Application of Ballast Water to Maintain The Stability of The Ship when Loading Avtur in The Lecturer Internship Program on The MT Senipah

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Abstract. The maritime world is very rapidly developing today and requires human resources who are very skilled in their fields, also the maritime world is not a business without risks, one of which often occurs is ship accidents, both caused by external factors and internal factors such as bad weather, high waves or fires that can sink ships. One of the factors causing ship accidents at sea from within is the role of the crew who do not pay attention to the calculation of the stability of the ship so that it can disrupt the general balance which as a result can cause fatal accidents. As is well known, ballast is one of the ship's stability devices that greatlyaffects the weight of a ship that can make it stable and prevent capsizing or to petrifyit upright again.

Such is the importance of knowledge of calculating ship stability, especiallythe influence of ballast water for shipping safety, therefore every crew member concerned or even prospective crew must be equipped with a set of knowledge andskills in maintaining the stability conditions of their ships so that safety and comfortof shipping can be achieved. This research was carried out for 2 weeks of internshipon the MT SENIPAH ship owned by the company PT. PERTAMINA.

This research uses qualitative methods using observation, interview and documentation methods. Primary data is obtained directly by observing and interviewing the skipper and secondary data is obtained from data collection and documentation. The results of this study show the importance of the use of ballast for ships when loading in ports because ballasts are proven to help regulate ship stability from ship trim, ship draft, and the degree of inclination of the vessel.

Keywords: Ballast Water, Ship Stability, Avtur

1. Introduction

This internship program has been initiated by the Directorate General of Higher Education since the 80s. In 2005, it was reactivated in line with the change in status of several private universities to state universities. Currently, the internship program is expanded to include private universities. Lecturer internship program activities for placement on MT. Senipah with SBM Cengkareng - Cirebon route which was taken for two (2) days and we carried out this Internship for fourteen (14) days on the ship.

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Ballast water system studies conducted in several countries have shown that many species of bacteria, plants and animals can survive in viable forms in ballast water and sediments carried on ships. The potential for ballast water discharges to cause harm has been stated not only by the International Maritime Organization (IMO), but also by the World Health Organization (WHO). All those concerned with the safe operation and passage of vessels can be assured that they are equally protecting the marine environment and ensuring the safety of the vessel and crew.

Tabel I. 1. Hold / Tank arrangement, tank capacities and pump availability

Hold / Tank	Capacity	Pump/s available
FPT	1231.680	WBP 1 & 2
1P	1444.440	WBP 1 & 2
1S	1548.631	WBP 1 & 2
2P	1303.059	WBP 1 & 2
2S	1407.250	WBP 1 & 2
3P	1251.906	WBP 1 & 2
3S	1356.096	WBP 1 & 2
4P	1251.908	WBP 1 & 2
4S	1356.098	WBP 1 & 2
5P	1243.284	WBP 1 & 2
5S	1347.474	WBP 1 & 2
6P	1351.043	WBP 1 & 2
6S	1458.954	WBP 1 & 2
APT	653.877	-

Tabel I. 2. Allowable Ballast Exchange Methods (SEQUENTIAL and/or FLOW-THRU) for each compartment, as ascertained after evaluating individual tank/ hold location, configuration, construction and stated limitations/ restriction.

Identity of Tank / Hold	Capacity of tank / hold	Allowable Method/s
FPT	1231.680	Sequential and Flowthru
1P	1444.440	Sequential and Flowthru
1S	1548.631	Sequential and Flowthru
2P	1303.059	Sequential and Flowthru
2S	1407.250	Sequential and Flowthru

3P	1251.906	Sequential and Flowthru
3S	1356.096	Sequential and Flowthru
4P	1251.908	Sequential and Flowthru
4S	1356.098	Sequential and Flowthru
5P	1243.284	Sequential and Flowthru
5S	1347.474	Sequential and Flowthru
6P	1351.043	Sequential and Flowthru
6S	1458.954	Sequential and Flowthru
APT	653.877	Sequential and Flowthru

Ballast exchange should be carried out during calm sea and wave conditions, and in acceptable weather conditions. Vessels should also adhere to minimum/maximum fore and aft laden so as to prevent blocking, maintain maneuverability and maintain platform visibility. These factors along with more information on wave-induced hull vibration will help the ship's Skipper to determine a safe form of operation to control the dynamic effects on the vessel during deep-sea ballast water exchange.

