Conference Paper

Analysis of Log Cargo Handling Management

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Abstract

Log cargoes are bulk cargoes and could be loaded in holds on the deck. Logs have their own characteristics and particular treatments, especially when loaded on the deck. In this case, loading logs was conducted in two ports where specific skills and good preparation were needed because there was a possibility on missing cargo calculation. There are some methods of cargo calculation which were carried out manually and using the program. This research used fishbone and descriptive qualitative analysis. The purpose of this research was to make log cargo handling easier, more effective and efficient for one port to another port. The result showed that the implementation of loading management was done in four stages including planning, organizing, actuating and evaluating. In the first port, logs are loaded in holds and not contained fully. Then in the second port, the rest of logs were completely loaded on the deck. There is a difference on the cargo calculation because of the ontaking value of hydrostatic table.

Keywords: Log, cargo handling management, draught survey.

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1. Introduction

An item produced by the producer cannot be directly accepted by consumers. Therefore, a system called a distribution or shipping is needed. Shipping or distribution is a marketing activity that used to facilitate the delivery of goods and services from producers to consumers. Distribution of goods has a function. According to Andriansyah (2015: 23) the function of distribution delivers the product from the location where the product was produced until where they will be used.

Distribution is related to transportation. Transportation is the movement of people or goods from one place to another by using a vehicle driven by humans or machines. Transportation requires transportation equipment. According to Andriansyah (2015: 20) the types of transportation equipment are highway transportation, railroad transportation, sea transportation, air transportation, pipeline transportation, combined transportation (containerization).

In sea transportation there are various types of transportation based on its functions, such as passenger ships, tankers, Ro-Ro vessels, and cargo ships. Passenger ships, as

the name suggests, it is a means of transportation to carry people from island to another island. According to Semedi (2010: 62), a tanker is a ship that has a deck where tanks are integrally or separately arranged to transport bulk oil (crude oil or oil that has been distilled), chemical liquids, or liquefied gases. Ro-Ro Vessels are ships designed to load and unload goods onto ships on wheels (Semedi: 2010). Cargo ships are all types of ships that carry goods and cargoes from one port to another port, across the ocean. Due to their ability to carry various types of loads in large numbers, freighters or cargo ships become the lifeblood of world trade.

Cargo ships are divided into several types based on the type of cargo they carry, such as container ships, general cargo ships, and bulk carriers. Container ships carry cargo in container packaging, while general cargo ships carry packaged goods such as chemicals, food, furniture, machinery, vehicles, footwear, or clothing. Meanwhile, bulk carriers are ships that carry unpackaged cargo, for example wheat, coal, timber logs, etc.

MV. Pan Daisy where researchers carried out this research was a bulk semi log carrier vessel which can load cargo in bulk form, packaging load (sacks, packs, etc.), to wood loads or logs. MV. Pan Daisy has loaded the grain type, packed cargo to wood (log). Log Cargo is wood that is still intact when it is cut from the tree (not cut and split vertically from the original). This charge has a variety of sizes. Log loads can be loaded in hatches and on decks. The process of loading the log must meet the principles of loading, including protecting the ship, protecting the cargo, protecting the crew, maximizing the use of cargo space or full and down and systematically loading.

In general, log loads were loaded and unloaded from one port to destination ports. Researchers conducted research on the MV. Pan Daisy, and at that time the ship was carrying logs onto two ports and unloading them at one port. This loading was considered by the court to be unusual to vessel itself or unusual for other ships.

2. Literature Review

2.1. Cargoes

According to Sudjatmiko (1995:64) the ship's cargoes are objects of sea transportation because by transporting merchant, ships earn money which determines the sustainability of related shipping company. Therefore, each problem could affect the company profit.

Here are the classifications of carried cargoes:

1. Homogeneous cargoes and heterogeneous cargoes
2. Unitized cargoes and bulk cargoes

2.1.1. Log cargoes

Log cargo, according to Lloyd's Encyclodic (1895:626) is the load of wood that has not been processed and loaded on board. Based on Pan Ocean manual (tth:1) load of wood could be classified into three classes namely timber, lumber and log. *Timber* are trees that grow wood which is suitable for buildings or for woodworkers. Lumber is a log or timber that is ready to use. *Log* is a large or long section of wood that has not been formed or processed. In other words, logs are a large, irregular and unprocessed piece of wood Logs have many types. *Code of Safe Practice for Ship Carrying Timber* (2011:21) classifies logs based on the type as follow:

TABLE 1: Log Cargo Classification.

