

USE OF THE MARINE AIRBAG SHIP SYSTEM IN THE SLIPWAY AREA OF THE SHIPYARD

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ABSTRACT

PT. Citra Bahari Shipyard is a shipping company that uses Airbag Ship. Identification of hazards in the ship launching process using Job Safety Analysis(JSA) Guide Notes on the American Shipping Bureau (ABS) 2013, The procedures and processes that occur during the analysis and the equipment used are also what obstacles occur as well as solutions to these obstacles so that the launching process at PT. Citra Bahari Shipyard can run optimally. The purpose of hazard control measures in the launching process is to find out the potential hazards that can later cause work accidents and to obtain safe conditions from a launching process. The method that the observer uses is the method of directly observing the state of affairs in the field. Then conduct interviews with several parties related to ship launching and library study methods, namely by reviewing notes and reports that have to do with the launching of the ship with relevant sources. Then data processing is carried out to obtain control of the potential dangers and consequences that have been known so that it is hoped that potential hazards that cause injuries and material losses can be minimized. The result of this observation is that the control that has been carried out does not eliminate the danger completely, but minimizes the consequences of the potential dangers that exist from the ship launching process.

Keywords: Airbag, Analysis, Launching, Potential Hazards

INTRODUCTION

PT. Citra Bahari Shipyard Tegal as one of the companies engaged in the shipbuilding business also plays an active role in participating in improving the quality of the National and International maritime world and continues to improve so that it is hoped that it will not be less competitive in the current global competition. Shipbuilding is carried out from zero stage so that it becomes a ship that is ready to sail, carried out with a firm commitment to prioritizing the trust and satisfaction of its customers (Elvan & Hindiantoro, 2019).

The launching process is a process carried out when the main construction of the ship is declared complete and classification has been carried out by a special body that has been appointed based on an agreement between the owner and the shipyard. In the process, this launching activity is carried out using a marine airbag ship system which is placed under the ship which will later support the entire body of the ship for launching from land to sea. This process is of concern to the author, because this process has the potential for danger in the form of capsizing the ship during the launching process, the eruption of the airbags that support the ship so that the lower part of the ship's body collides with the slipway and also the breaking of the ship's slings which can cause the ship to slide without control and hit a tugboat or other ship.

Research on ship launching has previously been carried out. Ship launching can be done using the backward process method (Ju et al., 2020). His research explains that before launching, medium-term planning needs to be carried out. In 2021 research on the need for airbags for ships has been carried out. The number of airbags required for a ship is 18 (Yusim et al., 2021)

While carrying out launching activities, an accident occurred Companies can experience losses, both in the form of material losses and damage to the company's reputation. This special attention includes implementation procedures and requirements in the launching process by carrying out potential control analysis using work safety analysis methods and work hazard analysis which the company has never applied during the launch process. Therefore, the author feels the need for a work safety analysis method which has the function of analyzing the potential hazards of the job and controlling these hazards using the stages of Elimination, Substitution, Engineering Engineering, Administrative Control and Use of Personal Protective Equipment (PPE) so that it can help workers. Workers to know potential dangers and understand the work activities they carry out.

By using this method, the author hopes that he will be able to carry out an analysis of each process that poses potential dangers to carry out the control stage, and then the author can provide recommendations for all potential dangers that could occur during the launching process. So it is hoped that the launching process can run safely and smoothly, also in accordance with the company's consistency, namely being safe and healthy. The possible danger is that the ship could sink (Wisnawa et al., 2017). Potential danger is a situation where if there is no preparation to anticipate it, it could endanger human safety or endanger existing goods. Uncontrolled ship launching activities can also cause the ship to capsize (Al-Fian et al., 2017).

A shipyard is a place that is needed for shipbuilding. Shipyards also have the function of maintaining and repairing ships. Facilities at the shipyard include: offices, material warehouses, mechanical and electrical workshops, plate workshops, a place for building ships and a place for repairing ships. Building a shipyard is certainly not haphazard. Various facilities in the shipyard are adapted to the shape of the existing land, efforts are made to ensure that the order in the shipyard facilities facilitates the sequence of work and the series of materials needed.

The location chosen to be used as a shipyard must go through careful calculations (Saputra et al., 2017). There are several factors in determining location, namely: water conditions, electricity, availability of raw materials, transportation, environment, labor sources and consumers. When viewed geographically, there are two shipyards, namely open shipyards and closed shipyards. What is meant by open shipyard is a shipyard that is built facing directly onto open water, so that the foundation can be built with a longitudinal system. A closed shipyard means a shipyard built on the bank of a river which has a limited area. This shipyard will be built in a transverse shape and can only serve small vessels.

The shipyard has three facilities, namely slipway, Graving Dock, and Floating Dock. Slip way is a simple tool that has the function of raising and lowering a ship that is to be repaired. The length of the slipway is designed to be no less than 2.5 the length of the largest ship. There are two types of slipway, namely longitudinal slipway and transverse slipway.



Figure 1. Transverse Slipway

The advantages of a slipway include: it is effective for ship repairs and new vessels, it is faster and easier to operate compared to other types, its lifting capacity is large, and its construction costs are considered cheap.

