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Controlling of Tugboat Fuel Consumption Owned By Pt. Transcoal Pacific, Sangatta Branch

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Abstract

Fuel consumption is an energy conversion that converts the chemical energy of a fuel into another energy at a certain time. Fuel consumption must always be monitored because it will affect the company's profit. Since fuel is a significant expense, the company must be efficient in its usage to allow the company to grow. The author summarizes the problem and tries to solve the problem using quantitative research methods. The research is conducted at the branch office by interviewing the company's staff. PT. Transcoal Pacific is a company that focused on its service at preparing ships to carry cargo in coal. The company monitors the fuel consumption using a fuel lock system, so the target can be reached in using fuel as few as possible and get maximum profit. Based on the result of this research, it is clear that the company lacks the aspect of fuel monitoring. This causes the target cannot be reached. The old fuel lock cannot be applied by the tugboat and dragging where the vessel swept away by sea current that may increase fuel consumption. The company has to increase the monitoring aspect and implement the obligation to solve the problem to improve fuel consumption efficiency.

Keywords: Controlling, Fuel Consumption, Tugboat

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1. Introduction

The primary goal of every company is to get profit. The company will apply many strategies to reach the goal. In the world of shipping, a sailing company is one supplier to transfer the goods using ships as it is one of many transportation modes that is able to take care of goods and people.

Fuel is crucial for a vessel. High-speed diesel is a fuel type to operate the vessel's engine. In a calculation of fuel consumption during sailing time gives an ability to relate the use of fuel with operational cost, for example, knowledge about how the vessel burns its fuel at a specific moment of sailing time makes it possible to bidding vessel charter cost accurately, so the profit margin remains healthy. With consequences from various shipping expense based on fuel consumption cost that documented will be able to ease a shipper company offer cheaper shipping cost.

PT. Transcoal Pacific is a shipping company that concentrates on ships' operational, crewing, and load-unload coals from the specific harbor at Tanjung Bara and Bengalon Jetty heading to loading point in Tanjung Bara sea and Bengalon. Limited draft (water level is the vertical distance between water surface until the lowest keel of the vessel) area that is not able to get through by the fleet with DWT over 8000 ton (amount of weight/mass reserved by the vessel so the aid vessel gonna sinking until allowed level and written as longton or metric ton, the maximum allowed level marked by plimsoll mark at the side of hull). This causes coal is moved using transshipment (goods moving that able to dock at jetty vessel as transit dock before being moved to the mother vessel to send goods or service from producent and consument/distribute to designated country).

PT. Transcoal Pacific branch Sangatta provides transshipment and coal discharging service for PT. Kaltim Prima Coal as the coal owner which already prepare some Jetty to support the efficiency at a specified dock. This includes jetty vessel and conveyor docking which are a piece of equipment that move coal from stockpile (coal's temporary rest place before getting sold/shipped away) until the coal advanced inside the barge, then distribute to the mother vessel that is already waiting for its cargo.

The transshipment process advancing fuel consumption on a tugboat is a variable/research object that the researcher chooses considering fuel expenses is one of the most significant aspects spent on a ship at its operational phase. This also means the company should be efficient in fuel consumption plan.

PT. Transcoal Pacific fuel management has implemented a system using fuel lock to control fuel consumption. This is within standard establishing that is based on fuel lock for each trip from Tanjung Bara jetty to Tanjung Bara anchorage then back again to Tanjung Bara jetty. The distance span 3 miles and vessel speed 2 knots need 700 liters of HSD, at long trip from Tanjung Bara jetty to Lubuk Tutung anchorage then back again to Tanjung Bara jetty with distance span 16 miles and vessel speed 3,5 knots need 1600 liters of HSD. In reality, the fuel consumption is around 1325 for a short trip and 2009 liters for a long trip.

Then, the researcher makes identification about the cause to the effect of fuel consumption, and the researcher makes identification or estimate about the problem, such as:

The effect of a long time spent for maneuver while towing a barge full of coal and how the tugboat undergoes dragging situation.

The explanation of the question will be given a slight figure about how the researcher sees and judges a condition within the company. It is then followed by an attempt to give a problem-solving solution for the company. To that, the researcher gives this research

the title **"Controlling of Tugboat Fuel Consumption owned by PT. Transcoal Pacific, Sangatta branch "**.

Within research, writing creating mind framework is a crucial thing. This step will give ease in the research process and seek for a more accurate answer. Based on the background problem stated above, the researcher creates mind framework as follows:

The main factor that influences fuel consumption control plan on tugboat possessed by PT. Transcoal Pacific, the effect of the implementation of fuel consumption control plan on tugboat owned by PT. Transcoal Pacific and the effort to control fuel consumption on tugboat.

