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ANALYSIS OF OPTIMIZATION AND UTILIZATION OFCARGO BOAT ROUTES IN LOGISTICS DISTRIBUTION INOFFSHORE AREA

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ABSTRACT

This study discusses the optimization and utilization of cargo ship routes and trajectories in offshore logistics distribution. This study aims to identify problems that occur in logistics distribution, analyze the optimal utilization of routes and trajectories, and formulate strategies to improve efficiency in logistics distribution. The research method used is a case study with a qualitative and quantitative approach. The population is in the Oil and Gas Company, namely Pertamina Hulu Energi Offshore North West Java with a sample of 46 routes per week. The results of the study indicate that by optimizing cargo ship routes and trajectories, efficiency in the use of engine fuel can be achieved. The conclusion of this study is the importance of choosing the right route and trajectories to improve efficiency in offshore logistics distribution.

KEYWORDS: Fuel, Cargo boat tray, Route, Trayect, Utilization,

1. INTRODUCTION

Offshore logistics distribution involves the delivery of goods and materials to locations far from land, such as oil rigs, gas platforms, or remote islands. This is a major challenge because it involves complex route planning, unpredictable weather conditions, and the need for operational efficiency. Cargo boats, or cargo ships, are the primary means of transporting goods in offshore areas. The operational effectiveness of cargo ships is highly dependent on optimal route and route planning to ensure timely and efficient delivery. In carrying out operational activities in supporting oil and gas exploration and exploitation activities in meeting national oil and gas needs according to the mandate of the 1945 Constitution of the Republic of Indonesia Article 33 paragraph (3) which reads "The earth, water and the wealth contained therein are controlled by the state and used as much as possible for the prosperity of the people". In supporting this, planned optimization and utilization of all oil and gas operational lines are needed.

Where every company must have goals and targets to be achieved and one of them is to obtain profit or profit that can be used for the survival of the company to obtain large profits or profits, profit is often also a benchmark for success in a company management. Management deliberately to gain personal or organizational benefits in a process related to financial reporting. So that profit management can harm external parties of the company, because it can cause external parties of the company to make a mistake in decision making if based on information from financial reports that contain profit management practices (Wardani & Santi, 2018), (Wati, 2018). In achieving effective and efficient company goals, good planning and supervision are needed, especially optimizing operational costs. These things are supported by management's ability to see possibilities and opportunities and anticipate changes in conditions in the future. The costs incurred by the company in operating need to be controlled as well as possible, because even though operations can run smoothly and well, if they are not supported by efforts to be able to reduce operational costs as low as possible, it will result in decreased operational income (Pebriyanti, 2013).

In oil and gas companies in managing Marine operations in offshore areas such as PHE ONWJ, PHE OSES, PHE WMO, PHE NSO, PHM, PHKT, MUBADALA ENERG, EML, Medco E&P Natuna and others. All of these oil and gas processing companies are companies under the supervision of SKK MIGAS / Special Task Force for Upstream Oil and Gas Business Activities which is an institution formed by the Government of the Republic of Indonesia through Presidential Regulation (Perpres) No. 9 of 2013 concerning the Implementation of Upstream Oil and Gas Business Activities. Of course, every Oil and Gas Company has Core Values that are implemented,

as one example, Pertamina as one of the BUMN in accordance with SE-7 / MBU / 07/2020 implements Core Values - AKHLAK carried out by all its employees with the implementation of HSSE which is an absolute thing and is a work culture in the Pertamina Hulu Energi Subholding Upstream environment implementing the International Safety Management (ISM) code, HSSE Golden Rules Pertamina

Previous studies that proposed optimization of ship operational costs are studies by Fitria et al., (2022), R Gultom, (2017), Wardhana, et al., (2021) which stated that the results of ship operational cost optimization in stage 11 obtained that ship operational costs would be optimal if using a speed that was in accordance with the total operational costs. The speed decision remains at 19 knots for the Manokwari-Sorong voyage even though a penalty cost variable has been added when the ship is late. From Salamah et al., (2021) the results of their research are that from the analysis and interpretation of the data that has been carried out, it can be concluded that in its implementation during the first six years, the sea toll program has not had a significant impact on improving the economy of the 3TP region. Much evaluation is still needed regarding the implementation of this sea toll development policy. Because there are still many implementations in the field that are not in accordance with the initial target so that the implementation cannot be carried out optimally. From the description above, the author is interested in analyzing routes, trajectories and fuel consumption in offshore shipping companies.

Research Objectives

Based on the formulation of the problem, the objectives of this study are:

a. Analyzing the effect of changes in routes, days, size of carrying capacity, speed and loading and unloading activities at the port on the distribution of logistics supporting offshore activities simultaneously.
b. Analyzing the effect of changes in routes, days, speed, size of carrying capacity and loading and unloading activities at the port on the distribution of logistics supporting offshore activities partially.
c. Knowing the variables that have a dominant effect on routes, days, size of carrying capacity, ship speed during the voyage and loading and unloading activities at the port on the distribution of logistics supporting offshore activities.