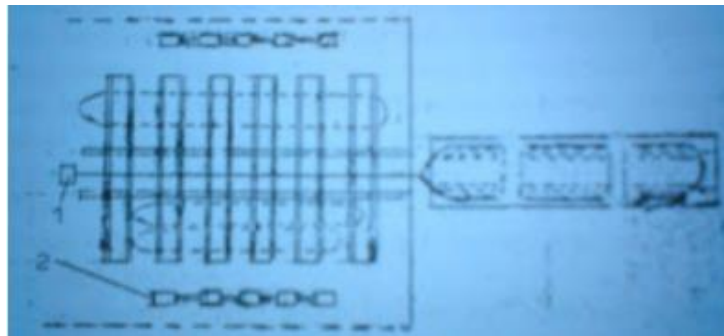


Figure 2. Longitudinal Slipway

The second facility in the shipyard is the Graving Dock. This facility also functions to repair/repair ships that are shaped like pools with concrete construction located on the shore or sea. There is a partition between the pool building and the sea with a watertight door. The advantages obtained from this facility are: safe, long service life, fairly low maintenance, and can be used for building new ships. However, this facility also has disadvantages, namely that the costs required are quite large, it cannot be moved, and the location is very influential in the activity.

The third facility in the shipyard is the Floating Dock. Floating dock is a type of dock that can be moved or in other words portable. The process is carried out by submerging and floating the dock with a certain water load assisted by a filling pump. When docking, the most important thing is the order in which water is filled into the compartment so that excessive defects do not occur during dock construction. The advantages obtained from using this facility are cheap manufacturing costs, being able to move from place to place, being able to lift a longer ship from the dock itself and what is even more interesting is being able to carry out self-docking if it is damaged.

The marine airbag ship system is very useful for launching ships, what you need to pay attention to about the airbags is the position and wind pressure. The position of the airbag and the pressure of the airbag will greatly influence the position of the ship during launch. During launch, it is hoped that the ship's position will remain stable. De Fretes et al. (2022) Launch with airbags is a stage in the ship launching process that is potentially dangerous (full of risks) so it must be planned and implemented properly because the stability of the ship affects the position of the ship above the airbags. This launching calculation is needed to prevent the ship from experiencing critical conditions such as tipping, dropping and stern lift.

The dangers identified from the ship launching process are physical hazards, including falling from a height, hitting the ship's hull. Energy Hazards include electric shock, fire and explosion, excess air pressure. Chemical hazard from the paint used; and work environment in the form of noise and mechanical vibrations. Launching a ship on a launching pad that is not continuous but stops at a certain height above the water surface, the higher the distance, the more dangerous it is for the safety of the ship (Irawanto et al., 2019; Sugeng et al., 2020).

METHOD

The research steps used in this research are problem identification, determining problem focus, conducting research, processing data, and reporting results. At the problem identification stage, the researcher formulated the problem, namely how to launch ships at PT. Shipyard Nautical Image. Once the problem is found, the next step is to focus on the existing problem. Researchers will focus on the problem of how to launch ships using the marine airbag ship system. The next step is to carry out research. Researchers conducted research starting with observations at PT. Shipyard Nautical Image. The results of the observation were that the researcher saw activities using the marine airbag ship system. After conducting research, researchers find existing problems and then find ideas for solving existing problems. The next step is to make a report. The report made by the researcher is in the journal that will

be published. This research was conducted at PT. Vitra Bahari Shipyard by taking samples, namely a ship that will later launch the ship. Data collection in this research was carried out in August.

RESULTS AND DISCUSSION

Developments in the field of ship launching systems in order to increase the safety and stability of ships in the water, various types of ship launching methods. The method of launching ships used by PT. Citra Bahari Shipyard uses a marine airbag ship system.

Launching ships using air bags is an innovative and safe technique for launching ships in water. By using an alternative method that can be used, namely by launching a longitudinal airbag system that can be used in shipyards. These airbags are usually cylindrical in shape. Airbags are made of reinforced rubber layers and have a high load capacity. This method can be easily used on all types and sizes of vessels.

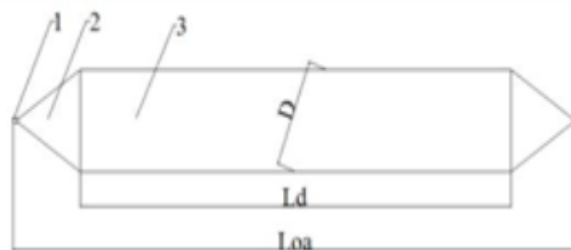


Figure 3. Airbag Structure

The airbag structure is divided into 3 parts, namely: airbag mouth, airbag head and airbag body. Where :

L = Length of the ship supported by the airbag

D = Airbag diameter

Loa: Total length of the airbag

The available airbag diameter sizes (D) are 0.8 m, 1 m, 1.2 m, 1.5 m, 1.8 m and so on depending on needs. Likewise, the length of the airbag (L) is considered based on the width of the ship to be launched and the length of the airbag head can be calculated as $0.866 D$. Advantages of using the Airbag Method: The airbag launching system does not need to be built in a traditional slipway, thus saving time, investment, land and others. Airbags do not require additional maintenance and after use, they can be cleaned and folded in a corner to wait for another mission. It is easy to find elasticity airbags, which can provide more protection when launching ships. The extraordinary character of airbags is that the working height can be changed to direct ships or launched objects by adjusting the air pressure.

