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Research Paper

Towing Pin Performance Optimization Strategy in SV. Triton 501

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Abstract

AHTS (Anchor Handling Tug Supply) is a ship specifically designed to support the operation of offshore building systems. Supply vessel or AHTS equipped with a towing pin, shark jaw. Towing winch, anchor handling winch, and tugger winch support work activities in the offshore industry (platform or riq). This research aims to analyze the factors that affect towing pin performance, what impacts can occur if the towing pin is not optimal, and the towing pin optimization strategy. The research method used is qualitative. This study uses the SWOT method (Strength, Weakness, Opportunity, and Threat). The results showed that the factors that caused the towing pin performance were not optimal due to several factors, including not optimal selenoid valve, dirty filters, mud in the towing pin gap, leaks or blocked hydraulic pipes, dirt in hydraulic oil, availability of spare parts, and human resources error. Advice that can be given is to anticipate internal and external factors that affect the performance of the towing pin in order to reduce or avoid the impacts that occur, learn how to handle components related to the towing pin directly and carry out regular and scheduled system maintenance plans for hydraulic components, the towing pin is prone to damage.

Keywords *AHTS, Towing pin, SWOT*

INTRODUCTION

As an archipelagic country with approximately 17,500 islands with a coastline of 80,000 km, Indonesia has an enormous potential for oil reserves, namely 7,408.24 stock tank barrels (Supriatna & Maharani, 2020). Indonesia has abundant marine potential, both the fisheries sector and even the oil and gas sector off the coast of Indonesia (Fadhilah et al., 2019). In the last decade, increasing interest has been in installing heavy and complex underwater equipment (de Andrade et al., 2023). Many companies build offshore platforms (platforms or rigs) in deeper seas to obtain satisfactory results. A platform or riq is a building equipped with drilling equipment built to support the exploration of natural minerals and minerals. The main function of offshore platforms is to explore underwater oil and natural gas production. Drilling activities in the offshore industry require assistance from certain vessels to support the process so that it runs smoothly. Vessels to support offshore drilling activities include tankers, AHTS ships, floating storage vessels, and crew boats. AHTS (Anchor Handling Tug Supply) is a type of ship that can carry out major operations such as towing, anchor handling, supply, stand-by, and as an assistant in the offshore industry (Chen, 2013).

Over time, the oil and gas industry saw the versatility of this type of ship, and then new technologies and applications were installed to support drilling activities in the offshore industry or towing barge work and platform maintenance. AHTS ships are equipped with towing pins, shark jaws, towing winches, anchor handling winches, and tugger winches to support work activities in the offshore industry. This study aims to analyze what factors affect the towing pin performance and the impact caused if the towing pin performance is not optimal.

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RESEARCH METHOD

This study uses a qualitative method. The object of this study is the performance of the towing pin, which is not optimal. The research was conducted when researchers carried out sea practice for 12 months and one day, which was carried out from September 1, 2021, to September 2, 2022, on the SV ship. Triton 501, which is one of the ships belonging to the shipping company PT. Blue Sea Triton. In this study, the Slovin method was taken from cadets in semester VII of the Semarang Merchant Marine Polytechnic technical study program with a population of 96 cadets with an error rate of 5%, and the final result of 5% error was 83 cadets. Furthermore, the method used is a questionnaire (questionnaire), observation, interviews, literature study, documentation, and a problem approach or SWOT tool (Strength, Weakness, Opportunity, Threats).