2. Literature Review

The existence of more business activities in the shipping environment requires more serious handling so that no waste and fraud can result in financial losses to the company, to avoid this an appropriate control system is needed. This aims to maintain the possibility that the implementation can run well.

1. Definition of Control

   General control is defined as an administrative activity that aims to rely on the evacuation of work that has been completed whether it is following the plan or not. With supervision, it will prevent or reduce various regular irregularities and errors in implementing the task to achieve organization goals. This is not intended to find out what is wrong or right but to make efforts for correcting the activities. Then, if there are errors and irregularities that are not in accordance with the goals to be achieved, immediate action is taken in order strengthen next activity so that the implementation is directed as defined by H. Abbas Salim (2012:317) supervision as follows:

   "Control is a process of setting performance measures and taking actions that can support the achievement of the expected result following the predetermined performance."

   In Iman Siswadi (2009:195) "The control is a process to guarantee that organization goal is achieved." Reksohadiprodjo (2008:63) told that "The control is an effort to give direction for the conductor so that they do like the plan." Suyono (2011:30) explained, "Control is a process to implement agency or unit that acts by the name of the leaders of the organization and duties to collect all of the data also

information needed by the organization leader to judge increase and decrease within work execution."

From the definition above, control is one of the management function that is processed to reach better performance. The monitoring management function can cause what goals achieving process has been what the leader makes and wants, so we can take an action that fixes human resources for advance for the goal.

2. Fuel Consumption

One of unit energy convention characteristic that changes the fuel chemical energy into another form which more beneficial like heat energy, mechanical energy, centrifugal force, etc. The fuel consumption tell what amount is needed (in kilograms, grams, meter cubics, liters, kilowatt, and horsepower) within a period (in seconds, minutes, hour)

To get heat energy that needed is mixed gas from air and fuel. The quantity of the fuel used depends on piston size, piston phase, and combustion efficiency.

Fuel consumption is normally seen as kilometer for each liter of its fuel. The fuel consumption suits with engine capability that got all the time is, "Fuel Specific Consumption (FSC)". One of FSC is fuel drumb per kWh. Active FSC expressed as = [drumb fuel per horsepower x time].

SFC is an effectivity indicator of piston capability in creating power, for example, a known quantity of the motor A SFC consumption is between 245 and 300 gram/kWh then motor B between 175 and 205 gram/kWh, means the more economical one is motor b.

If a piston has little fewer SFC amount, that motor is more economical within fuel consumption to create energy ratio within a given period. As the stated amount of SFC from a motor or energy conversion unit usually can be measured as a standard to calculate that motor economical operation rate.

3. Definition of Tugboat

Tugboat is a vessel that specified as an assist vessel or vessel that is used for towing barge whether it is occupied or empty. Tugboat is a strong vessel. Regardless of its small size, tugboat has a tremendous sheer horsepower. This makes this kind of vessel become the most common in use within Indonesia.

A vessel is used for moving goods from one vessel to another but still specified vessel that used as a container which moved goods from loading place or discharge process at mother vessel in Tanjung Bara harbor activity.

3. Methods

3.1. Data Types

In research, collective of data is important and it must contain in scientific research. To get true data which is appropriate with purpose of research and make neater data, the data used are as follow:

1. Primary Data

   Primary data is the data that were gained through interview and discussion directly from interviewees to know about fuel consumption for operational manager, supervisor bunker, and operational staff of PT. Transcoal Pacific.

2. Secondary Data

   Used as additional data to make primary data better. Secondary data were gathered from literature study that were copied from the operational book.

3.2. Research Method

Is the method that was conducted by direct interaction with research object. Collecting data very important within research to get the data, due to research main reason is collecting data itself. From this research, the researcher used many kind of technic, some of them:

1. Observation

   Is a collecting data technic that done through observation together with documented condition and behavior of the observation object towards fuel consumption problem. The researcher had an experience when prada in company, the researcher was conducted an observation in tugboat and did a research about consumption of fuel on 15th of January 2017.

2. Interview

   Is collecting data technique used when researcher want to create pre-research study also to gather evidence to get discussion topics. Researcher directly ask

branch manager or supervisor bunker fuel consumption of owned tugboat in order to get accurate data.

3. Literature Study and Document

   Purposed to search about scientific problem which is followed by literature. This step is important because it is fundamental to make a plan to solve the problem.

Before making scientific research researcher must learn about literature study and learn about the book. We mean the book contain SOP fuel consumption for tugboat. This book also contains operational guide, bunkering process and other problem then followed by theories that were studied in campus. Although primary data used through direct interaction, literature study and documentary are still important as additional data for supporting the accuracy and credibility of each source or article researcher used inside, whether it is from book or internet. In the end, it helps researcher to gather reference related to problem caused by fuel consumption control on tugboat.