Type of timber cargo	Density [ton / m^3]	Volume factor [m^3 hold space / m^3 cargo]	Stowage factor [m^3 hold space / ton of cargo]
Sawn wood			
Packages of sawn wood with even ends	0.5 – 0.8	1.4 -1.7	1.8 – 3.4
Packages of sawn wood with uneven ends	0.5 – 0.8	1.6 – 1.9	2.0 - 3.8
Packages of planed wood with even ends	0.5	1.2 – 1.4	2.4 - 2.8
Round wood			
Coniferous round wood, fresh (bark on)	0.9 – 1.1	1.5 - 2.0	1.4 - 2.2
Broad-leaf round wood, fresh (bark on)	0.9 – 1.5	2.0 - 2.5	1.3 - 2.8
Round wood, dried (bark on)	0.65	1.5 - 2.0	2.3 - 3.1
Debarked coniferous round wood, fresh	0.85 – 1.2	1.5 – 2.0	1.2 – 2.4
Debarked broad-leaf round wood, fresh	0.9 – 1.0	1.5 – 2.5	1.5 – 2.8
Debarked round wood, dried	0.6 – 0.75	1.2 – 2.0	1.6 – 3.3

Based on the table, it is seen that different log condition–whether it is skinned or not, or dried or not–will have different weight and different *stowage factor* (SF).Besides their types, logs could also be classified based on their places or plans. Pan Ocean Manual (tth:3) explains type of log based on their place. Logs that are loaded in Southeast Asia including the Philippines and Kalimantan Island, are mostly called meranti wood. The woods' length ranges from 10-15 ft to 20 ft, and their weight ranges from 1-2 tons to 10-15 tons.

2.1.2. Cargo Handling

Cargo handling skills are essentials when the cargoes are loaded on board. According to Martopo and Soegiyanto (2004:07) arrangement and loading technique on board is

one of sea proficiencies which concern on many kinds of aspect about how to load on board, maintain cargoes during sailing and how to discharge in destination port.

Stowage or handling of cargo is a knowledge of loading and unloading form on the ship by considering and implementing 5 (five) good loading principles. The main principles of loading are protecting crew and laborers, protecting the ship, protecting the loads, loading and unloading quickly and systematically, preventing loss space.

2.2. Handling the log cargoes.

Naturally, log load have different shapes and sizes. Therefore, special handling is required to load them on board both holds and on the deck. When the log is loaded, especially on the deck it may cause the danger such as shifting of log, losing load or falling logs, or even damaging the ship's structure. Therefore, it is necessary to handle them properly and appropriately.

2.2.1. Preparation

The preparation stages for loading can determine the readiness of the ship to receive / load logs. Preparation stage before log loading, according to Isbester (1993: 210), is sweeping or cleaning the hatches from all debris. The holds have to be cleaned and tested too. After the cargo holds are in clean condition, Isbester (1993: 210) adds that all cranes must be thoroughly inspected and all damages and wires that are not suitable must be replaced including deck cranes, sling wire, and cargo hooks. The condition of the lifting equipment must be perfect in accordance with the criteria. lasing tools include turnbuckles, shackles, snatch blocks, over lasing wire, hog / center lasing wire. After all equipment is ready, there are several things to do before carrying out the loading in the holds. According to Istopo (1999: 303), loading process must firstly started with seeing the draft of the back, left and right faces, measuring Sea Gravity (SG) time, sounding all tanks including ballast tanks, freshwater and all tanks Fuel Oil and Diesel Oil. A draft survey is conducted to find out the initial displacement.