2. Research Method

2.1 Type of Research

Based on the opinion of Walidin & Tabrani (2015, p. 77) qualitative research is a research process to understand human or social phenomena by creating a comprehensive and complex picture that can be presented in words, reporting detailed views obtained from informant sources, and carried out in a natural setting.

2.2 Researcher Presence in the Field

The presence of researchers in the field is very important. The role as a research data collector and directly see and find phenomena that occur and take place. His presence is absolute in searching, conducting interviews, observing, recording and documenting research findings. In addition, the presence of researchers provides information in confirming the rechecking of data findings to the final findings of the study.

2.3 Place/Location and Time of Research

This research is an internship for placement on the MT Ship. Senipah with the Company PT Pertamina International Shipping Directorate of Fleet Management Patra Jasa Office Tower Lt. 14 Jl Gatot Subroto Kav. 32-32, East Kuningan, Setiabudi Dis-

trict, South Jakarta Postal Code 12950 with the SBM Cengkareng - Cirebon route which was traveled for two (2) days.

2.4 Data Source

Primary Data

Primary data is data that comes from the original or first source. This data is not available in complicated form or in file form. This data must be sought through the source or respondent, namely the person who is the object of research. In the preparation of this scientific proposal, primary data is obtained through observations and interviews with all crew members and officers on the ship.

Secondary Data

Secondary data is data obtained from data collection techniques that support primary data. data collection techniques that support primary data. This secondary data comes from documents on the ship, tank washing SOPs, ship inspection documents, ship history, notes, SMS, photos and others that are used as supporting data. Some considerations in finding secondary data: the type of data must be in accordance with the research objectives that have been determined previously, the secondary data required does not emphasize quantity, but quality and suitability. Therefore, it must be selective and careful in using it. Secondary data is usually used as support for primary data. Therefore, both are mutually used as a source of information to complete this research.

2.5 Data Collection Techniques

Secondary data is obtained from the study of documents either in the form of written, pictorial, or moving documents such as videos, or in any form as long as the data can enrich and support the research (Arikunto, 2010: p.22). Data collection techniques in this study used three data collection techniques, namely interviews, observation and documentation studies.

2.6 Data Analysis Techniques

The presentation for this proposal research is to use the Descriptive method, which is research that contains exposure and description of an object of problems that arise at a certain time. This method is used to describe in detail with the aim of providing information about problems that arise and relate to the material discussed in this proposal. Miles and Huberman in (Sugiyono, 2010), state that activities in data processing and analysis include data collection, data display, data reduction, conclusion drawing and verification.