3.3. Analysis Data

Is the way to extract information from the source so it become easier to understand and useful for problem solving. This research use qualitative method. Qualitative method is a description about real condition that researcher knew.

Within this scientific research researcher used two kinds of analysis data, here some of them:

1. Data reduction

   After studying and reviewing the result, next step data analytical process is creating data reduction which is form of effort to create conclusion from the data which researcher had chosen before to be the basic discussion in this research. While the basic discussion itself is: How to force tugboat's fuel consumption to minimum so it will decrease PT. Transcoal Pacific expenses on operating cost.

2. Data Serving

   Is a group of information that is already arranged systematically and easy to understand to give possibility of conclusion drawing and action that may be taken appropriate with scientific method.

3. Conclusion Taking or Verification

   Verification step is conducted since the beginning, data gathering, patterns making, explanation of each possible configuration, and action-reaction cause.

4. Result and Discussion

4.1. Company's General Definition

1. Profile of PT. Transcoal Pacific

   As a company specialized on transportation and energy products logistic service for domestic industrial company customers, this company has a fleet consists of 13 tagboats, 13 unit barges, also 1 unit floating terminal station. The Central office is located on Bakrie Tower 9th floor, Rasuna Epicentrum residence, HR. Rasuna Said Street, Kuningan, South Jakarta, Indonesia – 12940. It also has regional branch office in Kalimantan and many other various city to sustain company operational activity. Established based on Sea Company Approval Letter Number: BXXXIV-686/47.54 date 21 December 2009 about forming of PT. Transcoal Pacific also Number NPWP 02.189.507.3-062.000 person in charge R.M. Harlin Erlianto Rahardjo as Chief Director. PT. Transcoal Pacific has created relationship contract with one of customers in Kalimantan, that is PT. Kaltim Prima Coal in term of fleet owner for coal shipping with *transshipment* system.

2. Vision and Mission of PT. Transcoal Pacific

   (a) Vision

      Transcoal Pacific will be main service supplier of transportation and logistic at Indonesian ocean. We develop with responsibility altogether with customers and stakeholders through innovation, commitment, and our passion for dominance.

   (b) Mission

      i. Giving logistic solution simultaneously in terms of sea transportation.

      ii. To develop each available resources also always raise our professionality for highest stage of customers satisfaction

      iii. Full commitment in giving best service for everyone that related include minimizing society loss and environmental damage.

4.2. Research Result Analysis

Based on the result, the researcher can give an image about three problems that exist; they are fuel consumption influencing factor, the impact of fuel consumption control, and the effort to control fuel consumption. Researcher gets the results and a

bunch of data from details of interviews with the branch manager of operational, port captain, bunker supervisor, finance supervisor, technic supervisor, operational admin, also literature study from related documents.

When the vessel is going to conduct operational activities, the vessel's crew will be guided by the port captain in each maneuver. Starts from coal loading at the jetty until discharging it on the mother vessel and every other side activities like assist, freshwater bunkering, also taking the ransom at the jetty. Each of those maneuvers has been regulated by fuel lock from company obligation belongs to PT. Transcoal Pacific.

Based on research that was conducted by the researcher, in reality, emerge a problem within the process while doing this research. One of which was when bunkering the amount of fuel left inside the tank only known from crew's report that since it does not meet fuel lock which is already set by the company that later on will sum up as losing profit.

Within operational activities from 12 sets of towing tugboats that operated at a specified dock of PT Transcoal Pacific exist four set towing tugboats they possessed and in this research, the researcher will take those four vessels as research object because the company was already focusing them as fuel consumption standard vessel. Below are data that considered as fake in the monthly report.
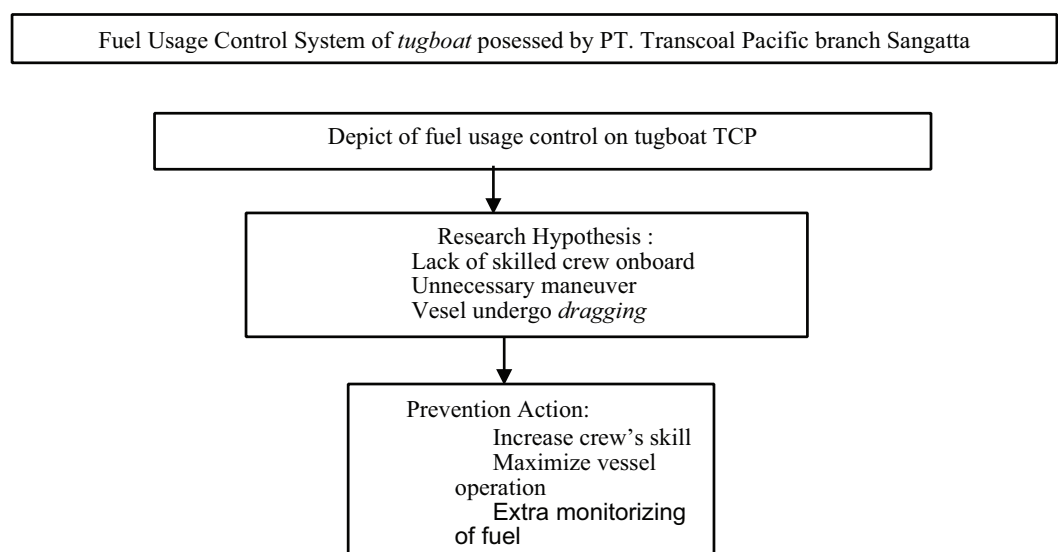
Fuel Usage Control System of *tugboat* posessed by PT. Transcoal Pacific branch Sangatta

