamber: The place where the bilge water enters and the oil begins to be separated from the water.
- Filters and Sensors: To ensure that the oil content in the water meets the standards set before being discharged. Filters also serve to prevent solid particles from contaminating the OWS.
- Pump: Used to move water and oil into the separation chamber and outflow.

Table 2. Interview Results with Respondents on the Sultan Hasanuddin Training Ship

No.	Respondents	Interview Results	Information
1	KKM	Operation according to procedure	Engine room location
2	Engineer 2	Constrained by spare parts filter./OWS strainer not available	Engine room location
3	Engineer 3	Treatment is carried out according to the manual book guidelines	Engine room location
4	Foreman	Supervision during operation	Engine room location
5	Oiler 1	Recording on each porosity	Engine room location
6	Oiler 2	Entered in the oil record book journal	Engine room location
7	Oiler 3	Always carry out according to the officer's orders	Engine room location

Data, processed 2024

The OWS system works through the process of gravity, where lighter oil floats to the surface, while heavier water remains at the bottom and this process can be affected by several factors, such as temperature and type of oil. Maintenance is a function that monitors and maintains ship facilities, equipment, and work facilities by designing, arranging, handling, and checking work to ensure the function of the unit during operating time and minimize downtime caused by damage or repair.

Good maintenance is essential to maintain the efficiency of OWS. Maintenance steps include:

- Routine Inspection: Scheduled inspection to ensure all components are functioning properly.
- Cleaning and Replacement: Periodically clean the filter and replace worn parts to maintain optimal performance.
- Staff Training: Personnel must be trained to understand how to properly operate and repair OWS.

Maintenance of OWS (Oil Water Separator) on ships is very important to ensure that oil dissolved in bilge water can be separated effectively before being discharged into the sea, in accordance with applicable environmental regulations.

Based on the results of observations and interviews at the research location, the explanation regarding maintenance and shortage of spare parts in this system can include several main points related to OWS maintenance, as follows:

- Routine Cleaning: The OWS should be cleaned regularly to avoid the buildup of dirt and waste. Make sure all components, such as filters and sensors, are in good condition.
- Functional Testing: Performing OWS functional testing to ensure that the system is performing as per specifications. This includes testing water flow and oil separation efficiency.
- Recording and Documentation: All maintenance activities must be properly recorded, including the date, type of maintenance performed, and test results. This is important for audits and regulatory compliance.



- d. Staff Training: Personnel who operate and maintain the OWS must be well trained so that they understand how it works and can respond to problems that may arise.

4. CONCLUSION

OWS plays a very important role in maintaining the sustainability of the marine environment. The performance that Optimal performance depends largely on proper maintenance and selection of appropriate technology.

- a. The effectiveness of OWS performance with routine maintenance shows better separation efficiency than those that are rarely checked. The cleanliness level of the effluent of a maintained OWS ranges from 5-10 ppm, while an unmaintained OWS reaches 20-50 ppm.
- b. Availability of spare parts and the level of personnel training are significant challenges. Ships often experience delays in maintenance due to difficulties in obtaining the necessary spare parts.

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