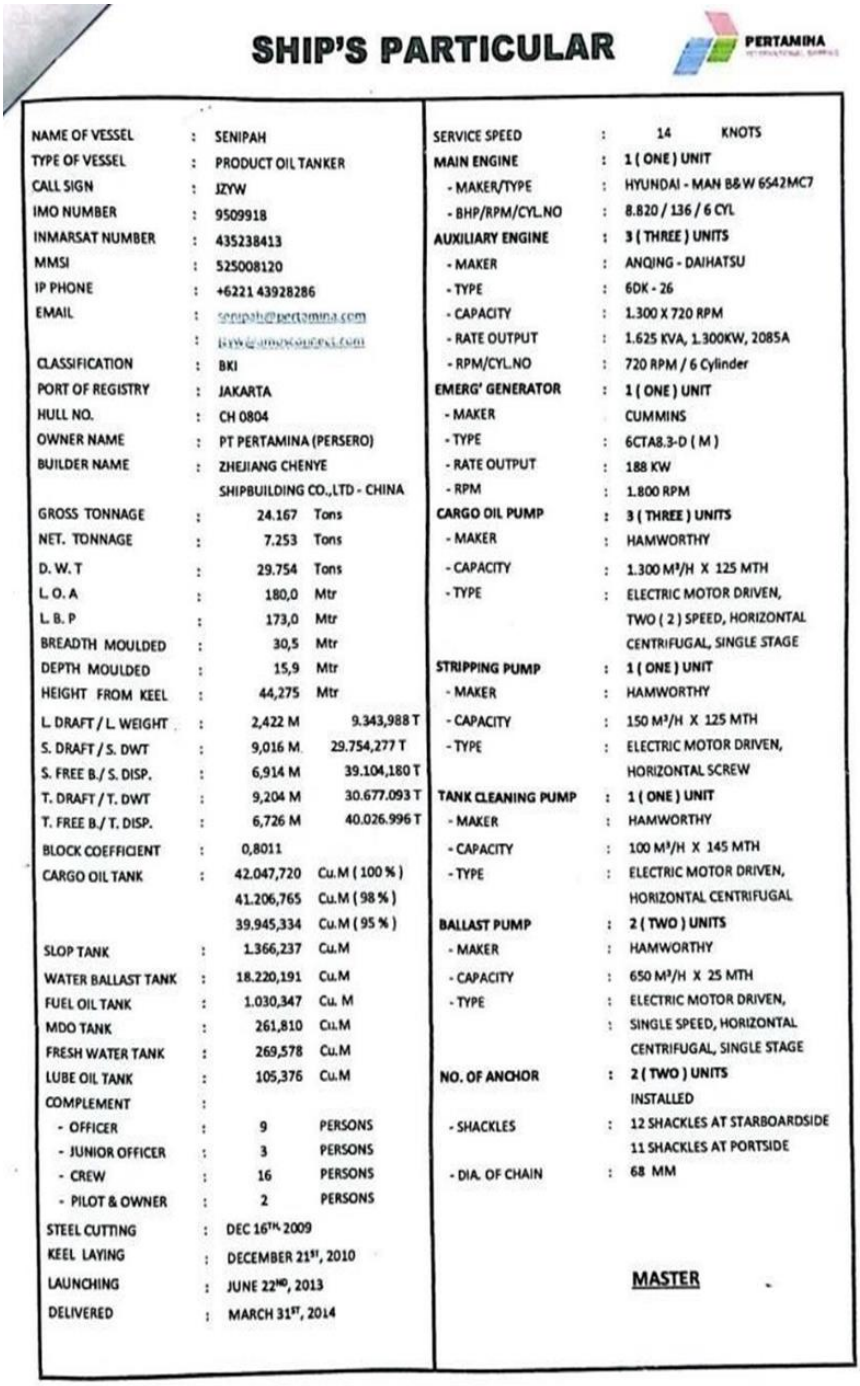
3. Results and Discussion (Main Heading of the Analysis)

This section is the most important section of your article. The analysis or results of the research should be clear and concise. The results should summarize (scientific) findings rather than providing data in great detail. Please highlight differences between your results or findings and the previous publications by other researchers.

3.1 General Description of the Research Location/Subject

The following are some descriptions of experiences or data - data that has been experienced by the author at the time of carrying out internship practices and making this research, where the author finds how the application of air ballast in stabilizing the ship in the process of loading AVTUR which is used as fuel for aircraft. The following is a description of the ship data where the author conducted the research.

Gambar IV.1 Kapal MT Senipah
Source : Researcher Documentation



SHIP'S PARTICULAR

PERTAMINA

NAME OF VESSEL	:	SENIPAH	
TYPE OF VESSEL	:	PRODUCT OIL TANKER	
CALL SIGN	:	JZYW	
IMO NUMBER	:	9509918	
INMARSAT NUMBER	:	435238413	
MMSI	:	525008120	
IP PHONE	:	+6221 43928286	
EMAIL	:	senipah@pertamina.com	
	:	jzyw@anonsource.com	
CLASSIFICATION	:	BKI	
PORT OF REGISTRY	:	JAKARTA	
HULL NO.	:	CH 0804	
OWNER NAME	:	PT PERTAMINA (PERSERO)	
BUILDER NAME	:	ZHEJIANG CHENYE SHIPBUILDING CO.,LTD - CHINA	
GROSS TONNAGE	:	24.167 Tons	
NET. TONNAGE	:	7.253 Tons	
D. W. T	:	29.754 Tons	
L. O. A	:	180,0 Mtr	
L. B. P	:	173,0 Mtr	
BREADTH MOULDED	:	30,5 Mtr	
DEPTH MOULDED	:	15,9 Mtr	
HEIGHT FROM KEEL	:	44,275 Mtr	
L. DRAFT / L. WEIGHT	:	2,422 M	9.343,988 T
S. DRAFT / S. DWT	:	9,016 M	29.754,277 T
S. FREE B./ S. DISP.	:	6,914 M	39.104,180 T
T. DRAFT / T. DWT	:	9,204 M	30.677.093 T
T. FREE B./ T. DISP.	:	6,726 M	40.026.996 T
BLOCK COEFFICIENT	:	0,8011	
CARGO OIL TANK	:	42.047,720	Cu.M (100 %)
		41.206,765	Cu.M (98 %)
		39.945,334	Cu.M (95 %)
SLOP TANK	:	1.366,237	Cu.M
WATER BALLAST TANK	:	18.220,191	Cu.M
FUEL OIL TANK	:	1.030,347	Cu. M
MDO TANK	:	261,810	Cu.M
FRESH WATER TANK	:	269,578	Cu.M
LUBE OIL TANK	:	105,376	Cu.M
COMPLEMENT	:		
- OFFICER	:	9	PERSONS
- JUNIOR OFFICER	:	3	PERSONS
- CREW	:	16	PERSONS
- PILOT & OWNER	:	2	PERSONS
STEEL CUTTING	:	DEC 16TH, 2009	
KEEL LAYING	:	DECEMBER 21ST, 2010	
LAUNCHING	:	JUNE 22ND, 2013	
DELIVERED	:	MARCH 31ST, 2014	

