



Optimization Of Cruise Vehicle Loading As An Effort To Improve Ship Stability And Safety Sailing

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Abstract

Load planning is one of the most important things in the world of shipping because it concerns the stability and safety of all crew and passengers on board. At the time of loading and unloading and when sailing, the ship always gets forces both from the cargo being unloaded and from objects and the surrounding nature: waves, currents, wind, collisions with docks, other ships or aground. These forces cause the ship to experience sway and other movements. In bad weather, these forces will get bigger and will cause the ship to capsize. So we need to know the ship's ability to deal with these forces and the possibility that the ship will capsize. Generally, passenger ships have more than enough stability to ensure that regulations are obeyed when the load is full but in practice sometimes ships can lose their stability when they are overloaded, because Therefore, the condition of the ship needs to be ensured in order to meet the existing minimum stability regulations. If this is not followed then the safety of the ship, crew and goods will be at stake. The purpose of this study is to describe the problems in ferry cargo arrangement as an effort to improve ship stability and safety and to determine the optimization of ferry cargo arrangement as an effort to improve ship stability and sailing safety. This research is a qualitative descriptive study, the data collection technique used is observation, and literature, Data analysis techniques used Qualitative analysis techniques. Based on the explanation above, it can be concluded that the problems with the stability of ships include internal factors, namely factors originating from the ship itself, such as ship size, layout, leakage due to collision or aground, and so on. For this reason, the crew must pay attention to the location and weight of the goods before sailing. While external factors are external factors that affect the balance of the ship, such as natural conditions, waves, storms, and the like.

Keywords: Assessment; Ship Stability; Ship Cargo; Sailing Safety

I. Introduction

Indonesia is an archipelagic country whose two-thirds of its territory consists of oceans, and has the second longest beach in the world (according to the Law of the Republic of Indonesia Number 32 of 2014 concerning Marine Affairs). Geographically, it is very strategic for the world of shipping, because it is flanked by two continents and two oceans through which most of the world's shipping passes. Thus, a good fleet of ships is needed as a means of transportation, as well as skilled, trained and competent crews in their fields, in order to compete in the field of sea transportation at regional and international levels as it is today. Load planning is one of the most important things in the world of shipping because it concerns the stability and safety of all crew and passengers on board. At the time of loading and unloading and when sailing, the ship

always gets forces both from the cargo being unloaded and from objects and the surrounding nature: waves, currents, wind, collisions with docks, other ships or aground. These forces cause the ship to experience sway and other movements. In bad weather, these forces will get bigger and will cause the ship to capsize. So we need to know the ship's ability to deal with these forces and the probability that the ship will capsize. Generally, passenger ships have more than enough stability to ensure that regulations are complied with when their cargo is full but in practice sometimes ships can lose their stability when they are overloaded, therefore the condition of the ship needs to be ensured in order to meet the existing minimum stability regulations. If this is not followed then the safety of the ship, crew and goods will be at stake. Therefore, it is necessary to know the problems or problems that disturb the stability of the ship in sailing so that it can make cargo planning and problem solving and prevent the occurrence of rocking on the ship considering that sailing safety is the main factor for ships. This is an effort to improve sailing safety. Therefore, the authors are interested in conducting research with the title "Optimizing the Load Arrangement of Crossing Ships as an effort to improve ship stability and sailing safety".

II. Method

The approach used in research is qualitative research. This research will be a research descriptive using qualitative data. In order to be more sensitive in capturing information qualitative, used a case study in the form of status research subjects with respect to a phase specific or typical of the whole personality in the form of individuals, groups and institutions or institution. The data collection method in this research uses literature study and the data sources used are primary data sources that relevant to the research. Observation method, which is observation by looking at and observing yourself, then recording behavior and events that occur in actual circumstances or participating in observing and listening as much as possible. In this data collection, the writer made direct observations to related parties related to activities related to the implementation of guard services. Documentation methods, namely the collection, selection, processing and storage of information in the field of knowledge, as well as data collection and sorting based on research needs to be processed into information. Interview method, namely data collection by asking a number of questions orally to be answered orally as well. Interview is a form of communication between two people that involves someone who

wants to get information from other people by asking questions based on specific objectives. Data analysis in research is an activity related to understanding, explaining, interpreting and looking for relationships between the data obtained.