Depict of fuel usage control on tugboat TCP

Research Hypothesis :
Lack of skilled crew onboard
Unnecessary maneuver
Vesel undergo *dragging*

Prevention Action:
Increase crew's skill
Maximize vessel operation
Extra monitorizing of fuel

Figure 1: Research Planning.

In the table above, the researcher gathered it from the bunker daily operation report of March 2017, total consumption for all vessel reaching extremely high rate in term of fuel consumption means the ratio that the company set not meet (the ratio between fuel

Figure 2: Log book *tug boat* TB. TCP 203.

Figure 3: Observation of PT. Trancoal Pasific.

consumption & amount of cargo transported) its recorded as 0.16 means operational cost is too high.

As the table shows, in March 2017 total fuel consumption of TB. TCP 201 vessel is 21.934 liters got ratio 0.19 with opening stock (total consumption from one day before) 21.673 liters get additional fuel consumption around 1.500 liters for 24 hours cycle of use as much as 261 liters. TB. TCP 201 not meet the ratio company already set. Otherwise, it shows 0.19 which total consumption is 21.673 liters.

Total consumption of TB. TCP 203 is 22.084 liters get 0.24 ratio with opening stock 22.084 liters for 24 hours cycle of use as much as 421 liters. TB. TCP 203 not meet the ratio company already set. Otherwise, it shows 0.24 which total consumption is 22.084 liters.

Total consumption of TB. TCP 206 is 21.355 liters get 0.20 ratio with opening stock 21.603 liters to get additional fuel consumption around 1.500 liters for 24 hours cycle of use as much as 248 liters. TB. TCP 206 not meet the ratio company already set. Otherwise, it shows 0.20 which total consumption is 21.603 liters.

TABLE 1: The amout of data comsumption and suply March 2017.

BUNKER DAILY OPERATION REPORT	DATE: Maret, 31th 2017 Operation Area: KPC Projek	NAME TUG, LCT & SUPPORT	TB. TCP 201	TB. TCP 203	TB. TCP 206	TB. TCP 207
		Opening Stock (Liter)	21,673	21,663	21,355	19,735
		ROB 00:00	785	1,788	884	1,190
		ROB 06:00	743	1,706	842	1,041
		ROB 12:00	654	1,491	800	999
		ROB 18:00	612	1,499	678	957
		ROB 24:00	2,024	1,367	2,136	915
		BUNKER	1,500		1,500	
		Pemakaian 24 jam	261	421	248	275
		Total Pemakaian (Liter)	21,934	22,084	21,603	20,010
		Cargo (Mt)	113,377	93,955	105,956	79,271
		Ratio	0.19	0.24	0.2	0.25
		Pemakaian 0.16	18,140	15,033	16,953	12,683

Total consumption of TB. TCP 207 is 20.010 liters get 0.25 ratio with opening stock 19.735 liters for 24 hours cycle of use as much as 275 liters. TB. TCP 207 not meet the ratio company already set. Otherwise, it shows 0.25 which total consumption is 20.010 liters.

From the statement above can be concluded that all vessel from PT. Transcoal Pacific does not meet the condition company already set that is fuel consumption ratio at 0.16. As it can be seen at the table ratio TB. TCP 207 is the highest because the total consumption plan is high but with little cargo than for TB. TCP 201 has the smallest ratio because the ratio of total consumption amount and cargo transported relatively cover each other but still not meet the condition company already set.

If this not quickly taken care, the company will have a hard time to advance and develop due to operational cost and the profit they get not balanced. It requires harmony between expense and profit in order company able to advance and develop at a high rate. Fuel Consumption watch over is crucial so the operational cost for fuel expenses will be able to reduce so company profit would cover up the expenses. Once more, it is crucial to reduce and to control fuel consumption on a tugboat so the operational cost is not too high.