2. LITERATURE REVIEW

Logistics Management

Logistics management according to experts as follows:

Garcia, Hernandez, & Hernandez (2013), Logistics management is part of supply chain management that plans, implements and controls the efficient and effective flow and storage of goods, services, and related information between the point of origin and the point of consumption to meet customer requirements. Siahaya (2012), states that logistics management is part of Supply Chain Management. Which plans, implements, and controls the flow of goods effectively and efficiently, including transportation, storage, distribution, and services and related information from the point of origin to the point of consumption to meet customer needs (Ruseno, et al, 2022).

Sea and Ship Transportation

Sea transportation is the activity of transporting and/or moving passengers and/or goods using water vehicles that have certain shapes and types, and can be driven by mechanical power, wind power or other forms of energy (Jinca, 2011). Transportation is needed because of the existence of production centers that are located differently from consumption centers. This difference concerns the abnormality in the value of production results from the area of origin for sale to the destination area in order to increase the value of the goods produced.

Ship Specifications

Ships built in shipyards certainly have a design or size that is intended to support the operational activities of certain sea transportation. In Law No. 17 of 2008 concerning Shipping Chapter 1 Article 1 that detailed supervision and analysis and inspection are carried out by the Classification and Government Agency so that the ship can be considered seaworthy and ready to be operated by its users by issuing a certificate:

The ship specifications contain all detailed ship data consisting of,

a. Ship register data including, port of registration, registration number at IMO, Official No., Ship nickname, registration from ship classification, and others.
b. Ship size data including, overall length of ship or LOA (Length over all), ship width, gross ship weight / GRT (Gross Register Tonnage), net ship weight / NRT (Netto Register Tonnage), dead weight / DWT (Dead weight Tonnage), empty ship draft, maximum draft, fuel tank capacity, fresh water tank capacity, and other data.
c. Data from the details of the installed machinery, the size and number of ship's propulsion engines, the size and number of electric generator engines, the pump capacities available on board both for fire fighting and cargo distribution.
d. Data and dimensions of the deck and support equipment installed on the ship's deck.
e. Data on Navigation and Communication aids, including Magnetic Compass and/or Gyro, Radar, ARPA (Automatic Radar Plotting Aid), Sea depth gauge or Echosunder, VHF Radio and GMDSS (Global Maritime Distress and Safety System), Wind speed and direction measuring devices.
f. Data on accommodation capacity for the crew and passengers.

3. RESEARCH METHODOLOGY

Population and Sample

The research conducted took samples from logistics distribution activities carried out in marine operations to support offshore activities in general and how to regulate marine operations carried out in one of the Oil and Gas Companies, namely Pertamina Hulu Energi Offshore North West Java.

Research on the optimization and utilization of routes and routes in logistics distribution at PT. Pertamina Hulu Energi Offshore North West Java (PHE ONWJ) in determining the number of samples from 52 populations using the Slovin Formula with a sampling error rate of 5%, then the minimum number of samples that must be taken is:

$$n = \frac{Ne}{1 + Ne}$$

$$n = \frac{52}{1 + 52\,(0.05)^2}$$

$$n = 46$$

So the minimum number of samples taken in this study was 46 routes each week.

Definition and Operational of Research Variables

Table 1. Definition and Operational of Research Variables

Variable	Dimension	Shipping Routes in a week			
		3 (Tiga) Rute (A)		2 (Dua) Rute (B)	
Sailing Distance (∑X)	Total Distance traveled in Nautical miles (Nm)	Total sailing distance of the West area route	∑X(A1) + e	Total sailing distance of the West area route	∑X(B1) + e
		Total sailing distance Central area	∑X(A2) + e	Total sailing distance of the East area route	∑X(B2) + e
		Total sailing distance East area	∑X(A3) + e		
Sailing Time (∑Y)	Total time taken for a voyage at normal speed from one area to another in hours.	Total timing distance of the West area route	∑Y(A1) + e	Total time distance of the West area route	∑Y(B1) + e
		Total timing distance Central area	∑Y(A2) + e	Total time distance of the East area route	∑Y(B2) + e
		Total time distance East area	∑Y(A3) + e		
Time Manouvering (∑Z)	The time required to maneuver the ship in maneuvering mode when approaching / entering / leaving the area in hours	Total time maneuvering at West area	∑Z(A1) + e	Total time maneuvering of the West area	∑Z(B1) + e
		Total time maneuvering at Central area	∑Z(A2) + e	Total time maneuvering of the East area	∑Z(B2) + e
		Total time maneuvering di East area	∑Z(A3) + e		
Fuel Consumption Shipping (∑Q)	Use of fuel oil in normal speed mode (c1) according to the agreed contract in liters.	∑Q(A) = A (∑X / ∑Y) * c1+ e (i)		∑Q(B) = B (∑X / ∑Y) * c1+ e (iv)	
Maneuvering Fuel Consumption (∑R)	Use of Fuel Oil in Maneuvering mode (c2) according to the agreed contract in liters	∑R(A) =A (∑Z) * c2 + e (ii)		∑R(B) = B(∑Z) * c2 + e (v)	
Shipping Route Operational Costs every Week (∑S)	Operating Cost Budget for fuel usage required in logistics distribution activities in Rupiah (IDR)	∑S(A) = [A(∑Q + ∑R) + e] * IDR…..(iii)		∑S(B) = [B(∑Q+ ∑R) + e] * IDR…..(vi)	