This activity can be done by providing patterns, arrangements, sequences, classifications, themes and so on so that the data can be understood and interpreted. Analysis in this form is more of a researcher effort to describe the data in a systematic, patterned manner so as to produce a good and complete understanding. The technique used by the writer in doing this scientific work is descriptive qualitative method. Data obtained from various sources. uses various data collection techniques (triangulation), and is carried out continuously until the data is saturated. Qualitative data analysis can be defined as an effort made by processing data, compiling data, sorting it out, and looking for what is important and what can be learned.

III. Main Heading of the Analysis or Results

Handling and managing cargo on board The handling and regulation of cargo on board involves several aspects, including the following: a. Cargo Handling and Management Principles. b. Load Handling Planning. c. Implementing Load Management Principles of Handling and Load Management. There are 5 (five) Principles of Handling and Regulation of Loads, namely: a. Protect the Ship. b. Protect Payload. c. Utilization of loading space as much as possible. d. Loading and unloading quickly, regularly and systematically. e. Protecting crew and workers.

The following is an explanation of the principles of handling and regulating these loads. Protect the ship. Protecting ships means creating a situation where in carrying out cargo handling and regulation activities, the ship always remains in good, safe and seaworthy condition. To be able to achieve these goals, what needs to be paid attention to is the distribution of loads that must be proportional in its arrangement, both vertically. Transverse, Longitudinal and load distribution specifically on intermediate decks.

Vertical Load Distribution Concerning transverse stability issues. If the vertical load distribution is concentrated at the bottom, the ship will have a large GM value, and consequently the ship will have. rigid nature (Stiff). If the vertical distribution of cargo is concentrated at the top, the ship will have a small GM value, and as a result the ship will have a tender nature. Load Distribution Longitudinal (Longitudinal) Concerning the

problem of Trim, Sagging and Hogging. If the longitudinal distribution of cargo is concentrated at the front, then the ship will have a Trim front condition (Trim by the head), the Forward draft is greater than the After draft ($F > A$). And vice versa) If the longitudinal distribution of cargo is concentrated at the rear, the ship will have a rear trim condition (Trim by the stem). After draft is bigger than Forward draft ($A > F$). If the longitudinal distribution of cargo is concentrated in the middle of the ship, then the ship will have a Sagging condition. Amidships draft is greater than Mean fore and of ($MD > MFA$). Vice versa, if the longitudinal distribution of cargo is concentrated at the ends, the ship will have a Hogging condition.

The mean fore and aft are greater than the Amidships draft ($MFA > MD$). Ships that are in a condition of Sagging or Hogging, will cause stresses that can cause damage to the joints of the ship, especially on the deck and the hull plate. Transverse load sharing concerns the problem of slope in the ship's rolling. If the transverse distribution of cargo is not balanced with the center line, it will certainly result in the ship experiencing a sloping condition (List). If the charge distribution is transversely balanced . to the entry line but centered on the wing- wings, the rolling of the ship will be slow or slow (Tender), and vice versa if it is centered on the center line, the rolling of the ship will be fast or stiff (Stiff). Load sharing specifically on the intermediate deck (Tween Deck) Concerning the problem of Deck Load Capacity.

The arrangement of payloads on the Intermediate Deck, needs special attention, especially in the arrangement of heavy loads, so that the concentration of the weight of the load on each part of the deck does not exceed the capacity limit of the deck's capacity. Therefore, the Mualim and the skipper must know or be able to calculate the amount of ability. the capacity of each deck so as not to cause damage to the deck. The capacity of the deck capacity (Dec Load Capacity) is expressed in tons/m², which means the amount of weight that can be accommodated by a deck for each square meter.