In the questionnaire, each factor will be given a weight starting from 1 (not important) to 4 (very important). The following is an example of a questionnaire table as follows:

Table 1. Questionnaire Variables

No	Strength indicators	Scale
1	Regular maintenance and towing checks	Interval (1-4)
2	The crew working on the ship works according to standard procedures	Interval (1-4)
3	There is a reserve of hydraulic oil	Interval (1-4)
4	Good cooperation between the engine crew (teamwork).	Interval (1-4)
No	Weakness indicators	Scale
1	Engineers who are not familiar with hydraulic systems	Interval (1-4)
2	Lack of cooperation between the deck and the machine	Interval (1-4)
3	Rarely do safety meetings take place	Interval (1-4)
4	The operation that exceeds SWL (Safety Working Load)	Interval (1-4)

No	Opportunities indicators	Scale
1	The company provides reliable technicians to assist repairs on board	Interval (1-4)
2	The company has improved its inventory management system to avoid a shortage of spare part inventory	Interval (1-4)
3	The company conducts checks or inspections regularly and records any deficiencies experienced by the ship in order to establish good coordination	Interval (1-4)
4	Crew training before boarding the ship	Interval (1-4)
No	Threats indicators	Scale
1	Bad weather and inadequate	Interval (1-4)
2	Lack of spare parts and delays in spare parts with different specifications	Interval (1-4)
3	The mud in the towing pin gap due to anchor handling causes it to get stuck on the towing pin	Interval (1-4)
4	Lack of supervision from the company	Interval (1-4)

According to Rangkuti (2015), SWOT analysis is a way to evaluate so that we can plan better. There are elements in a SWOT analysis, including strengths, weaknesses, opportunities, and threats. The first step in preparing the strategy using SWOT analysis is to analyze the research object's internal and external factors. This is done in order to find out what problems there are in internal and external factors. The tool for compiling strategic factors within a company can use the SWOT matrix.

As for calculating the weight and rating of the SWOT analysis, according to Rangkuti (2015), how to calculate the weight x score for internal factors, namely strengths and weaknesses. The weight value is determined based on the level of importance and urgency of handling; the magnitude starts from 1 to 5 (1 is not important, 5 is very important).

The next step is to formulate a strategy by combining S with O, W with O, S with T, and W with T (Rangkuti, 2015:7). In the formulation of this strategy aims to determine the position and strategy to be used. The SO strategy includes implementing PMS (Plan Maintenance System), training for dri makers, planning spare parts, and improving company communication. The WO strategy includes familiarizing hydraulic system equipment, deepening knowledge in the machinery field, increasing the ability to operate machines, and implementing regular safety

meetings. ST Strategy Adding networking with alums and companies engaged in shipping, increasing competency by taking a certificate of shipping knowledge, Procurement of spare parts according to qualifications, and cruise planning according to weather conditions. The WT strategy includes increasing the ability of knowledge in the field of machinery, increasing cooperation between parts of the ship, improving PMS (Plan Maintenance System), and operating according to standard operation procedures.

FINDINGS AND DISCUSSION

Not optimal performance of the towing pin occurs due to several factors, including technical factors, which include the components themselves, weather factors that affect the performance of the towing pin, and factors from human error or human error in operation and lack of maintenance of the towing pin.

On March 25, 2022, when the researchers were about to carry out a towing operation, a time charter from PT. Timas for three months until July. When locking the wire, there is a problem with delays in raising and lowering the performance of the towing pin, which causes disruption and delays in operations when towing. The problem in the towing pin is due to corrosion on the towing pin due to lack of maintenance and mud in the towing pin gap, and lack of hydraulic oil caused by leaks in the pipes due to corrosion. The next step after the researcher saw and identified these activities, the second engineer and the researcher took action according to the towing pin operating procedures according to the manual book and made improvements to the problems that occurred in the towing pin. Based on the results of the research and interviews conducted, it was found that the factors that influence the performance of the towing pin and the resulting impact if the towing pin is not optimal include the following:

Factors that influence the not optimal performance of the towing pin are technical factors, which include the components themselves, bad weather factors, human error factors, which include the operation and lack of maintenance of these components, while the problems that hinder the performance of the towing pin are the presence of mud in the towing pin gap due to the anchor handling or anchor jobs that have piled up. The following are problems that cause the towing pin to be not optimal, including not optimal selenoid valve, dirty filter in the hydraulic system, mud in the towing pin gap, leakage and blockage of the towing pin hydraulic pipe, dirt in the hydraulic oil line, spare part availability, human error factor.