2.2.2. Loading in hold

The first step in loading the log is to begin loading in the hold. Then the draft survey must be carried out to determine the weight of the empty vessel. After that the log loading is carried out. Then a pre-loading draft survey is carried out to determine empty ship

displacement. In general, the log load is loaded homogeneously or one type of charge. Referring to the International Association of Classification Societies (1997: 13) similar charges refer to load loading, generally divided in all holdings. Thus the log link is divided equally at the maximum capacity of each hold. Isbester (1999: 211) adds that loading the first arrangement of logs on the top tank should be done carefully, so that a good storage arrangement will be achieved, and the broken stowage (BS) is minimized. The loading of logs in the hold uses an excavator to arrange the load, so that the BS can be minimized as little as possible. Logs are lifted from land / barges using cranes and cargo wire slings which are then arranged by an excavator. After loading process has been accomplished, hatch cover is cleaned and tightly closed. Then, a draught survey should take place. Draught survey aims to calculate how many cargoes are being loaded.

2.2.3. Loading on deck

The loading of logs on deck should be based on the Code of Safe Practice for Ships Carrying Timber (2010: 12), where the basic principle for the safe carriage of timber cargo decks is to make the stow solid, compact and stable, and the basic principle of safe loading of wood on deck is to create a solid loading, properly arranged and stable. To obtain the good principle, loading process must be carried out based on the following orders:

1. Draught Survey.

   After loading in the holds has been completed and the hatch cover was completely closed, the draught survey is carried out. According to Istopo (1999: 304) draught survey aims to find out the amount of weight in each hold. This is very important and is needed to calculate the metacentric height (GM) at the end of the process of loading. From the above definition, the authors conclude that stanchions are vertical poles on the right and left deck of the ship. Its function is as a barrier as well as a log loading space on the deck.

2. Log loading on the deck

   This stage is the main one in loading log on the deck. When loading on the deck, not just any logs can be loaded. According to Isbeter (1993: 211) the logs should be lighter and longer as they can be loaded on deck; it is for stability reasons and to ensure safeguarding loads. The area between hatch coaming and the ship

side stanchions must be carefully stowed with the longest log at the ship side and these logs are tighten up to each other.

According to Istopo (1999: 304) after the wood is as high as one stack above the hatch lid, a wire is installed. It spreads loosely around the stanchion from left to right on the wood and it will tighten itself if it is pressed over the log. This process is called the lasing center.

After the lasing center is done, the logs are loaded again on it. The logs must be loaded with the middle section higher than the side, so when more logs are loaded, the lasing will secure all of them. After completing loading the entire logs, over lasing is done. Over lasing, according to the Code of Safe Practice for Ships Carrying Timber (2010: 31), is a frictional lasing method whose effect is creating a vertical pressure that increases friction force between the outer stows of deck cargo and the ship's deck / hatch cover.

3. Binding/lasing

In loading logs on deck, spinning is very important to keep the load safe and to maintain the stability of the ship. lasing is an inspection or security supervision on the binding of cargo for the transportation process so that it will safely arrive at the destination. According to Taylor (1991: 123) lasing is a complimentary term to use of cargo gear. lasing is a term related to the use of loading and unloading equipment. It is an activity of binding or securing the cargo using charge binding devices so that the load is safe.

In loading logs on deck there are more than one lasing systems to use. These lasing systems are center lasing or middle lasing and over lasing or final lasing. The definition and explanation of lasing methods are as follows:

4. Center lasing

The center lasing, according to Istopo (1999: 304), is a lasing that travels around the stanchion from left to right on wood in a loose condition, and it will tighten itself if it is overloaded on it. Center lasing was carried out when the load on deck was as high as one stack above the hatch lid. The center lasing has the function of tightening the ship's stanchion because the wire is connected to the stanchion. This lasing center requires 200 m of wire rope with a diameter of 22.5 cm, and shackle a number of stanchions per hold. The center lasing starts from tying the eye/ pad eye wire in the stanchion at the end with a shackle, then pulling across and forming a zig zag.