Source: author processed data

4. RESULTS AND DISCUSSION

Data Analysis Results

From the research and data collection from the sampling that has been done, there are several analyses where the logistics distribution method on the current route and route patterns are:

a. Shipping travel time on 3 (three) routes in a week with routes carried out on the following schedule:
b. Monday: Zulu - Papa - MM
c. Wednesday: Lima - Bravo - NGL - Arjuna Terminal
d. Friday: Echo - Foxtrot - Uniform - KLA
a. The use of fuel used for the above routes is high, because the "cargo boat" returns to the shorebase 3 (three) times a week.
b. Loading and unloading activities carried out at the shorebase 3 (three) times a week.
c. The management of the “Sailing Approval Letter” permit issued by the KSOP in charge of the work area, namely the Marunda KSOP in the Shorebase area and the Seirbu Islands KSOP in the offshore work area, was carried out 3 (three) times.
d. From this, large operational costs were incurred including the cost of purchasing fuel, berthing costs and handling loading and unloading, licensing costs and other operational costs.
e. Descriptive Statistics

a. Travel time and distribution route of logistics and materials carried out with 3 (three) routes with routes carried out on the following schedule:
Monday: Zulu - Papa - MM - KLA (travel time around 40 hours)

Wednesday: Lima - Bravo - NGL - Arjuna (travel time around 31 hours)
Friday: Echo - Froxtrot - Uniform (travel time around 36.5 hours)
Where the voyages carried out have the same patterns and needs in general between one offshore station and another. Different travel distances but in the cycle travel time in one route ranges from 31 - 40 hours of sailing.
b. Fuel Consumption
Monday's voyage route on the Zulu - Papa - MM route during the voyage until returning to the shorebase uses 4100 liters of fuel with a tolerance limit of 10% for normal use, so that it has an average fuel consumption limit every month of 4510 liters

Table 2. Summary of the use of fuel cargo boats for logistics distribution with 3 routes

Daily	Route	total distance	Steaming time	Fuel Consumption	Diviation	Total fuel comsumption
Monday	Zulu - Papa - MM	137	39,7	41	41	45,1
Wednesday	Lima-Bravo-NGL-Ardjuna	119	29,8	38	38	41,8
Friday	Echo-Foxtrot-Uniform-KLA	161	40	54	54	59,4

Source Author's data processing

The Wednesday shipping route on the Lima – Bravo – NGL – Arjuna Terminal route during the voyage until returning to shorebase uses 3800 liters of fuel with a tolerance limit of 10% for normal use, so that it has a monthly fuel usage limit of 4180 liters. The Friday shipping route on the Echo – Foxtrot – Uniform - KLA route until returning to shorebase uses 5400 liters of fuel with a tolerance limit of 10% for normal use, so that it has a monthly fuel usage limit of 5940 liters.

Table 3. summary of the use of fuel cargo boats for logistics and material distribution

2022	Minggu 1			Minggu 2			Minggu 3			Minggu 4		
Bulan	West	Center	East	West	Center	East	West	Center	East	West	Center	East
Jan	4560	4225	5980	4545	4190	5975	4499	4232	5970	4500	4187	5998
Feb	4545	4232	5987	4563	4230	5950	4545	4228	5980	4525	4225	5985
Mar	4675	4240	6000	4683	4225	5987	4675	4245	5958	4670	4238	5972
Apr	4548	4215	5975	4501	4178	5912	4555	4165	4405	4582	4181	5945
Mei	4478	4158	5745	4480	4085	5798	4425	3990	5795	4378	3975	5740
Jun	4460	4138	5835	4388	4125	5805	4398	4120	5806	4510	4138	5785
Jul	4418	4198	5740	4395	3985	5765	4500	4008	5792	4280	4095	5782
Aug	4518	4100	5870	4465	3895	5790	4390	3975	5890	4275	3989	5875
Sept	4410	4123	5843	4512	3990	5775	4425	3998	5805	4265	3995	5720
Oct	4540	4193	5965	4522	4103	5900	4520	4170	5945	4508	4168	5940
Nov	4548	4210	5970	4510	4168	5902	4535	4182	5915	4512	4150	5939
Dec	4550	4235	5960	4488	4180	5920	4550	4165	5970	4565	4210	5925
Rata-rata	4521	4189	5906	4504	4113	5873	4501	4123	5769	4464	4129	5884

* Fuel Control Team PHEONIX Marine

Cuaca Buruk | Angin <20 kts & Gel < 1m | Angin 20 kts & Gel. 1m | Material Urgent

Source Author's data processing

The average operational fuel consumption requirement in 2022 with operational conditions with differences in monsoon conditions (West wind) or bad weather with relatively high winds & waves and normal conditions and meeting sudden operational needs to offshore stations in parallel, where the fuel consumption requirement ranges from 4510 - 5940, that includes a 10% tolerance limit.

5. DISCUSSION

Fuel Consumption
In ship operations, where fuel consumption is certainly a major consideration, where fuel consumption is comparable to the specifications of the ship used, especially with the size of the ship's propulsion engine. As stated in the background of the problem, that around 70% of the budget costs of the operational costs are used for fuel.

In the ship procurement strategy, where the use of fuel for each ship has been regulated and agreed upon in each ship's operating mode, for example the operating mode when the ship is at high speed (High speed), normal speed (Normal speed), slow speed (Slow speed), maneuvering, standby (when anchored and/or when docked at the jetty).