1. The factor that influenced fuel consumption on tugboat at PT. Transcoal Pacific

TABLE 2: *Fuel lock* PT.Transcoal Pacific.

Break Down Perhitungan Konsumsi BBM Towing Tug TRANSSHIPMENT KPC per Sailing Voyage

1 JETTY TG. BARA - TG. BARA ANCHORAGE - JETTY TG. BARA [SHORT TRIP]

Jarak Tempuh Bermuatan	: 3	Mil
Speed Bermuatan	: 2	Knot
Jarak Tempuh Kosongan	: 3	Mil
Speed Kosongan	: 2,5	Knot

KONDISI OPERASI	DURASI M/E (Jam)	KONS. BBM/JAM (Liter)	TOTAL KONS. BBM (Liter)
Manuver Sandar Jetty	1	80	80,0
Sailing Full Loaded	1,50	100	150,0
Manuver Sandar di M/V	1	80	80,0
Sailing Empty Loaded	1,00	100	100,0
Konsumsi A/E per Trip	13,00	8	104,0
			514,0
		Spare fuel 30% :	**668,2**
		Dibulatkan :	**700,0**

2 JETTY BENGALON - LUBUK TUTUNG ANCHORAGE - JETTY BENGALON [SHORT TRIP]

Jarak Tempuh Bermuatan	: 4	Mil
Speed Bermuatan	: 2	Knot
Jarak Tempuh Kosongan	: 4	Mil
Speed Kosongan	2,5	Knot

KONDISI OPERASI	DURASI M/E (Jam)	KONS. BBM/JAM (Liter)	TOTAL KONS. BBM (Liter)
Manuver Sandar Jetty	1	80	80,0
Sailing Full Loaded	2,00	100	200,0
Manuver Sandar di M/V	1	80	80,0
Sailing Empty Loaded	1,60	100	160,0
Kegiatan Assist dan Stand by	0	80	0,0
Konsumsi A/E per Trip	13,00	8	104,0
			624,0
		Spare fuel 30% :	**811,2**
		Dibulatkan :	**800,0**

3 JETTY TG. BARA - LUBUK TUTUNG ANCHORAGE - JETTY TG. BARA [LONG TRIP]

Jarak Tempuh Bermuatan	: 16	Mil
Speed Bermuatan	: 3,5	Knot
Jarak Tempuh Kosongan	: 16	Mil
Speed Kosongan	: 4,5	Knot

KONDISI OPERASI	DURASI M/E (Jam)	KONS. BBM/JAM (Liter)	TOTAL KONS. BBM (Liter)
Manuver Sandar Jetty	1	80	80,0
Sailing Full Loaded	4,57	120	548,6
Manuver Sandar di M/V	1	80	80,0
Sailing Empty Loaded	3,56	120	426,7
Kegiatan Assist dan Stand by	0	80	0,0
Konsumsi A/E per Trip	13,00	8	104,0
			1239,2
		Spare fuel 30% :	**1611,0**
		Dibulatkan :	**1600,0**

4 JETTY BENGALON - TG. BARA ANCHORAGE - JETTY BENGALON [LONG TRIP]

Jarak Tempuh Bermuatan	: 17	Mil
Speed Bermuatan	: 3,5	Knot
Jarak Tempuh Kosongan	: 17	Mil
Speed Kosongan	4,5	Knot

KONDISI OPERASI	DURASI M/E (Jam)	KONS. BBM/JAM (Liter)	TOTAL KONS. BBM (Liter)
Manuver Sandar Jetty	1	80	80,0
Sailing Full Loaded	4,86	120	582,9
Manuver Sandar di M/V	1	80	80,0
Sailing Empty Loaded	3,78	120	453,3
Kegiatan Assist dan Stand by	0	80	0,0
Konsumsi A/E per Trip	12,00	8	96,0
			1292,2
		Spare fuel 30% :	**1679,8**
		Dibulatkan :	**1700,0**

TABLE 3: Constanta on March 2017.
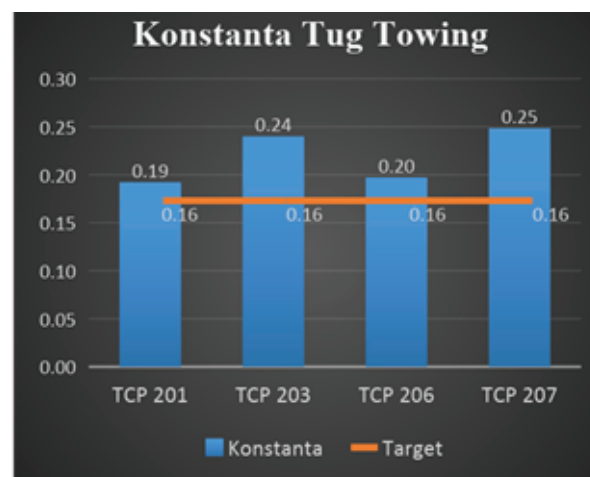
(a) *Fuel log* not up to date

TABLE 4: Ship's data of PT.Transcoal Pacific.