2. Protect the payload The purpose of protecting cargo is about responsibility. the carrier (Carrier) for the safety of the cargo that is loaded from a port to its destination port safely as the condition of the cargo as it was received. The carrier's responsibility for the safety of the cargo is based on "From Sling to Sling" or "From Tackle to tackle". In order to be able to maintain safety or protect the cargo, the Carrier in carrying out its duties and responsibilities must be well acquainted with the properties and types of these loads so

as to avoid damage to the cargo caused by: a. ship sweat b. Payload Sweat c. Leakage/wetness from other loads. d. Friction with the skin or hull. e. Friction with other loads. f. Load handling. g. Other loads. h. Spontaneous heating i. Theft (Pilferage). In order to avoid / prevent damage caused by the things mentioned above, what must be done properly and appropriately are: a. Application Usage (Dunnage). b. Lashing and securing c. Provision of Ventilation. d. Charge Separation. e. Excellent planning.

3. Utilization of loading space. Utilization of the maximum possible loading space is related to the mastery of broken stowage, namely the arrangement of loads carried out in such a way that the available cargo space can be filled with as much cargo as possible and the unused cargo space can be reduced as small as possible. Broken stowage is the percentage (%) of the amount of lost space or unused space or loss space in the arrangement of cargo in a hold. The thing that can't be avoided on the cargo regulator into a hold is the occurrence of Broken stowage in places which include: a. Hatch corners. b. End hatches c. In the sewer area (Bilge). d. In the topmost load arrangement (Top tie). e. Between loads In carrying out load regulation activities, the causes of Broken Stowage are: a. The shape of the hatch. b. Payload Form. c. Load type. d. Skills of Labor / workers. To overcome the occurrence of Broken Stowage, the things that must be done are: a. Selection of the shape of the load in accordance with the shape of the hatch. b. Grouping and selecting the type of payload. c. Use of charger d. Payload control. e. Use of Dunnage to a minimum.

A. Problems In Structuring Ferry Cargo As An Effort To Improve Ship Stability And Safety

Indonesia is an archipelagic country located between the Pacific Ocean and the Indian Ocean. So that sea transportation becomes indispensable in the distribution process to each region. Its forest area reaches 75 percent of its area. An example of a case study of a ship that had an accident is KM Senopati Nusantara operated by the shipping company PT. Prisma Vista, a Ro-Ro type ship with a weight of 2,718 GT and a passenger capacity of 1250 people. The initial assumption was that the disappearance of the ship was due to bad weather and the release of vehicle straps, especially large trucks, so that the vehicle swayed beyond the maximum limit, causing the ship to overturn. In addition, the dimensions of the ship on the crossing must be considered, including the draft height, ship height, and freeboat height because they can affect the conditions when sailing and

leaning. The SPM inspection process is carried out so that when the ship is operating it does not cause problems (accidents) because the SPM determined by the Ministry of Transportation is the finishing of class standardization and harbormaster, the SPM determined by the Ministry is compiled based on Safety of live at sea (SOLAS).

One type of ship that is often found in Tanjung Perak Harbor is a Ro ro (Roll on – Roll over) ship. This ship has a rampdoor for the entry and exit of vehicles from the ship to the port and from the port to the ship. Inter-island crossing ships in their operations carry passengers and their vehicles. Generally the vehicles transported are privately owned passenger vehicles, city transport buses, trucks transporting goods and others. This type of ship serves as a liaison between islands in Indonesia for entry and exit. On this ship there is a ramdoor door that can be opened when leaning on the port. . In addition to Ro-Ro ships, there are also ships with a container transportation system, so there are many ships that are specifically used to deliver container loads from the loading port to the destination port of unloading as a means of transporting goods. In an effort to increase the flow of goods in the international world, this container system is able to pack cargo safely and move and move more quickly. we find that by using the container system, the benefits that can be obtained are that the time used for loading and unloading is carried out quickly. Facilitate supervision on the part of the cargo owner, because loading can be carried out in its own warehouse. Reduces the risk of damage and theft. Separation can be made of goods that have mutually damaging properties Judging from some of the advantages above, this system can push down the cost of transporting the goods being transported and be able to compete in the world of sea transportation, especially in terms of transporting goods. Thus, the community's demands for sea transportation services for the distribution of goods so that they arrive in their hands can be fulfilled. The smooth means of sea transportation can make the difference in the price of goods from one place to another stable. Especially on islands that produce a commodity with islands dominated by consumers. The success of this system certainly helps equitable development which is one of the government's programs. The system of transporting goods by Ro ro ships or containers also requires a security system when the cargo is on board. It should also be noted that a ship in the free sea on its voyage can move freely in all directions in different directions, this is because of the influencing forces, namely (rolling, pitching, yawing, swaying, heaving, surging) in the presence of these