Shorebase Distance to Offshore Platforms and Distance Between Offshore Platforms
The shipping distance from the loading port/shorebase to the offshore platform and the distance between the offshore platforms are one of the factors that must be taken into account in the route and route determination. This distance must also be known to calculate the arrival time of deviation changes if needed in transporting materials, logistics, personnel and others.

Where the further the distance, of course, greatly affects the length of the voyage carried out and of course affects the use of fuel oil consumption used on the voyage. This also greatly affects the quality of the quality of the food ingredients sent and also if there is a sudden need required by one of the offshore platforms which of course requires one of the mitigations, one of which is a change in route from the normal route that has been agreed upon.

Mooring Costs and Loading and Unloading Costs
In general ship operational activities, where the ship functions as a transporter of materials, logistics and people, of course, it is carried out in a place that has been provided for the purpose of loading and unloading activities. Loading and unloading activities support offshore activities carried out at the port or shorebase. The shorebase is facilitated with a jetty, warehouse, heavy equipment (crane, forklift, and others), bulk material storage tanks and passenger terminal facilities and others.

Of course, these activities have operational costs for berthing and loading and unloading activities that are adjusted to the agreed contract. The costs explain the rental cost figures for various activities for berthing, use of heavy equipment, transportation of material transfers from the jetty to the warehouse or vice versa, manpower, tanks and various other activities or equipment that support loading and unloading activities at the port.

Foodstuff Handling Costs
For handling logistics transportation related to food, costs are also required in the process including transportation costs, use of containers, source power reefer containers and manpower needed in handling the food in maintaining the quality and quantity of the food is maintained properly.

The handling fee is already included in the agreed contract. The cost incurred is calculated by how many times the handling and transportation of the food material to the loading port from the market or supplier. In this case, the cost will be smaller if the handling is done in a short duration and is well scheduled.

Ship Specifications and Maintenance
In the logistics operation, a utility ship is used with specifications that are certainly in accordance with the technical specifications contained in the agreed contract. Where all technical aspects of the ship specifications used have been adjusted to the operational needs of the Cargo boat and have been inspected in detail before the ship became the winner nomination and other preparations in terms of technical matters before the ship began to be contracted.

Supervision of ship readiness and also during operation is very influential in the success of the Cargo boat in supporting logistics distribution. This includes the maintenance of ship machinery and other supporting equipment on the Cargo boat.

The monitoring and supervision carried out are carried out regularly both directly by visiting the ship and indirectly with ship maintenance monitoring data carried out both by the ship's crew by following the manual instructions by the Engine manufacturer or with the format provided by the ship owner and the Class and Government Authorities in this case the Sea Transportation in validating the ship's certificate.

During the implementation of the contract, where the PDCA system is carried out by PHE ONWJ, according to the direction of the Marine Operations Guidelines and STK (Governance System) both Marine Assurance & Marine Vessel Audit are regularly regulated in the STK. If there is damage to the cargo boat's machinery, it can harm logistics and material distribution activities, of course it requires a temporary replacement ship that is designated as a cargo boat. This has been included in the risk study that was carried out previously & coordinated in detail.

The amount and distribution of transported materials are located on each of the offshore platforms. In the logistics distribution mode with 3 (three) routes, namely West area, Central area and East area. Where on Monday it serves the West area with the Zulu - Papa - Mike-Mike - KLA route. Furthermore, on Wednesday it serves the Central area with the Lima - Bravo - NGL - Arco Ardjuna Terminal route. And on Friday it serves the East area with the Echo - Foxtrot - Uniform route.

Table1. Calculation Table of Fuel Consumption for Cargo Boat Engines on 2 (Two) Routes: West Area Route and East Area Route in Every Week.

Fuel Consumption of Cargo Boat Ships on the West Area Route with the Route Marunda – Papa – Zulu – Mike Mike – Lima – KLA – Marunda				
No	**Activity Details**	**Distance (Mil)**	**Timer (Jam)**	**Consumption BBM (Liter)**
1	Sailing from Marunda to Papa	21	3.5	546
2	Maneuvering during distribution in Papua area	-	3.0	198
3	Voyage from Papa to Zulu	39	6.3	988
4	Maneuvering during distribution in Zulu area	-	3.0	198
5	Voyage from Zulu to Mike Mike (MM)	54	9.0	1404
6	Maneuvering during distribution in MM area	-	2.0	132
7	Shipping from MM to Lima	12	2.0	312
8	Maneuvering during distribution in Five areas	-	3.0	198
9	Shipping from Lima to KLA	10	1.7	260
10	Maneuvering during distribution in KLA area	-	3.0	198
11	Shipping from KLA to Marunda	56	9.3	1456
Total		181	45.8	5890
Total fuel consumption cost (Rp. 18,000,- per liter) per route			Rp	106,020,000.00
Total Cost of Fuel Consumption per Year			Rp	5,513,040,000.00

Source: author processed data

Note: Ship speed at normal speed – 6 knots.
Fuel consumption for normal speed – 156 liters per hour
Fuel consumption for maneuvering activities – 66 liters per hour

Table2. Calculation Table of Fuel Consumption for Cargo Boat Engines on 2 (Two) Routes: West Area Route and East Area Route in Every Week