Nama Kapal	Jenis Kapal	Gross Tonnage (Ton)	Mesin Kapal	
			MAIN ENGINE	AUX ENGINE
TB. TCP 201	Kapal tunda	259	2 X 1000 HP (YANMAR)	2 X 64 HP (DONGFENG CUMMINS)
TB. TCP 203	Kapal tunda	231	2 X 759 HP (MITSUBISHİ)	2 X 82 HP (WEICHAI HEAVY MACHINERY)
TB. TCP 206	Kapal tunda	254	2 X 1000 HP (YANMAR)	2 X 89 HP (WEIFANG WEICHAI DEUTZ)
TB. TCP 207	Kapal tunda	254	2 X 1000 HP (YANMAR)	2 X 89 HP (WEIFANG WEICHAI DEUTZ)

TABLE 5: Fuel Comsumption Calculation.

Fuel log is one of the main components within the operational vessel process where fuel consumption already set by the company as standard.

Transcoal Pacific, Mr. Abdul Muid, stated that the reason for inefficient fuel consumption mainly because of too much unnecessary maneuver within tugboat's operation time. This affects fuel consumption since engine work longer than it supposed to be as what company already set through fuel lock in one trip exist possibility to add more time within vessel maneuver report.

From the interview result, it can be concluded what factors that have an effect on inefficient fuel consumption on the tugboat of PT. Transcoal Pacific are:

i. Operational condition of the vessel is not compatible with current maneuver obligation

ii. Decrease ratio into 0.16

iii. Old *fuel log* is still in use for fuel consumption calculation.

(b) Unnecessary Tugboat's maneuver

The cause of high fuel consumption also can be triggered by unnecessary maneuvers. A vessel that undergoes short trip or long trip sails calculated within condition where all vessel advance from one jetty to the next jetty for new coals cargo and called as one vessel trip. In one trip at least needs 800 liters HSD (High-Speed Diesel) for short trip & 1.700 liters HSD for a long trip. The event of unnecessary movement in operational have a significant impact on the increasing of tugboat's fuel consumption rate due to the vessel will add more time to engine consumption span. Whenever the engine works longer, it needs more fuel. Of course, this will cause inefficient fuel consumption that put a high burden on the company.

Mr. Abdul Muid, stated that the reason for inefficient fuel consumption mainly because of too much unnecessary maneuver within tugboat's operation time. This affects fuel consumption since engine work longer than it supposed to be as what company already set through fuel log in one trip exist possibility to add more time within vessel maneuver report.

From the interview result, it can be concluded what factors that have an effect on inefficient fuel consumption on the tugboat of PT. Transcoal Pacific are:

i. The existence of unnecessary maneuver within tugboat's operational.

ii. The extra time that is reported by vessel's crews.

2. The impact due to fuel consumption control on *tugboat* of PT. Transcoal Pacific, Sangatta branch

At load-unload coal activities where fleet that put in use to transport them from *shipper Jetty* to mother vessel for *shipment* process toward PT. Kaltim Prima Coal where PT. Transcoal Pacific as PBM hopped to be quick at transporting coal within huge scale using tugboat. For each *barge* approximately able to move 8.000 MT a day. In a day there is 3-4 barge which docks in *Jetty* to content coal that carried to the big vessel/*mother vessel* by *Coal Loading Barge*. In this coal carrying process, tugboat has to be accused to pull barge to mother vessel quickly so that able to discharged quickly as possible. PT. Transcoal Pacific hoped to be quick in conducting loading process from barge to mother vessel because contract with PT

Transcoal Pacific with PT Kaltim Prima Coal based on *net loading rate*. *Net loading rate* is a targeted load quantity that loaded to mother vessel in a day. 25.000 MT loads/day of coal is target that should be reached PT Transcoal Pacific in a day, so that the transport fleet should be quick in carrying a cargo (coal) from loading point in jetty to mother vessel.

The consequences that should be reached in carrying coal by tugboat is high fuel consumption. In a day from 8 a.m until 8am of next day a single tag boat able to depleted 1.500 to 2.000 liters HSD. This case has a big impact towards profit because almost 40% expenses of the company used for fuel. For each shipment needs refuel/*Bunker* as much as 25.000 liters for one fleet in a month, yet fleet that used for to load and unload are 12 sets *towing tugboat* and 2 LCT (*Loading Craft Transfer*).