A solenoid valve is a kind of electromagnetic control industrial equipment that relies on the power valve opening and closing force to drive the valve core to open and close the valve; its main role is to automatically cut off, connect, or switch fluid flow automatically (Zheng et al., 2019). If this component is not optimal, it is usually due to dirt on the valve. The way to deal with this dirt is by cleaning the solenoid valve; the solenoid valve is cleaned using Oil Spill Dispersant (OSD) liquid until the dirt on the valve is gone then the next step is to wait until it is dry and blow it with compressed air so that the remaining dirt is not left in the solenoid valve and then reinstall the component.

Based on the questionnaire data collection technique, the results have been distributed to semester VII of Engineering studies. The results obtained by researchers can be concluded as follows:

Table 2. Results of internal factor analysis

No	Strength	Weight	Rating	Weight x Rating
1	Regular maintenance and checking of the towing pin	3.0	3.6	10.8

2	The crew working on the ship works according to procedures	4.0	3.5	14.0
3	There is a reserve of hydraulic oil	1.0	3.4	3.4
4	Good cooperation between the engine crew (teamwork).	2.0	3.5	7.0
	Sub Total	1.0		35.2
No	Weakness	Weight	Rating	Weight x Rating
1	Engineers who are not familiar with hydraulic systems	-4.0	3.0	-12.0
2	Lack of cooperation between the deck and the machine	-1.0	3.1	-3.1
3	Rarely do safety meetings take place	-2.0	3.0	-6.0
4	The operation that exceeds SWL (Safety Working Load)	-3.0	3.3	-9.9
	Subtotal	-1.0		-30.1

Table 3. Results of analysis of external factors

No	Opportunities	Weight	Rating	Weight x Rating
1	The company provides reliable technicians to assist repairs on board	2.0	3.5	7.0
2	The company is improving the inventory management system to avoid a shortage of spare parts inventory	4.0	3.6	14.4
3	The company conducts checks or inspections regularly and records any deficiencies experienced by the ship in order to establish good coordination	3.0	4.0	12.0
4	Crew training before boarding the ship	1.0	3.5	3.5
	Subtotal	1.0		36.5
No	Threats	Weight	Rating	Weight x Rating
1	Bad weather and inadequate	-2.1	3.4	-6.8
2	Lack of spare parts and delays in spare parts with different specifications	-4.0	3.5	-14.0

3	The mud in the towing pin gap due to anchor handling causes it to get stuck on the towing pin	-3.0	3.7	-11.1
4	Lack of supervision from the company	-1.0	3.5	-3.5
	Subtotal	-1.0		35.4

After calculating the weights and scoring the indicators on internal factors and external factors, the coordinates (X, Y) are calculated where the value of X = total value S – W = 35.2 – (-30.1) = 5.1, and Y coordinates through the calculation of matrix coordinates SWOT which includes a total value of O – T = 36.9 – (-35.4) = 1.5 and the coordinates are found to be (X = 5.1, Y = 1.5).

Based on the calculation of the coordinate points (X, Y) on the calculation of the coordinate points. It can be seen that the strength of the company is in quadrant 1 (Strength–Opportunity). In this problem, the strategy formulated is a progressive strategy. This strategy utilizes all strengths to seize and take advantage of an opportunity as much as possible. Strategies that can be formulated are as follows: 1). implementation of PMS (Plan Maintenance System), and 2). maker training, and 3). spare part planning, and 4). improved communication with the company.

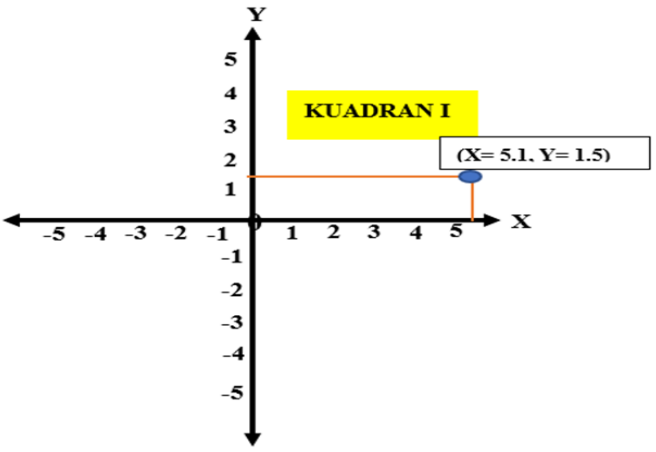

Figure 1. SWOT quadrant diagram

(Source: Result of recapitulation calculation)