Fuel Consumption of Cargo Boat Ships on the East Area Route with the Route Marunda – Bravo – NGL – Ardjuna Terminal – Echo – Foxtrot – Uniform – Marunda				
No	**Activity Details**	**Distance (Mil)**	**Timer (Jam)**	**BBM Consumption (Liter)**
1	Sailing from Marunda to Bravo	43	3.5	1118
2	Maneuvering during distribution in Bravo area	-	3.0	198
3	Voyage from Bravo to NGL	2	0.3	52
4	Maneuvering during distribution in NGL area	-	3.0	198
5	Shipping from NGL to Ardjuna Terminal	2	0.3	52
6	Maneuvering during distribution at Ardjuna Terminal	-	2.0	132
7	Cruise from Ardjuna Terminal to Echo	12	2.0	312
8	Maneuvering during distribution in Echo area	-	3.0	198
9	Voyage from Echo to Foxtrot	17	2.8	442

10	Maneuvering during distribution in the Foxtrot area	-	3.0	198
11	Voyage from Foxtrot to Uniform	18	3.0	468
12	Maneuvering during distribution in the Foxtrot area	-	3.0	198
13	Shipping from Uniform to Marunda	66	11.0	1716
Total		137	30.8	4090
Total fuel consumption cost (Rp. 18,000,- per liter) per route			Rp	93,888,000.00
Total Consumption Cost per Year			Rp	4,882,172,000.00

Source: author processed data

Note: Ship speed at normal speed – 6 knots.
Fuel consumption for normal speed – 156 liters per hour
Fuel consumption for maneuver activities – 66 liters per hour
While in the logistics distribution mode with 2 (two) routes, namely West area and East area. Where on Monday serving the West area with the route Papa - Zulu - Mike-Mike - Lima - KLA. And then on Thursday serving the East area with the route Bravo - NGL - Arco Ardjuna - Echo - Foxtrot - Uniform.

From the two distribution route modes above, of course there are differences in the amount of material & food transported, the amount of fresh water and the amount of fuel, in connection with the 2 (two) route mode a week there is an additional 3 to 4 destinations visited from the offshore platform from each route from the 3 (three) route mode a week.

Table 3. Summary of Cargo Boat Operational Costs with 2 (Two) Routes a Week in a Year

Cargo Boat Operational Costs with 2 (Two) Routes a Week in a Year					
No	**Detail Biaya**	**Trayek West area**		**Trayek East area**	
1	Fuel Consumption Cost	Rp	5,513,040,000.00	Rp	4,882,172,000.00
2	Licensing Fees	Rp	182,000,000.00	Rp	182,000,000.00
3	Docking and Loading and Unloading Fees	Rp	325,000,000.00	Rp	325,000,000.00
4	Supplier Costs	Rp	104,000,000.00	Rp	104,000,000.00
Total		**Rp**	**6,124,300,000.00**	**Rp**	**5,493,436,000.00**

Source: author processed data

From the addition of offshore platforms that are visited, of course a strategy must be carried out to regulate the amount of material to be transported by the Cargo boat and the material must enter the shorebase to be transported by the ship the day before. Likewise, the stowage plan - the arrangement of loading materials and food in reefer containers on the ship is arranged and coordinated by the logistics escort officer with the 1st Officer who is responsible for arranging the stowage plan on the ship.

Fuel Oil and Fresh Water Tank Capacity
The strategy for fuel oil and fresh water needs for each offshore platform and its supporting vessels is also one that needs to be calculated. Where for offshore platforms where the fuel needs for generators and fresh water for the needs of personnel on duty on offshore platforms. The same is true for support vessels on each platform in addition to fuel for generators, there is also the need for fuel for the ship's propulsion engine.

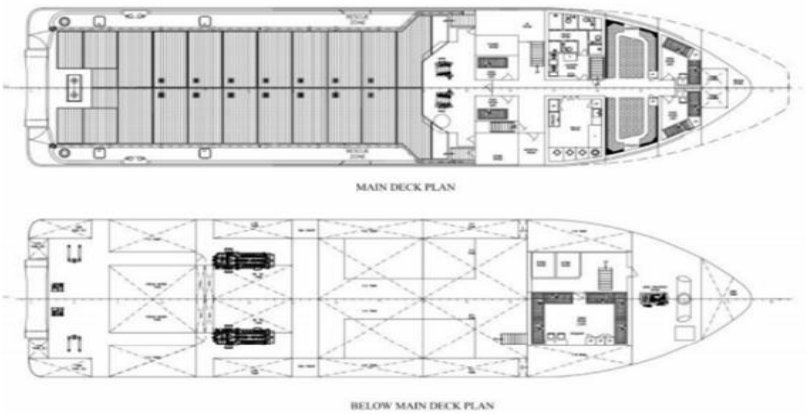

Figure 2. ship capacity

The capacity of the fuel and fresh water tanks available on board must be regulated and balanced with the distribution shared to the offshore platform and its supporting vessels. The average requirement for each offshore platform in terms of fuel requirements is 20-30KL and fresh water is 30 tons per week, where the request is received by the Fuel Controller Team for fuel and the Marine Dispatcher/Planner for fresh water requirements. The information is received the day before and then distributed according to the amount requested. Likewise, if the need for fresh water is outside of routine and urgent needs regarding carrying out massive activities in the offshore platform area, it is coordinated with the assistance of other ships from other work teams who happen to be working or passing through the platform to transfer only fresh water. This solution is carried out and coordinated when a ship returns to the port/shorebase to carry out maintenance or after work to transfer only its fresh water to other ships in need, not for fuel which is only provided by the Cargo boat as the central distribution of fuel.