SERVICE SPEED	:	14 KNOTS
MAIN ENGINE	:	1 (ONE) UNIT
- MAKER/TYPE	:	HYUNDAI - MAN B&W 6S42MC7
- BHP/RPM/CYL.NO	:	8.820 / 136 / 6 CYL
AUXILIARY ENGINE	:	3 (THREE) UNITS
- MAKER	:	ANQING - DAIHATSU
- TYPE	:	6DK - 26
- CAPACITY	:	1.300 X 720 RPM
- RATE OUTPUT	:	1.625 KVA, 1.300KW, 2085A
- RPM/CYL.NO	:	720 RPM / 6 Cylinder
EMERG' GENERATOR	:	1 (ONE) UNIT
- MAKER		CUMMINS
- TYPE	:	6CTA8.3-D (M)
- RATE OUTPUT	:	188 KW
- RPM	:	1.800 RPM
CARGO OIL PUMP	:	3 (THREE) UNITS
- MAKER	:	HAMWORTHY
- CAPACITY	:	1.300 M³/H X 125 MTH
- TYPE	:	ELECTRIC MOTOR DRIVEN, TWO (2) SPEED, HORIZONTAL CENTRIFUGAL, SINGLE STAGE
STRIPPING PUMP	:	1 (ONE) UNIT
- MAKER	:	HAMWORTHY
- CAPACITY	:	150 M³/H X 125 MTH
- TYPE	:	ELECTRIC MOTOR DRIVEN, HORIZONTAL SCREW
TANK CLEANING PUMP	:	1 (ONE) UNIT
- MAKER	:	HAMWORTHY
- CAPACITY	:	100 M³/H X 145 MTH
- TYPE	:	ELECTRIC MOTOR DRIVEN, HORIZONTAL CENTRIFUGAL
BALLAST PUMP	:	2 (TWO) UNITS
- MAKER	:	HAMWORTHY
- CAPACITY	:	650 M³/H X 25 MTH
- TYPE	:	ELECTRIC MOTOR DRIVEN, SINGLE SPEED, HORIZONTAL CENTRIFUGAL, SINGLE STAGE
NO. OF ANCHOR	:	2 (TWO) UNITS INSTALLED
- SHACKLES	:	12 SHACKLES AT STARBOARDSIDE 11 SHACKLES AT PORTSIDE
- DIA. OF CHAIN	:	68 MM

MASTER

Gambar IV. 2. Ship Particular

Source : Researcher Documentation

3.2 Research Results

PT Pertamina International Shipping (PIS), as an Integrated Marine Logistics Sub-holding inaugurated in 2021, was initially formed through a spin-off of the charter out business with the aim of obtaining real income, which later on a consolidated basis will provide benefits to PT Pertamina (Persero) in a professional manner, in accordance with applicable shipping practices.

Data Presentation Activity: at Cilacap Port.

The author makes observations to find out how preparations are made when starting to load Avtur.
Date: June 17, 2023

Based on the observations made by the author in the loading and unloading process at the port there are several problems such as the ship tilting too much to the right or left, the ship is too nungging or dongak and the draft of the ship is less or more which results in the ship not being able to sail properly. From these problems the role of ballast is needed to regulate the stability of the ship when loading so that the ship can sail properly.