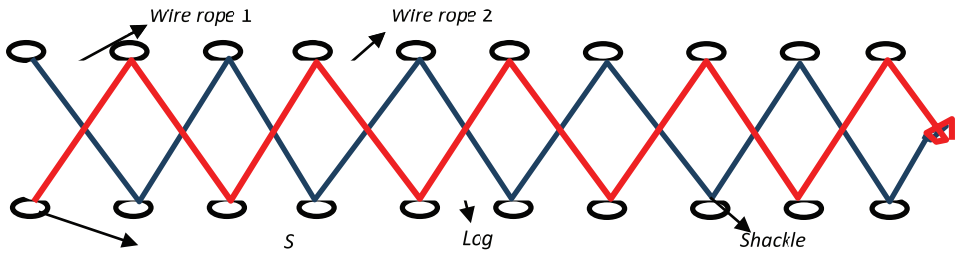

Figure 1: Center lasing.

5. Over lasing

   Over lasing is the last lasing on the log load which aims to secure the log by sewing using wire rope. Over lasing is quite complicated, because it uses a variety of lasing tools, such as lasing chains, foot wire, wire rope lasing, shackles, turnbuckles, snatch blocks, and wire clips.

   Firstly foot wire and lasing chain are attached to the pad eye that is on the deck and is pulled up onto the load. Then, associate shackle, turnbuckle and snatch block to each foot wire and lasing chain. Start inserting wire rope lasing into each snatch block in zig-zag movement and sewing it with wire.

6. Lasing material.

   lasing material can be classified into two ways, there are fixed lasing material and portable lasing material. Based on the Pan Ocean Cargo Securing Manual (eg: 19) fixed lasing equipment includes: Fixed stanchions, Collapsible stanchions, Spawn wire, Fastening wire, Heaving wire, Heaving snatch block, Heaving shackle.

   According to Pan Ocean *Cargo Securing Manual* (tth:41), those which are included as *portable lasing material* are as follows: Lasing chain, Turnbuckle, Foot wire rope, Bonding wire/ over lasing wire, Snatch block, Hog lasing wire rope, Wire clip, Shackle.

2.3. Draught Survey

According to United Kingdom P&I Club (2008:3), draught survey is a commercially acceptable form of weighing that is based on Archimedes Principle, which states that anything that floats will displace an amount of the liquid in which it is floating equal to its own weight. Briefly, the weight of the ship is determined both before and after loading and allowances made for differences in ballast water and other changeable items. The difference between these two weights is the weight of the cargo.

3. Methods

According Sugiyono (2009:224) said that, data analysis is process of finding and systematically arranging the data obtained from interview, observation and documentation.

This research used *mixed method research* (MMR). This research method can be applied and is concerning on the combination between quantitative method and qualitative method in a research (Masrizal:2011:53). In another view, Creswell and Clark (2007:5) say that mixed method is a research design which departs from the philosophical assumption of the inquiry method. According to Creswell and Clark's definition of MMR (2007:7), it can be described as integrating quantitative and qualitative data.

The following is data analysis. The researcher used two analysis approaches as follows.

1. Fishbone Analysis

   Fishbone or Fishbone diagrams are one of the methods / tools in improving quality. This diagram is often called the cause-effect diagram. The basic function of the fishbone diagram is to identify and organize the causes that may arise from a specific effect and then separate the root causes.

2. USG (*Urgency, Seriousness and Growth*).

   The second method of analysis is urgency, seriousness, growth (USG). This USG method determines the level of urgency, seriousness and growth of issues by determining a scale of 1-5 or 1-10. Issues that have the highest total score is the priority issue.

4. Results and Discussions

The implementation of management log cargo handling in two ports is done through a procedure as follows: pre-loading preparation, initial draught survey, cargo hold and cargo gear inspection, loading in hold (not full), draught survey in hold, shifting to second port, initial draught survey, loading rest of in hold, draught survey final in hold, on deck cargo space and cargo gear inspection, completing loading in hold, fumigation, shifting lasing tools to shore and rise stanchions, loading on deck, center lasing, over lasing, and final draught survey. The different calculations of the log cargo between manual calculation and direct calculation using the program The results of observation and the calculations of log cargo are described in table 1.

Table 2: Draught survey calculation.