forces. containers as cargo are also affected. Therefore, the arrangement of the cargo during the loading process at the port and the installation of equipment is very necessary, to ensure the safety of the ship, crew, and especially the cargo of goods during the voyage to the port of destination. Problems that often arise in the arrangement of shiploads include trim by the stern and trim by the head. Hogging occurs when the distribution of the weight of the load is concentrated at the fore and aft ends of the ship. Sagging occurs when the weight of the cargo is concentrated in the center of the ship.

In addition to the above, problems in cargo arrangement are caused by factors that influence, among others, different shapes and characteristics, type and structure as well as weight, far and near the destination port, the number of loading and unloading ports and the shipping area to be traversed, in connection with with different weather. Phenomena that occur in the sea, sailing ships face waves with long wave periods experiencing dangerous situations. In obtaining treatment from waves, the ship experiences 2 types of movements, namely: Rotational movement, this motion is a circular motion including: rolling, pitching and yawing. Translational (linear) movement, this motion is a straight, uniform motion according to its axis including: surging, swaying and heaving.

Between these movements can cause the cargo or vehicle in the ship to shift on an inclined plane, thus affecting the stability of the ship. When an object is tilted, several forces are involved, such as changes in the direction of motion, shape and speed.

Friction is a force that acts on an object and its direction is always against the direction of motion of the object. Friction will only act on an object if there is an external force acting on the object. The force can be a solid with a solid and a liquid with a solid. Comparison of General Requirements of Cargo Securing for Several Transportations. Sliding For cargo of 1000 kg with friction with a floor of 0.3 for several modes of transportation. Tipping For cargo of 1000 kg with a position as shown below and the ratio of height / width equal to 3. Another problem faced in the arrangement of ferry cargoes as an effort to improve the stability and safety of the ship is not according to the rules and capabilities of the ship, for example many shipping companies in Indonesia have poor management so that they force their ships to load more goods than the capabilities and construction of the ship. even though all the supporting equipment, both lashing and the ability of the deck to withstand the load on it sometimes exceeds normal.

This of course is very dangerous for the continuity of the cruise while traveling. Another example, although the arrangement of goods or the arrangement of the location of the cargo is good, the security equipment to bind the bottom of the cargo to the hull used is in damaged condition, so it is not able to hold and lock the cargo on the hull properly and the number is decreasing, so that if full load will cause other dangers to the cargo on board the ship.

B. Optimization Of Ferry Cargo Arrangement As An Effort To Improve Ship Stability And Sailing Safety

Ship is a water vehicle with a certain shape and type, which is driven by wind power, mechanical power, other energy, towed or towed, including vehicles with dynamic support capacity, underwater vehicles, as well as floating equipment and floating buildings that do not move. (Kemenhub, 2016). A ship that begins its journey by sailing at sea from the port of origin and the port of destination is a ship's activity in sending cargo. when the ship performs anchoring and mooring activities at a certain port, the ship is in the process of picking up cargo to be transported to the destination and sending the cargo to the owner of the goods. In the process of loading and unloading and the preparation of cargo into marine transportation equipment, especially for heavy loads, good and systematic handling is needed so that the preparation process can take place effectively and efficiently. the hold of the ship regarding the number, weight and location. This activity should consider the load at the previous port, the port of destination, the strength and stability of the ship. Stowage Plan or cargo compaction is the placement and arrangement of cargo according to the nature, shape, type of package and the purpose of each cargo. In connection with this, the placement and arrangement of cargo (stowage) must be carried out properly and the stability of the ship and the safety of shipping also needs to be maintained. According to Martopo (2004) Load arrangement or Stowage is a knowledge of loading and unloading cargo from and to the ship regarding the types of cargo, loading planning, the nature and quality of the goods to be loaded, cargo maintenance, the use of loading equipment, and provisions. -Other provisions relating to the safety of ships and cargo.