Tabel IV. 1. Types of activities on board MT Senipah

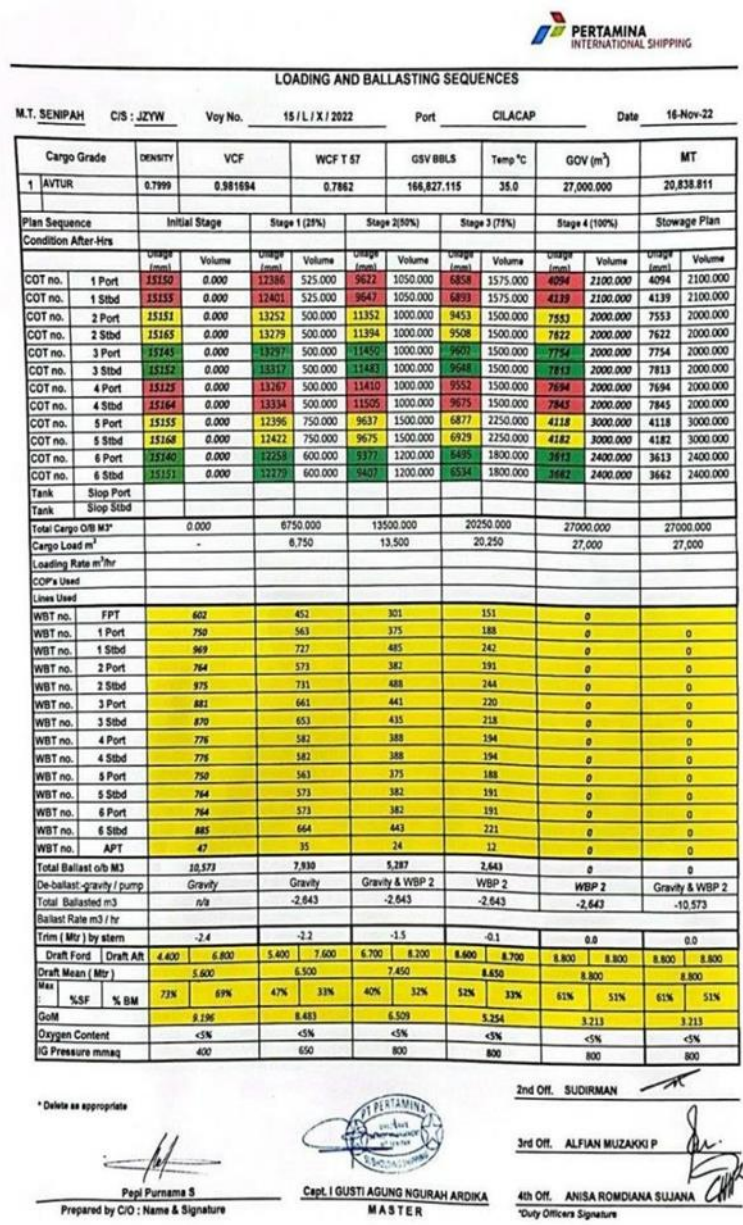
HARI KE-	TANGGAL	JENIS KEGIATAN DAN AKTIVITAS
1	17th Juni, 2023	Pilot On Board Cilacap Anchorageberthing Cilacap Port
2	17th Juni, 2023	Loading Avtur
3	18th Juni, 2023	Loading Avtur
4	19th Juni, 2023	Loading Avtur
5	20th Juni, 2023	Pilot On Board sailing to Cengkareng, Jakarta SBM

Ballast Water Reporting Form Format

This form is an example developed within IMO, serving as a guide to be used when reporting to national authorities requesting information in advance. To avoid misunderstandings, a guide to filling out the form is included in this plan. It should be noted that question 3, "Number of tanks on board" refers only to the total number of separate ballast tanks.

Care should be taken before using this general form, that the country visited does not have its own form to use when reporting. (It would be very convenient to return proof of all transmittals to the authority to which the guidance applies):

a) Ballast water logs are held to capture the origin and discharge of water taken or discharged from ballast tanks.
b) Both forms aim to record the type of information often requested by quarantine Officers who wish to learn about the source of ballast water on board.
c) Even if the vessel is not currently trading in an area where ballast water information needs to be reported, it may later prove useful to have a history of what water has been carried.
d) Here, it should be understood that although different operational records on board may contain the information required by the log, consolidating all the data in the log, will provide an easier inspection regime, saving valuable time of the ship's staff in port to attend to other in-port operations.