After finding the cause of a problem that results in the performance of the towing pin not being optimal, then checking and repairing the towing pin is carried out as soon as possible. In the S-O strategy in quadrant I, the researcher formulates the following strategies: 1). implementation of PMS, 2). Maker training, 3). spare part planning, and 4). improved communication with the company.

A dirty filter can result in not optimal towing pin performance; therefore, it is necessary to check and replace it according to what is in the manual book to achieve perfect results. Based on previous research, the hydraulic oil filter is a component in the hydraulic system that functions to filter impurities contained in the oil so that it does not circulate into the system. If the filter is dirty, it is necessary to replace or clean it so that the hydraulic filter does not clog (Aviva et al., 2021).

One of the factors causing the towing pin to get stuck is the presence of mud in the towing pin gap caused by remnants of anchor work or anchor handling activities. This can result in corrosion of the towing pin. Blockage of the flow of hydraulic oil occurs due to dirt accumulating in

the flow of hydraulic oil and causes blockage of hydraulic oil, which can result in non-optimal performance of the towing pin. Another factor is the lack of availability of spare parts because spare parts greatly affect the performance of a machine, so that the machine's performance is optimal. Based on previous research (Bacchetti & Saccani, 2012), efforts to address the availability of spare parts focus on three main areas, namely the application of classification methods for spare parts, internal (company) demand and information sharing, and external (customer) supply.

The human error factor is caused by the man himself, usually caused by individual quality due to lack of experience, ability, and knowledge of the towing pin hydraulic system. This is also usually due to stress and lack of focus and can result in mistakes at work. Based on previous research by Zetli (2021), quoting Sanders & and McCormick (1993), human error is an action or behavior that can reduce a system's effectiveness, security, and performance.

Not the optimal performance of the towing pin can have a major impact on AHTS ship types because this component is very important to support the ship's operation. The impact is: a) the operation of the towing pin is delayed and less than optimal. If the towing pin is not optimal, the operation of the machine itself will experience delays, which can affect the ship when it is operating; b) the temperature of the hydraulic pump may rise, and damage may result. Not optimal towing pin can also result in a rapid rise in engine temperature, which can result in more severe damage; c) delays in operations to be carried out by the ship. Towing pin hydraulics that are not optimal also have an impact on ship and company operations because if there is a delay during charter operations, the charterer has the right to fine the company because the operations are not optimal; d) have an impact on all crews because they are considered unprofessional. This can also impact all crew on board because they are considered unable to solve the problems that occur, and the crew can be considered less professional in this field.

CONCLUSIONS

Based on the research analysis results, it can be concluded that optimizing the performance of the first towing pin is a technical factor. Technical factors include towing pin components, weather factors, human error factors, which include inappropriate operation and maintenance, and mud in the towing pin gap, which hinders the performance of the towing pin. Several other factors that affect the performance of the towing pin include not the optimal selenoid valve, a dirty filter in the hydraulic system, mud in the towing pin gap, leakage and blockage of the towing pin hydraulic pipe, dirt in the hydraulic oil, spare part availability, and human error.

The non-optimal performance of the towing pin has a major impact on AHTS ships because this component is very important to support the operational activities of AHTS ships. These impacts include: a) the operation of the towing pin that is late and less than optimal, b) the temperature rising in the hydraulic pump and resulting in damage, c) delays in operations to be carried out by the ship and can have an impact on companies that are subject to charter fines, d) have an impact on all crew because they are considered unprofessional in this field, causing a lack of safety at work.

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