Sudden Needs and Materials
In connection with the operations on each massive offshore platform, sometimes there is a sudden or urgent need for materials in operational activities. So that other strategies and solutions are needed, either by changing the route on the route or synergizing with other parties with other ships in the same direction or passing the platform by entrusting the materials needed if they cannot be loaded/carried.

This is certainly not something that is not well planned, but simply because of sudden conditions and requires fast handling. Meanwhile, if there is material that is not well planned (unplanned), it will be left and use another ship or get approval from the Sr Manager if it will still be transported in accordance with the TKO (Organizational Governance).

Route Changes on Normal Routes
The coordination mechanism for changes in routes from the normal route must be conveyed at the meeting between platforms held in the morning or information agreement via email as a mutual agreement that there is a change in the route on the route regarding sudden material needs. If there is a change in the route from the normal route, of course, the calculation of the change in arrival time at each offshore platform must also be carried out so as not to interfere with the next route and loading and unloading and refueling activities and filling fresh water at the port.

Route change calculation table
Other strategies and solutions can be implemented by using and coordinating with other ships and teams carrying the material based on agreements from inter-platform meetings held in the morning or approval information via email as required
Weather Conditions

Table 4. cargo shipping schedule on the west area route

Stasiun	Aktifitas	Durasi (Jam:Menit)	Hari	Jam (WIB)
MARUNDA	ETD	3:30	Senin	14:00
PAPA	ETA		Senin	17:30
	Lifting Cargo	3:00	Senin	20:30
	ETD	6:00	Senin	20:30
ZULU	ETA		Selasa	02:30
	Support Logistik Kapal	4:00	Selasa	06:30
	Lifting Cargo	2:00	Selasa	08:30
	ETD	8:18	Selasa	08:30
MIKE-MIKE	ETA		Selasa	16:30
	Lifting Cargo	3:00	Selasa	19:30
	Support logistik Kapal	2:00	Rabu	21:30
	ETD	2:00	Rabu	24:00
LIMA	ETA		Rabu	02:00
	Support logistik Kapal	3:00	Rabu	05:00
	Lifting Cargo	2:00	Rabu	07:00
	ETD	1:30	Rabu	07:00
KLA	ETA		Rabu	08:30
	Lifting Cargo	2:00	Rabu	10:30
	Support Logistik Kapal	3:00	Rabu	13:30
	ETD	8:30	Rabu	13:30
MARUNDA	ETA		Kamis	00:30

Source: author processed data

Table 5. cargo shipping schedule on the east area route

Stasiun	Aktifitas	Durasi (Jam:Menit)	Hari	Jam (WIB)
MARUNDA	ETD	9:00	Kamis	16:00
BRAVO	ETA		Jumat	01:00
	Support logistik Kapal	5:00	Jumat	06:00
	Lifting Cargo	2:00	Jumat	08:00
	ETD		Jumat	08:00
NGL	ETA	1:00	Jumat	09:00
	Lifting Cargo	2:00	Jumat	10:00
	ETD	1:00	Jumat	11:00
ARCO ARDJUNA	ETA		Jumat	12:00
	Support logistik Kapal	1:30	Jumat	13:30
	Lifting Cargo	2:00	Jumat	15:30
	ETD	2:00	Jumat	15:30
ECHO	ETA		Sabtu	17:30
	Support logistik Kapal	2:00	Sabtu	19:30
	Lifting Cargo	2:00	Sabtu	21:30
	ETD	2:30	Sabtu	21:30
FOXTROT	ETA		Sabtu	24:00
	Support logistik Kapal	3:00	Sabtu	03:00
	Lifting Cargo	2:00	Minggu	06:30
	ETD	3:00	Minggu	08:30
UNIFORM	ETA		Minggu	11:30
	Lifting Cargo	2:00	Minggu	13:30
	Support logistik Kapal	2:00	Minggu	15:30
	ETD	10:12	Minggu	00:30
MARUNDA	ETA		Minggu	10:42

Source: author processed data

In ship voyages, of course, it is inseparable from changes in weather conditions, both daily and periodic seasons. Where for the Indonesian region, which is located between 2 oceans and has 2 climates that are greatly influenced by changes in weather conditions. Especially in the monson climate conditions that occur in September - March, where high rainfall is accompanied by increasing wind speed and wave height.

At sea, rainy weather conditions, changes in tidal currents, wind speed and wave height can occur in various ways, it is very necessary in this case to get weather forecast information from BMKG per week which is updated every day. The weather forecast from BMKG is very helpful in determining work and operational activities on offshore platforms and the necessary mitigations.