PERTAMINA INTERNATIONAL SHIPPING

LOADING AND BALLASTING SEQUENCES

M.T. SENIPAH C/S : JZYW Voy No. 15 / L / X / 2022 Port CILACAP Date 16-Nov-22

Cargo Grade		DENSITY	VCF	WCF T 57	GSV BBLS	Temp °C	GOV (m³)	MT
1 AVTUR		0.7999	0.981694	0.7862	166,827.115	35.0	27,000.000	20,838.811

Plan Sequence		Initial Stage		Stage 1 (25%)		Stage 2(50%)		Stage 3 (75%)		Stage 4 (100%)		Stowage Plan	
Condition After-Hrs													
		Ullage (mm)	Volume	Ullage (mm)	Volume	Ullage (mm)	Volume	Ullage (mm)	Volume	Ullage (mm)	Volume	Ullage (mm)	Volume
COT no.	1 Port	15150	0.000	12386	525.000	9622	1050.000	6858	1575.000	4094	2100.000	4094	2100.000
COT no.	1 Stbd	15155	0.000	12401	525.000	9647	1050.000	6893	1575.000	4139	2100.000	4139	2100.000
COT no.	2 Port	15151	0.000	13252	500.000	11352	1000.000	9453	1500.000	7553	2000.000	7553	2000.000
COT no.	2 Stbd	15165	0.000	13279	500.000	11394	1000.000	9508	1500.000	7622	2000.000	7622	2000.000
COT no.	3 Port	15745	0.000	13297	500.000	11450	1000.000	9607	1500.000	7754	2000.000	7754	2000.000
COT no.	3 Stbd	15152	0.000	13317	500.000	11483	1000.000	9648	1500.000	7813	2000.000	7813	2000.000
COT no.	4 Port	15125	0.000	13267	500.000	11410	1000.000	9552	1500.000	7694	2000.000	7694	2000.000
COT no.	4 Stbd	15164	0.000	13334	500.000	11505	1000.000	9675	1500.000	7845	2000.000	7845	2000.000
COT no.	5 Port	15155	0.000	12396	750.000	9637	1500.000	6877	2250.000	4118	3000.000	4118	3000.000
COT no.	5 Stbd	15168	0.000	12422	750.000	9675	1500.000	6929	2250.000	4182	3000.000	4182	3000.000
COT no.	6 Port	15140	0.000	12258	600.000	9377	1200.000	6495	1800.000	3613	2400.000	3613	2400.000
COT no.	6 Stbd	15151	0.000	12279	600.000	9407	1200.000	6534	1800.000	3662	2400.000	3662	2400.000
Tank	Slop Port												
Tank	Slop Stbd												
Total Cargo O/B M3*		0.000		6750.000		13500.000		20250.000		27000.000		27000.000	
Cargo Load m³		-		6,750		13,500		20,250		27,000		27,000	
Loading Rate m³/hr													
COP's Used													
Lines Used													
WBT no.	FPT	602		452		301		151		0			
WBT no.	1 Port	750		563		375		188		0		0	
WBT no.	1 Stbd	969		727		485		242		0		0	
WBT no.	2 Port	764		573		382		191		0		0	
WBT no.	2 Stbd	975		731		488		244		0		0	
WBT no.	3 Port	881		661		441		220		0		0	
WBT no.	3 Stbd	870		653		435		218		0		0	
WBT no.	4 Port	776		582		388		194		0		0	
WBT no.	4 Stbd	776		582		388		194		0		0	
WBT no.	5 Port	750		563		375		188		0		0	
WBT no.	5 Stbd	764		573		382		191		0		0	
WBT no.	6 Port	764		573		382		191		0		0	
WBT no.	6 Stbd	885		664		443		221		0		0	
WBT no.	APT	47		35		24		12		0		0	
Total Ballast o/b M3		10,573		7,930		5,287		2,643		0		0	
De-ballast -gravity / pump		Gravity		Gravity		Gravity & WBP 2		WBP 2		WBP 2		Gravity & WBP 2	
Total Ballasted m3		n/a		-2,643		-2,643		-2,643		-2,643		-10,573	
Ballast Rate m3 / hr													
Trim (Mtr) by stern		-2.4		-2.2		-1.5		-0.1		0.0		0.0	
Draft Fore	Draft Aft	4.400	6.800	5.400	7.600	6.700	8.200	8.600	8.700	8.800	8.800	8.800	8.800
Draft Mean (Mtr)		5.600		6.500		7.450		8.650		8.800		8.800	
Max %SF	% BM	73%	69%	47%	33%	40%	32%	52%	33%	61%	51%	61%	51%
GoM		9.196		8.483		6.509		5.254		3.213		3.213	
Oxygen Content		<5%		<5%		<5%		<5%		<5%		<5%	
IG Pressure mmaq		400		650		800		800		800		800	