No	Ship's condition			No	Ship's condition	
1	LOA		179.9 m	6	SG	1.023
2	LBP		171.5 m	7	Constant	300.0 MT
3	Breadth moulded		28.4 m	8	Ballast	10618.65 MT
4	Depth moulded		14.1 m	9	Fuel oil	608.60 MT
5	Read draught	Port (P)	Stbd (S)	10	Diesel oil	26.47 MT
	Fwd (dFo)	4.21 m	4.21 m	11	Lube oil	0.00 MT
	Mid (dMo)	5.41 m	5.42 m	12	Fresh water	290 T
	Aft (dAo)	6.66 m	6.66 m			
Displacement		**Manual = 20922.19 MT**		**Program = 20612.94 MT**		
Different		**309.25 MT**				

Table 1 shows that there were differences of the results of draft survey calculations from manual calculations and calculations done using the program. From manual calculation, the ship displacement was 20922.19 MT., whereas from calculation using the program, the ship displacement was 20612.94 MT. It was found that the difference between the two calculation was 309.25 MT.

A loading of cargo on board is arranged, and it is called management. Because each load has different characteristics, management organizes the loading work effectively and efficiently.

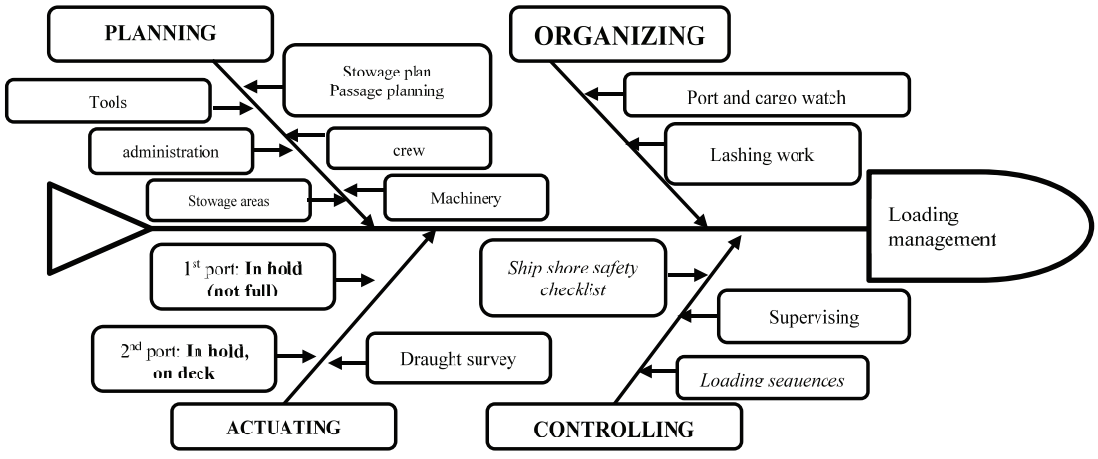

Figure 2: The fishbone analysis at the implementation of loading management.

Based on the results of the fishbone analysis at the management of the loading of logs in two ports, MV. Pan Daisy covered four factors comprises of preparation planning, organizing, actuating and controlling. The followings are the results of the fishbone analysis concerning the implementation of log loading management.

Table 3: Result of fishbone analysis.

Observed factors	Result
1. *PLANNING /PREPARATION*	a. Passage plan. b. Stowage plan. c. Preparation of loading gear. d. Preparation of machinery. e. Preparation of document and port paper. f. Preparation of stowage space.
2. *ORGANIZING*	a. Arrangement of port watch. b. Distribution role on lasing.
3. *ACTUATING*	a. Loading in 1^{st}: *in hold.* b. Loading in 2^{nd}: in hold, *on deck.* c. Cargo calculation.
4. *CONTROLLING*	a. *Ship shore safety checklist.* b. *Loading sequences.* c. Loading supervision.

2). The difference between manual calculation and direct calculation using the program

Since the differences in calculating draught surveys occurred, it was suspected that there was a possible factor causing the difference of calculation to occur. Therefore, in order to measure the possible factor, USG Approach was used to analyze the priority scale.

In analyzing the data using the USG approach, the researcher has designed the problem factors that cause differences in the results of draught survey calculations. The followings are the problem factors that cause differences in the results of the draught survey:

Problem A: Draught survey calculation support tools.