Table 6. fuel usage

NSW = No Significant Weather, FU = Smoke, FG = Fog, SL RA = Slight Rain, MOD RA = Moderate Rain, HVY RA = Heavy Rain, SHRA = Shower Rain, TSRA = Thunderstorm

Thresholds Level					
Waves	Moderate (1.25-2.5 m)	Rough (2.5-4.0 m)	Very Rough (>4 m)		
Winds	Moderate (11-16 kts)	Fresh (17-21 kts)	Strong (22-27 kts)	Near Gale (28-33 kts)	Gale (>33 kts)

Time	WX	Visibility	Winds				Waves						Current		Temp
			10 m			50 m	Total Wave			Swell			Surface		Surface
(LT)		10 m	Dir	Spd (kts)	Gust (kts)	Spd (kts)	Dir	Hsig (m)	HMax (m)	Dir	Hgt (m)	Per (sec)	Dir	Spd (cm/s)	Sea (deg C)
Monday, 12 December 2022															
07	NSW	Clear	SW	16	24	18	SW	0.9	1.2	-	No Swell	-	NW	21	29.0
10	NSW	Clear	SSW	13	20	15	SW	0.7	1.1	-	No Swell	-	NW	24	29.0
13	NSW	Clear	W	10	15	11	SW	0.5	0.8	-	No Swell	-	NW	26	30.0
16	SL RA	Moderate	WSW	15	21	17	WSW	0.8	1.2	-	No Swell	-	NW	26	30.0
19	NSW	Clear	WSW	17	26	20	WSW	0.8	1.3	-	No Swell	-	NW	25	29.0
22	NSW	Clear	SW	18	27	21	WSW	0.8	1.3	-	No Swell	-	WNW	26	29.0
Tuesday, 13 December 2022															
01	NSW	Clear	SW	15	23	17	SW	0.8	1.3	-	No Swell	-	WNW	26	29.0
04	SL RA	Moderate	SSW	14	21	16	SW	0.7	1.1	-	No Swell	-	WNW	26	29.0
07	SL RA	Moderate	SSW	12	18	14	SW	0.7	1.1	-	No Swell	-	WNW	26	29.0
10	SL RA	Moderate	SSW	8	12	9	WSW	0.4	0.6	-	No Swell	-	WNW	26	30.0
13	NSW	Clear	W	1	2	1	W	0.2	0.3	W	0.1	3.0	WNW	24	30.0
16	NSW	Clear	W	6	9	7	W	0.2	0.3	-	No Swell	-	WNW	23	30.0
19	SL RA	Moderate	WNW	5	8	6	W	0.2	0.3	WSW	0.2	4.0	W	22	30.0
22	SL RA	Moderate	SW	5	8	6	W	0.2	0.3	WSW	0.2	4.0	W	23	30.0
Wednesday, 14 December 2022															
01	SL RA	Moderate	SW	5	8	6	W	0.2	0.3	W	0.1	3.0	W	23	30.0
04	SL RA	Moderate	WSW	5	8	6	W	0.2	0.3	W	0.1	3.0	W	23	30.0
07	SL RA	Moderate	SW	7	11	8	W	0.3	0.4	-	No Swell	-	W	24	29.0
10	SL RA	Moderate	NE	3	5	3	WSW	0.2	0.3	-	No Swell	-	W	24	30.0
13	SL RA	Moderate	NNE	5	8	6	WSW	0.2	0.3	-	No Swell	-	W	23	30.0
16	NSW	Clear	N	4	6	5	WSW	0.2	0.3	-	No Swell	-	W	23	31.0
19	SL RA	Moderate	NNW	3	5	3	WSW	0.2	0.3	-	No Swell	-	W	22	30.0
22	SL RA	Moderate	NNW	2	3	2	WSW	0.2	0.3	-	No Swell	-			30.0
Thursday, 15 December 2022															
01	SL RA	Moderate	N	1	2	1	WSW	0.2	0.3	-	No Swell	-			30.0
04	SL RA	Moderate	S	2	3	2	WSW	0.2	0.3	-	No Swell	-			30.0
07	SL RA	Moderate	S	5	8	6	WSW	0.2	0.3	-	No Swell	-			30.0
10	SL RA	Moderate	S	5	8	6	WSW	0.2	0.3	-	No Swell	-			30.0
13	NSW	Clear	WNW	4	6	5	WSW	0.2	0.3	-	No Swell	-			30.0
16	NSW	Clear	WNW	6	9	7	W	0.2	0.3	-	No Swell	-			30.0
19	SL RA	Moderate	WSW	10	15	11	WSW	0.5	0.8	-	No Swell	-			30.0
22	SL RA	Moderate	SW	9	14	10	WSW	0.4	0.6	-	No Swell	-			30.0
Friday, 16 December 2022															
01	SL RA	Moderate	SW	8	12	9	WSW	0.4	0.6	-	No Swell	-			30.0
04	SL RA	Moderate	SW	11	17	13	WSW	0.5	0.8	-	No Swell	-			30.0
07	SL RA	Moderate	SW	12	18	14	WSW	0.7	1.1	-	No Swell	-			30.0
10	SL RA	Moderate	W	13	20	15	WSW	0.7	1.1	-	No Swell	-			30.0
13	NSW	Clear	NW	10	15	11	W	0.5	0.8	-	No Swell	-			30.0
16	SL RA	Moderate	NW	9	14	10	W	0.4	0.6	-	No Swell	-			30.0
19	NSW	Clear	NW	9	14	10	NW	0.4	0.6	-	No Swell	-			30.0
22	SL RA	Moderate	WNW	8	12	9	NW	0.4	0.6	-	No Swell	-			30.0
Saturday, 17 December 2022															
01	SL RA	Moderate	WSW	6	9	7	NNW	0.2	0.3	-	No Swell	-			30.0
04	SL RA	Moderate	S	7	11	8	W	0.3	0.4	-	No Swell	-			29.0
07	SL RA	Moderate	SSW	8	12	9	SSW	0.4	0.6	-	No Swell	-			29.0
10	SL RA	Moderate	SSW	3	5	3	SW	0.2	0.3	-	No Swell	-			29.0
13	NSW	Clear	NNW	4	6	5	NNW	0.2	0.3	-	No Swell	-			30.0
16	NSW	Clear	N	6	9	7	NE	0.2	0.3	-	No Swell	-			30.0
19	SL RA	Moderate	N	8	12	9	NE	0.4	0.6	-	No Swell	-			30.0
22	SL RA	Moderate	NNW	7	11	8	NE	0.3	0.4	-	No Swell	-			-
Sunday, 18 December 2022															