* Delete as appropriate

2nd Off. SUDIRMAN

3rd Off. ALFIAN MUZAKKI P

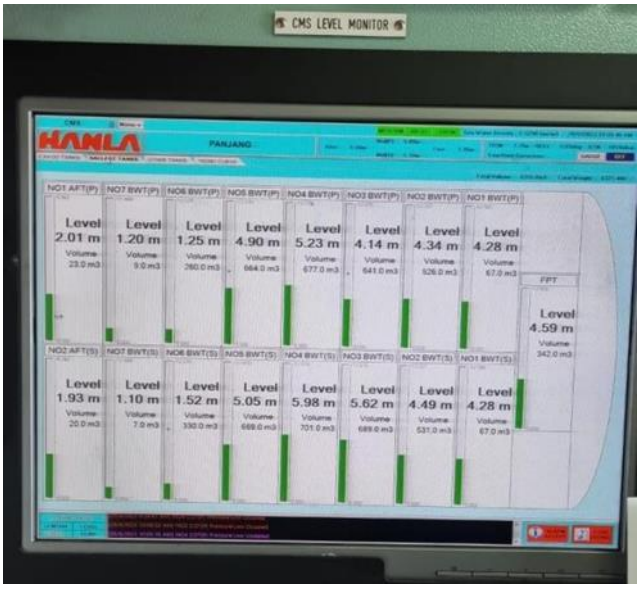
4th Off. ANISA ROMDIANA SUJANA

Pepi Purnama S
Prepared by C/O : Name & Signature

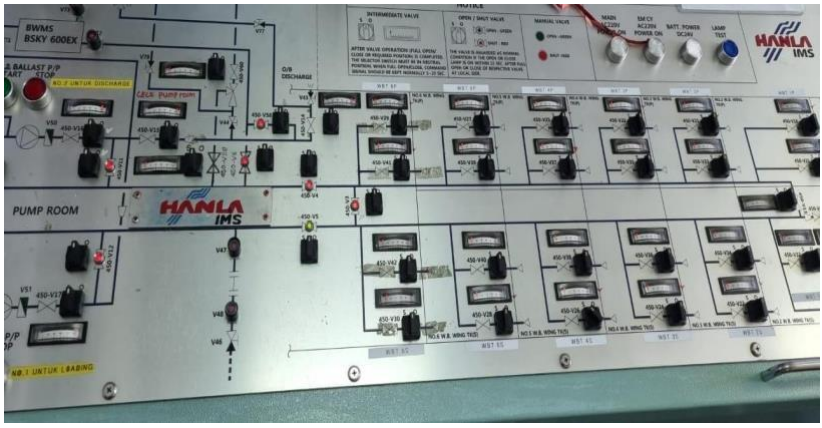
Capt. I GUSTI AGUNG NGURAH ARDIKA
MASTER

*Duty Officers Signature

Gambar IV. 3. Loading And Ballasting Sequences
Source: Researcher Documentation



Gambar IV. 4. Tampilan Ballast tank MT Senipah
Source: Researcher Documentation



Gambar IV. 5. Tampilan Panel Ballast tank MT Senipah
Source: Researcher Documentation

The following is a routine procedure in preparation for loading:
1) Loading master, Surveyor board the ship
2) NOR (Notice Of Readiness) Acc
3) Key and safety meeting
4) Sampling, sounding and cargo calculation
5) Hose installation
6) Check that all water discharge holes are sealed.
7) Sea suction when checking the pump room, check that the valve must be in the closed position.