Problem B: Human Resources' capability in calculating draft surveys.

Problem C: Method of calculating draft surveys.

Problem D: Readings on ship draft markings.

Table 4: USG difference of cargo calculation.

NO	PROBLEMS	ANALYSIS OF COMPARISON	U	S	G	RESULT				PRIORITY
						U	S	G	T	
A	Draft survey calculation support tools.	A-B A-C A-D	B C D	B C D	A A D	0	0	2	2	III
B	Human Resources' capability in calculating draft surveys.	B-C B-D	C B	C B	C B	2	2	2	6	II
C	Method of calculating draft surveys.	C-D	C	C	C	3	3	2	8	I
D	Readings on ship draft markings.	-	-	-	-	1	1	1	3	IV

From the USG analysis table above, it was found that the main problem that affected the difference in draught survey results was problem C, namely method of calculating draught surveys.

The condition of the ship at the time of the calculation was as follows:

Table 5: The condition of the ship at the time of calculation.

No	Ship's condition			No	Ship's condition	
1	LOA		179.9 m	6	SG	1.023
2	LBP		171.5 m	7	Constant	300.0 MT
3	Breadth moulded		28.4 m	8	Ballast	10618.65 MT
4	Depth moulded		14.1 m	9	Fuel oil	608.60 MT
5	Read draught	Port (P)	Stbd (S)	10	Diesel oil	26.47 MT
	Fwd (dFo)	4.21 m	4.21 m	11	Lube oil	0.00 MT
	Mid (dMo)	5.41 m	5.42 m	12	Fresh water	290 T
	Aft (dAo)	6.66 m	6.66 m			

Comparison between manual and program calculations.

Table 6: Comparison of manual calculations and using programs.

NO	Manual calculation		Program's calculation	
1	dF	4.12 m	dF	4.123 m
2	dA	6.806 m	dA	6.806 m
3	dO	5.37 m	dO	5.371 m
4	t	2.68 m	T	2.683 m
5	dM	5.46 m	dM	5.46 m
6	0d	-0.09	Mean draught	5.417
7	D_1	20935.95 t	Quarter mean	5.394
8	M.T.C	444.60	0d	-0.094
9	T.P.C	41.69	M.T.C	18.82
10	L.C.F	4.9	1^{st}trim corr/D_2	-319.635
11	D_2	319.90 t	2^{nd} trim corr.	39.500
12	D_3	-292.77 t	Corr. Disp	20653.24 t
13	D_4	-40.90 t	SG corr	-40.299
14	D	20922.19 t	**Corr. Disp by SG**	**20612.94 t**
Displacement		**20922.19 t**		
DIFFERENCES RESULT			**309.25 t**	

Based on the calculation above, the difference in calculation was 309.25 t. After calculating the data and comparing them, it was found that manual calculations of draught survey took data of Moment to change trim by 1 cm (MTC), Tonnes per centimeter immersion (TPC), Longitudinal centre of floatation (LCF) and displacement from hydrostatic book from mean draught (dM). Meanwhile, when using the program, the

data were taken from from hydrostatic table using value of quarter mean. Mean draught (dM) was average value of mid ship draught, while quarter mean draught was average draught quarter of the ship.

5. Conclusion

From all discussions that have been explained in the previous subchapters about log loading management in two ports, some conclusions can drawn.

1. The implementation of loading log management in 2 (two) ports is started from the planning stage (voyage plan, stowage plans, machinery, administration and stowage space). Then, the stage organization consists of cargo and port watch, lasing duty. Then, it is followed by the next stages namely inspection and draught survey, in hold loading, fumigation, final in hold draft survey, shifting to the second port, preparation of loading on deck, initial draft survey on deck, loading on deck, center lasing, over lasing, and final draft survey. Then, supervision stages take place to ensure security and to monitor the order of loading. The supervision stages were done by the minimum number of supervisors at the loading process and deck officer.
2. The difference between manual calculation and program calculation occurred when taking data from hydrostatic. Differences came from the value that was used for taking data from hydrostatic table. Manual calculation used mean draught (dM), while the program used quarter mean (qM).

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