Source: author processed data

In the process of the ship approaching the offshore platform is a critical condition, where the conditions of the incoming or outgoing sea currents have different maneuvering procedures, wind speed limits and sea wave heights, which have a detailed risk assessment according to the Standard Operating Procedure for approaching offshore platforms. Conducting a 500 m zone checklist as a way to conduct a risk assessment before the ship enters and approaches the 500 m area from the offshore platform. The risk that occurs can result in property damage or higher escalation, if this occurs due to a ship colliding with the offshore platform. Where if the weather conditions do not allow the Cargo boat to approach the offshore platform, the Captain requests that the activity be temporarily postponed until the weather or current conditions meet the Standard Operating Procedure. The Captain's request to suspend the activity is recognized by the SOP and in accordance with element 5.2 of the ISM Code regarding Master Overriding Authority, namely the absolute power of the Captain to do anything to save the crew, environmental damage and his ship

Food Quality During Sailing

In the long sailing time from the port/shorebase to the offshore platform, of course maintaining the quality of each food ingredient must be considered carefully. Receiving food ingredients before being put into the Reefer Container and boarding the ship must be carried out in great detail by competent personnel, which is coordinated by the HSSE section, especially OHIH (Occupational Health & Industrial Hygiene) which is tasked with integrated health services that focus on aspects of occupational health and safety to support the need for the provision of healthy and fit workers, including workers who are tasked with supervising the quality of food ingredients that will be distributed to offshore platforms.

Maintaining the quality of food ingredients during the voyage is also carried out collaboratively by the quality control of food ingredients and officers who are tasked with overseeing and regulating and maintaining the quality and quantity of the food ingredients, who are sailing and the ship's crew under the supervision of the First Officer. Recording, data collection and supervision, especially on the temperature conditions of the Reefer Container which are well maintained and normal, are regularly carried out during the voyage and the food ingredients arrive at their destination.

The reefer containers and steel boxes used are checked and maintained regularly and periodically, reports are made and documented properly. This is also one way to identify if there are complaints of damage to food when received by the offshore platform or ship and health problems that are suspected of being caused by damage to the food.

Damage to food that occurs during the voyage is recorded and reported by the food guard on board to the supplier and OHIH and the offshore platform of all requested food items, so that they are taken into account and of course replaced by the supplier later with the mechanism & transportation that is arranged later.

If there are records and reports of damaged food, coordination will be carried out to replace the food with the required amount by entrusting it to another ship that is heading to or passing through the area or entrusting it to the crew boat at the same time as the offshore station crew change schedule.

6. CONCLUSION, LIMITATIONS AND SUGGESTIONS

Conclusion

The conclusion of the above study is that reducing routes from 3 to 2 per week significantly saves fuel. Routes involving more routes consume more fuel than routes with fewer routes. Reducing routes also reduces other operating costs, including permits, docking and loading and unloading, and freight costs. Reducing routes provides significant monthly and annual savings for the company. Over the course of a 3-year contract, the savings will be even greater, providing substantial financial benefits to the company. Overall, reducing routes from 3 to 2 per week provides significant savings in fuel and other operating costs.

Research Limitations

There are limitations in the research process that is carried out directly in the field and collecting data and obtaining information from interviews conducted, where there are several limitations experienced and there are several factors that can be of concern to future researchers in perfecting this research.

The shortcomings and limitations in this study include:

The amount of data obtained is very limited in relation to the very massive ship operation pattern, of course it is still lacking to describe the actual situation.

The object of research is only focused on the conditions of distribution activities on cargo boats and has not seen directly the conditions in the field regarding the actual conditions and data or records on the offshore platform.

In the data collection process, the information provided by respondents in interviews and the questions asked sometimes do not show the respondents' true opinions, this happens because sometimes there are differences in thinking, assumptions and understanding that are different for each respondent, as well as other factors such as honesty factors.

Suggestions

The suggestions from this study are:

The need for further studies on other methods concerning Optimization of Route changes and logistics distribution route patterns.

Can be used as a recommendation for a fast, efficient route change and shipping time from the old route pattern with 3 (three) routes to a new route pattern of 2 (two) routes with a difference in fuel consumption costs, operational licensing costs, loading and unloading costs and other costs. The results of this research can be used as a reference source for researchers for further development that is better and more sustainable.

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