Based on research that has been conducted by PT. Transcoal Pacific that inefficient fuel consumption due to lack of maximum control so the fuel consumption still high. The unachieved company goals for reaching target fuel consumption. Based on interview with branch manager gathered information about which able to be done for *bunkering monitoring* so that fuel consumption be more efficiency. Said, effort that conducted is by doing investigation in each vessel, so will be known the fuel that reported by the crew suits.

3. How to controlled the consumption of tugboat fuel PT. Transcoal Pacific, Sangatta branch

   Based on interview with branch manager gathered information about which able to be done for bunkering monitoring so that fuel consumption be more efficiency. Said, effort that conducted is by doing investigation in each vessel, so will be known the fuel that reported by the crew suits.

4.3. Problem analysis

1. The factors that affects fuel consumption in tugboat that belongs to PT. Transcoal Pacific

   In vessel operational process PT. Transcoal Pacific from jetty to the mother vessel, tugboat does much movement like:

   (a) SBE/ Stand by Engine/Start Engine

   Before doing *tugboat* maneuver normally conducts SBE so that vessel machine is able to use well.

(b) Maneuvering

It is to move wearing towing, assist or doing shifting barge normally the vessel does some movement or maneuvering.

(c) Running free

It is *tugboat* movement without burden that pulled or move without barge. Normally this movement will be done if doing assist, refuel/bunker and take ransom from Jetty.

(d) Assist

It is helping the other vessel to docking in Jetty area or exit from *Jetty* area, as well dock or *cast off* from mother vessel.

(e) Towin*g*

It is maneuvering where tugboat pulls a barge to a destination point. *Towing* has 2 branches:

 i. Towing empty barge

 The empty barge is pulled by tugboat to be carried to anchor area or jetty area to load

 ii. *Towing* full loaded barge

 After loading from *Jetty tugboat* should be able to pull a barge that contents coal around 8.000-9.000 MT.

(f) Finish With Engine/Main Engine Stop

After all off thing above done, the last thing that should be done is switching off the machine which means finish all of thing.

Some of movements should be done because in certain situation, such as:

(a) Afloat

Afloat normally conducted when the vessel has arrived in discharging area but there is the other vessel that doing the same in the area, so tugboat should wait for the turn to discharge. In this waiting time the tugboat is only stand by around that area but without any movement before getting instruction from loading master on the vessel.

(b) Dragging

If the weather is not in good condition where the winds blow strongly and strong sea current make barge move by its own. If this condition not solved so the barge will blowed towards the beach which may cause accident. To

anticipate tugboat should do dragging where the vessel hold barge as long as the bad weather continue.

From all processes above, fuel consumption that used to maneuver is not few. For each trip coal transport from jetty to docking place needs 1.500 – 2.000 liters. There are some factors that may causing high fuel consumption such as:

(a) Crew skill onboard

Doing maneuver, the crew of the vessel where this case is master or officer that should have good skill in every movement that done, the faster the movement the lesser the fuel used.

(b) Dragging

Dragging is a condition where the vessel should hold the barge because its swept away due to strong sea current or winds blow. If this happens occasionally so the fuel will throw away in vain only for dragging and not for loading. To anticipate this case, the anchor equipments at barge has to be always in good condition.

(c) Maneuver efficiency time

Each starting a maneuver on the tagboat must use the time efficiently. If the time that used not efficient so the fuel consumption that used will be much.

(d) Assist

When docking at loading / Jetty area needs 1 other vessel assist so that docking process be safety. In this case also caused high fuel consumption at tugboat due to out of loading or discharging coal the tugboat also has another task to assist another mother vessel or Jetty.

(e) *Horsepower* of engine

Horsepower of engine is machine capacity that used on the vessel, the higher the horsepower the higher the power it used to move, also increase fuel consumption on the tugboat.

Have another job to assist on big ship or jetty.

(a) Ship's Engine Horsepower

Engine horsepower is engine capacity used on ship, The higher engine capacity used, the higher horse power used by the ship as the use of the tug boat for moving.

How the effect of controlled fuel-used by the tugboat of PT.Transcoal Pacific branch sangatta?

By the company obligation to reduce fuel spent, so they can save 20% for budgeting tugboat fuel consumption. As a deliver, company allowed to lower the ship use because they are the one who bear the fuel budget. Yet it also determined by contract (charter Party) and related organization. If within the contract the charterer company does not have any right to reduce the using rate, then it is not possible to do so. If the captain or chief engineer against current consumption tired by the company then the company able to fired the captain or chief engineer or at least switch them. Many cases before when a company reduce ship's using rate the crew will go on labour strike or simply demonstration. In a company I was on internship, fuel reducement 4 to 5 fleet caused labour strike and slow down loading and discharging process. However the company solve this problem by give a warning the crews who conducting labour strike that if they insist to continue against current obligation they will got replaced. With the new obligations given by the boards of directions means branch offices should be more through in case of fuel spent and overwatch each bunkering process, in order to reach maximum work performance and target set by the boards of directors.