8) Check that the connection on the manifold is completely tight.
9) Bravo flag or red circumferential lighting must be installed.
10)Valve must be in position according to the loading plan (manifold).
11)Check the tanks to be loaded, must be completely dry, so that Dry Certificate and others can be loaded to receive cargo. Also check Fore Peak and Cofferdam tanks must be dry.
12)Mast riser, which is a valve associated with the warinan system, must be open.
13)If necessary, mark the pipes and valves with chalk, and write the loading plan on the board.

Preparation procedure for discharging

An unloading plan should include the sequence of the discharge and should be approved by the ship's officer in charge and the terminal representative covering the following:

a.The stages at which the vessel's tanks will be dismantled taking into account the transfer or change of tanks both on board and ashore, prevention of contamination, pipe clearance
b.Prevention of contamination, release of cargo pipes for unloading.
c.Limiting stresses on the hull and the difference between fore and aft trim of the tanker.
d.Unloading speed (Rate), The initial rate and maximum rate must be determined by the state of the cargo to be unloaded.
e.Network and capacity of the ship's cargo pipes and cargo pipes on land and received in cargo hoses and ship or land loader arms. Precautions to prevent accumulation of static electricity.
f. Emergency stop procedure for unloading.

Interview results

The result of the interview is that ships that use ballast have many advantages from being easier to regulate the stability of the ship, in setting the draft or trim on the ship the use of ballast can also help the process so that the first mate has no difficulty in adjusting the draft of the ship. In addition, ships that use ballast will have a weight that is more manageable than ships that do not use ballast, therefore ships that use ballast use ballast, the weight of the ship will increase so that the ship will be more pulled down making the ship not easily swayed when exposed to large waves.

Data analysis

Activities carried out are filling ballast when making observations from to find out ships that use ballast are more stable than those that do not use ballast, seen from different GM values and better trim ships that use ballast are more stable than ships that do not use ballast.

When loading cargo when the ship tilts as a result of the load does not match the existing so that the load is heavier on the right. The occurrence of the ship tilting as a result of not matching the actual weight of the cargo with that in the loading order becomes something that is not predicted.

So the importance of using ballast to help stabilize the ship apart from the ballast function to stabilize the ship with the help of ballast can also help in adjusting the trim or draft of the ship.

Analysis of Interview Results: The results of interviews with the Skipper and Chief of Staff 1 are the importance of using ballast for ships either to maintain ship stability or to regulate ship trim and draft, but not all ships can use ballast, many old ships cannot use ballast because the ballast pump is no longer functioning or indeed on the ship does not use ballast or use dead ballast so ballast filling or disposal cannot be done.

3.3 Discussion

From the analysis of these data, the author gets the importance of using ballast for ships from when loading or in shipping, it can be seen that there will be a tilt on the ship due to the difference in the actual weight of the cargo and the weight on the loading order. From these results, the importance of ships to use ballast in addition to regulating stability can also be used to help regulate trim and draft on ships. In the process also when loading ships that use ballast it is easier to manage the load because the position of the ship when tilting can be directly stabilized by using ballast. The definition of ballast itself is seawater taken from the sea which is used as ship ballast to maintain ship stability, reduce stress on the ship's body, increase ship propulsion and maneuverability, and can also maintain a safe level of operation while the ship is sailing.

4. Closing

From the above research related After the researcher conducts research related to the importance of regulating cargo quickly and systematically based on the principles of loading on board the ship, it can be concluded that:

1. Factors for the less than optimal implementation of the garbage management plan on board the KMP Munggiyango Hulalo are due to the low knowledge of the ship's crew, lack of supervision and responsibility of the ship's officers, and the non-fulfillment of equipment requested to the company.
2. Efforts to improve the implementation of the garbage management plan on board KMP. Munggiyango Hulalo through the availability of garbage disposal posters that can be easily read and garbage disposal procedures carried out according to the rules, cooperation, and crew skills provide good implementation.

On this occasion, the author will also provide suggestions that may be useful for the company, crew, and also to complete the information contained in the research.

information contained in the research. The suggestions are:

1. Preparation of ballast loading arrangements to be maximized so that ship stability is well maintained, and also with the right ballast calculations both to be disposed of and loaded.
2. The existence of learning ballast calculations using modern technology that is developing today to all mualim and learning more accurate manual calculations to crew members.
3. Checking at least once a month on the ballast pump in coordination with the engine people related to this work so that they can find out the location that will need to be maintained and repaired so that the function of the ballast pump is even better.

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