Meanwhile (Martopo, 1999) states that "Stowage Plan is a loading plan that is made or planned before loading goods, for all cargo on board". Based on some of the expert opinions above, it can be concluded that the Stowage Plan is a cargo arrangement plan

where we can find out the location, amount and weight of the cargo so that loading and unloading activities can be carried out properly and can take into account the length of time loading and unloading takes place. There are 2 (two) types of stowage plans, namely: Tentative Stowage Plan is in the form of *ancar-ancar* for a cargo arrangement plan made before the ship arrives at the loading port or before loading, made based on the Booking List or Shipping order received for a certain ports and the Final Stowage Plan, which is a description of information that shows the actual condition of the cargo locations along with the amount and weight in each hold equipped with a Consignment mark for each particular port.

After completing the cargo control activities, the actual condition of the cargo contained in the hold can be seen in this Stowage Plan, therefore, the Stowage Plan should be made as accurate as possible because it is one of the documents that is quite important and can function as. evidence of liability for the arrangement of cargo in the hold in the event of a claim for compensation from the cargo owner (Consignee). In addition to the Stowage Plan made by the Carrier as information material about the cargo that is in each hold, the Carrier still needs to make a Hatch List and Discharging List to complete the information contained in the Stowage Plan, because of course complete information regarding the cargo cannot be fully covered by the Stowage Plan. The usefulness of the Stowage Plan is to be able to know the location of each load as well as its quantity and weight, to be able to plan the unloading activities to be carried out, to be able to calculate the number of workers needed, to be able to calculate the length of time the unloading takes place and as an accountability document for the arrangement of the load. The uses of the Stowage Plan are: being able to know the location of each load as well as its number and weight, being able to plan the unloading activities to be carried out, being able to calculate the number of workers needed, being able to calculate the length of time the unloading takes place and as an accountability document for the arrangement of the load.

The handling of cargo must fulfill five principles of good loading, including protecting the crew and workers, protecting the ship, protecting the cargo, loading and unloading properly and systematically and using the maximum possible loading space (Kosasih, 2000). For that we need a good loading plan (Stowage Plan) in order to meet the principles of efficiency and effectiveness in the preparation of cargo into the ship's space so that loading can run smoothly and meet the effectiveness of loading times. In practice,

the load is divided according to its type as follows, a. Wet load cargo that is wet or in the form of a liquid that is shipped in packages, such as cans, drums, barrels, etc. underneath it is dunnage in such a way that the leak can flow directly into the side hatch of the hatch, so as not to damage other loads. b. Liquid Load liquid cargo that is loaded in bulk in deep tanks or tankers. which includes liquid cargo: CPO / palm oil, fuel, etc. c. Dry Load a type of load that does not damage other loads but can be damaged by other loads. Mainly by wet loads. classified as dry cargo, cigarettes, rice, flour and others. d. Dirty load cargo that causes dirt or dust during or after loading and unloading, which will cause damage to clean and smooth loads. e. Net load cargo that does not damage other loads, because it does not cause dust or dirt, which includes clean loads: klontong goods, glassware, cotton, yarn etc. f. Smelly charge: the type of charge which by the nature of the smell can damage other loads, and can also damage each other among other odorous loads.

For example: raw rubber, ammonia, fish, wet wood, fleece, cloves, cinnamon, etc. g. Sensitive or Smooth Load: is a material that is easily damaged by the influence of dirty, wet and smelly loads. For example: wheat flour, rice, milk powder and other dry ingredients h. Dangerous Payload: types of loads that require special attention as they pose a fire or explosion hazard. Hazardous cargo is divided into several groups. Load Unload quickly and systematically Avoid Long Hatch The ferry transports various types of vehicles that aim to cross to the island according to a predetermined ship route. Thus the number of vehicles that enter the ship, it should be necessary to arrange the placement of these vehicles. However, managing its placement alone is not enough to provide security on board the ship. Therefore, efforts are made to avoid changing the position of the vehicle that has been placed in a position where it will not disturb the stability of the ship. The methods used include: Use of support poles. The use of these support poles is generally not available on ferries used for passenger crossings, but is available on car carriers that distribute cars to consumers. The use of this support pole is intended to maintain the position of the car carried by the ship so as not to interfere with stability. Binding Use. On current ferries, cars in the form of large trucks are tied using fasteners to prevent the truck from shifting. Use of beams Usually the use of blocks to prop up the wheels of the vehicle so as not to roll. If the owner of the vehicle forgets to use the handbrake or the vehicle is damaged by the handbrake, then this block is very helpful.