2. The effort to control fuel consumption of tugboat by PT. Transcoal Pacific, Sangatta branch

(a) Restricting Tugboat Vessels Movement

Conducted so there no unnecessary additions movements and fuel consumption of tugboats. In maneuver restrichment of tugboat by PT.Transcoal Pacific publish circular about maneuver set by the company, which is:

i. After the barge lean to mother vessel, the tugboat that having stated barge must be stand by next to it waiting for instruction from loading master on mothership.

ii. For the leaving of the barge from mother used after discharging (Cast Off) not using any other ship's help to assist unless ordered by the loading master.

But of that, PT.Transcoal Pacific publish standard maneuvers for efficiency and save the fuel. Of course the consumption would be different since those standards based on main engine size and horsepower of each tugboat and the activity conducted by stated vessel.

i. For each vessel that would be maneuver, outside of Loading Master's request on the mother vessel (Outside of Operation) have to report and get agreement from Loading Master, after getting the agreement then the Captain immediately report the beginning move time and finishing move time which will be noted inside movement log book.

ii. Vessels that the barge are loaded but should go on berth to wait docking schedule toward mother vessel must lie at anchor as close as possible to the mother vessel which will be docked by the tugboat for discharging. For the vessel that the barge still vacant and temporary have turn to dock PT. Kaltim Prima Coal Jetty should be at anchor as close as possible while paying attention on safety and security factors (Keeping safe space with another vessel and not interrupting sailing course).

(b) Rewards to the crews

One of control effort at PT. Transcoal Pacific is by giving surplus for crews. With the time service quality that company given towards the crew it will raise crew faith to the company and ease them on implementing new rules. Give rewards to the crews is a form of bonuses set by company out of their basic salary.

(c) New Fuel Lock Implementation

Central management has set the fuel consumption calculation that expected so the branch office able to conduct the obligation.

In the progress to achieve fuel efficiency, new fuel consumption obligation have been implemented that is give quota system on fuel consumption for each fleet. The quota arranged based on route/trip the vessel went through, here is the detail:

i. Jetty of Tg. Bara – Tg. Bara kapal besar – Jetty of Tg. Bara: 480 Litres.

ii. Jetty of Bengalon – L.Tutung Kapal Besar – Jetty of Bengalon: 480 Litres.

iii. Jetty of Tg. Bara – L Tutung Kapal Besar – Jetty of Tg. Bara:1.360 Litre.

iv. Jetty of Bengalon – Tg. Bara Kapal Besar – Jetty of Bengalon: 1.360 Litres.

v. LCT *Long Trip*: 400 Litres.

vi. LCT *Short Trip*: 200 Litres.

Those quantity of fuel consumption above are fixed or locked for each trip cycle.

i. Fuel quota calculation above have include *Generator Set* (A/E) consumption.

ii. If after 3x24 hours the ship stop operating or stand by, the company will add quota for lighting (A/E) as,much as 160/day counted since the vessel stop the service.

iii. If at one sailing trip a vessel done a discharging at 2 different mother vessel (Return cargo) and still within one in docking area, the company will add a fuel quota for maneuver as much as 300 litres, however if its at 2 different docking area will be considered as locked long trip.

iv. If there any assist maneuver requested by port captain, then the activity will get 50 litres addition.

v. If bad weather happened, the crew should report it to officer who in charge at port (Port Captain/Operation Superintendent) in relation for calculating addition calculation of fuel. The quota that may be given as much as 50 litres/hour and should be recorded inside ship's log book followed by support data (wind speed, wave height, weather memo from "port authority.

vi. The consumption of assist tug at loading dock and mother vessel maximum 1 hour. The consumption at loading dock on normal weather only 1 unit..

(d) Monitoring the tugboat

Effort that able to done on tugboat when inflation of fuel consumption happened is increase monitoring on tugboat related to thoroughness also the skill bunkering process conducted on board.

5. Conclusion

The result of research about fuel consumption control for tugboat's fuel consumption efficiency from PT. Transcoal Pacific, Sangatta branch, the conclusion as a follow:

1. A dragging which caused by strong wind and sea current when the tugboat went to berth or to Mother vessel which was raised the fuel consumption. This was happened due the lack of monitoring and awareness of the operational staff make tugboat's fuel consumption got an impact on the high operational cost.

2. Stritch of monitoring on vessel which hadn't reached designated ratio of fuel consumption end up with decreasing of fuel consumption ratio.

3. At branch office implement restriction of vessel maneuver in order to achieve central boards of directors obligation and target which is efficiency of fuel consumption.

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