Ship launching activities require good preparation so that later the implementation runs smoothly and does not experience any obstacles. The thing that needs to be paid attention to is increasing the slip way, after that proceed with checking the water. Other things that also require inspection include: upgrading the ship's skeg, ground anchors, and thruster hole seals if any.

Before the ship is launched, the ship must be held in position with a ground anchor to make it easier to launch. The next step is to insert the ship launching airbag between the keel blocks, after everything is inserted then the airbag is inflated with the aim of jacking up the ship. In order for the launch to run well and not endanger people and ships, make sure the ground surface is flat. If there are holes in the ground, they must be immediately covered with sand, if there are bulges in the ground, they must be leveled first.

The position of the ship is built some distance from the water, then the ship is lowered onto the slipway first, before launching, the airbag pressure is checked again and ensured that it is appropriate to the condition of the ship. The next step is to arrange the mooring rope and insert it from the bow. These ropes are tied to strong ground, secured with the help of wooden stakes. The steps for releasing the ship

start from cutting or removing the ropes that tie the ship, then the ship is moved slowly with the help of airbags.

The ship will move slowly, if everything goes smoothly the ship will arrive at the dock. If the ship successfully reaches its destination safely, the next step is to measure the bow draft and also check the ship's stern. The ship must also be checked in the cabin whether there are leaks or not.



Figure 4. Ship Launching Using Airbags

Figure 2 shows the position of the airbag under the ship and the ship is in a stable condition so that the launching activity runs safely. Using a slipway dock is easier and faster to operate compared to other methods. For repairs and construction of new buildings it is also very effective. In determining the type of dock and what facilities will be used, the ship owner must pay attention to the suitability of the type of ship with the capacity of the dock itself, whether the capacity of the dock is able to accommodate the load of the ship that will be carrying out the docking process.

The basic form of an air bag is a cylindrical pneumatic balloon. The rubber layer of the air bag is coated with synthetic wire reinforcement like a car tire. The outer rubber layer functions to protect the reinforcing cable layer from abrasion and other external disturbances. This compound has sufficient tensile and tear strength to withstand extreme weather conditions and use. The next layer is a synthetic layer and reinforcing wire. This reinforcing layer consists of synthetic tire cables which are commonly used in modified rubber tires.

To determine the safety level of launching a ship, it can be seen from the impact of the bottom of the ship. Impacts on the bottom of the ship can occur due to launches that are not planned properly. Collisions can occur between the bottom of the ship and the launch platform or the bottom of the water. Apart from the bottom of the ship, you also need to be careful of the ship's deck at the end, especially if there is equipment in that part that needs to be kept away from water or if there are many holes in that part that allow water to enter the hole.

The distance of the ship to the water is one of the factors that needs to be considered when launching the ship. In free sliding movement, the further the object moves, the greater the sliding speed. In a ship launch, the conditions of the launching pad are not always ideal. There are times when the tip of the runway does not go straight into the water but changes gradually to follow the contour of the water depth or it could even be that the tip of the launch platform breaks off at a certain height above the water surface. The higher the distance from the tip of the runway to the water surface causes a larger trim angle and rotational movement of the ship before the ship experiences resistance from the water. Apart from that, when the ship's center of gravity passes the end of the launch pad, an acceleration of the ship's movement appears in the vertical direction.

CONCLUSION

The process of launching a ship is the process of lowering the ship's body from the launch platform at the shipyard into the water which is caused by the gravity of the ship on an inclined plane. The steps taken during the launching process are, starting with checking the condition of the ship, attaching the ship anchoring device to the ship's padear (place for the anchor), installing air bags under the ship, lifting the ship by pumping the air bags according to the recommended pressure, shifting the concrete blocks according to the berthing plan. , The next step is painting and spraying, removing the concrete blocks using a forklift, setting the height of the air bag, shifting the ship to the launching position, tightening the rope holding the ship in position to hold the ship, attaching sandbags to the side of the air bag holding the balloon, installing concrete blocks for setting the position of the air bag, after that the concrete block is removed, the sandbag holding the balloon is removed and the balloon pressure is adjusted, then the ship is launched by releasing the rope holding the ship.

Ship launching must be carried out with precise calculations, because if there is even the slightest error it can cause the ship's position to be unstable, and can even lead to critical conditions such as tipping, dropping and stern lift. There are two types of slipway in the ship launching process, namely longitudinal slipway and transverse slipway. A slipway is a piece of equipment at the edge of the water that is used to raise a ship that will be repaired using rails and the help of a train as well as several shifts.

Things that need to be paid attention to during ship launching activities so that the ship does not suffer damage include the runway should be free from rubbish, especially sharp rubbish, the slope of the runway should not be steep, calculate the number of airbags needed, the airbags should be properly maintained, when launching they must be there is supervision, and the runway is not muddy and must be coated with cement according to needs.

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