In accordance with the Regulation of the Minister of Transportation Number 30 of 2016 concerning Obligations to Bind Vehicles to Crossing Transport Vessels, the Ferry Port Authority Office functions to supervise its implementation. In accordance with the provisions of this regulation, it is stipulated that: Vehicles that must be lashed are those placed at the bow, midship, and stern of the vehicle deck; Vehicles that are in between are not required to be lashed but only wheel clamps are carried out; The maximum distance between front and rear vehicles is 30 cm and left and right is 60 cm.

In addition, based on observational studies in the field, the implementation of vehicle binding and spacing between vehicles according to these regulations has not been carried out optimally. Some of the problems identified in the field can be explained, among others: The lack of awareness of shipping companies to apply vehicle binding in accordance with the provisions. Implementation supervision by OPP officers tends to be weak; There is no standard for lashing equipment and lashing methods so that various variations of lashing ropes and ways of tying vehicles on ships are found; There is no standard vehicle wheel clamping equipment that does not require lashing; Shipping companies tend to maximize vehicle loading space so that they do not consider the maximum distance between vehicles according to the provisions in this regulation. Less strict supervision by OPP officers is likely due to lack of knowledge of the impact if the vehicle is not lashed on the ship. The inspection covers aspects of passenger service as regulated in the Regulation of the Minister of Transportation and the Decree of the Director General of Land Transportation. From the results of participation in the inspection, almost all of the inspected vessels have met the SPM requirements, except for small, insignificant notes. In this condition, the shipping company will be given time to improve or adjust to the provisions and then it is proposed again to get the approval of the SPM for Crossing.

C. Discussion

Optimization of cargo arrangement can be done by doing filler cargo. Filler cargo is a small cargo that can be arranged or placed between other loads or large loads. The empty space should be filled with dunnage which will be broken stowage. So this cargo filler is to minimize broken stowage. Dunnage can also be used for load separation, in order to carry out unloading quickly and systematically. Dunnage Ingredients: Wood or Bamboo Burlap board Corrugated Cardboard Dunnage fixed. What is meant by fixed dunnage,

for example: -boards mounted on top of the tanktop, basement floor of the hatch-sweat blades or spar ceiling attached to the side walls of the hatch, generally 5 cm thick with a width of 15 to 18 c, these sweat blades also serve as a gap for the passage between the payload and the hatch wall. The purpose of using a dunnage is to protect the load against damages caused by the presence of: Free liquid, Condensation or condensation Collision, Sudden Heat Friction, Theft Furthermore, to keep fast loads from shifting, especially deck loads, materials for lashing are used: steel wire, rope, chain, etc. according to the load. Do not remove the old lashing if you are going to replace it with a new one or tighten it. It is better to add, by tightening the new one, then the old one is also tightened.

IV. Conclusion

Problems in structuring ferry cargo as an effort to improve ship stability and safety Based on the results of research that has been carried out, the problems in the arrangement of shiploads, among others, are caused by factors that influence, among others, different shapes and characteristics, type and structure and weight, far and near the destination port, the number of loading and unloading ports and shipping areas. to be traversed, due to different weather. Optimization of ferry cargo arrangement as an effort to improve ship stability and sailing safety Optimizing the arrangement of ferry cargoes can be done by using support poles to maintain the position of the car carried by the ship so as not to disturb stability. Binding Use. to prevent the truck from moving. The use of blocks to prop up the wheels of the vehicle so as not to roll. Must avoid Overstowage, Overcariage. Can do filler cargo and use Dunnage

V. Suggestion

In order to handle narcotics abuse cases, especially for addicts and victims of drug abusers, Investigators and Public Prosecutors together with the national narcotics agency optimize the assessment process. With the optimal implementation of assessments, it is likely that medical rehabilitation and social rehabilitation efforts will be carried out.

The implementation of medical rehabilitation, as one of the new breakthroughs made possible by narcotics laws can be one of the efforts in addition to the use of criminal sanctions in breaking dependency and the possibility of increased narcotics circulation.

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