

ANALYSIS OF SHIP WAITING TIME TO GET SHIPYARD SERVICE AT PT. DOKP AND SHIPPING WAIAME IN AMBON CITY

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Abstract. The purpose of this research is to determine the best service system that can be applied by PT. Dokp and Shipping Waime Ambon. so that the waiting time can be pressed. This research is descriptive research, with the population in this study is the entire number and type of ships that have docked at PT. DOKP and Waime shipping for 13 months. The sampling method used in this research is Convenience Sampling. The sample used in this study is the number of ships repaired in a period of up to 13 months. The analysis tool used is queueing theory of multi channel-single phase model. The results showed that the average arrival rate of ships per month is as many as 9 units of ships, while the average length of docking as much as 3 units of ships / month. Therefore, it can be seen that the level of service is not optimal to reduce the arrival rate of ships, and the chance of idleness by 2. Therefore, the arrival of ships is more than the level of ship service at PT. Dokp and Shipping Waime Ambon.

Keywords: Waiting Time, Service Level

Abstrak. Tujuan penelitian ini adalah untuk menentukan sistem pelayanan yang terbaik yang dapat diterapkan oleh PT. DOKP dan Perkapalan Waime Ambon. agar waktu tunggu dapat ditekan. Penelitian ini merupakan penelitian deskriptif, dengan populasi dalam penelitian ini adalah seluruh jumlah dan jenis kapal yang pernah docking di PT. DOKP dan perkapalan Waime selama 13 bulan. Metode pengambilan sampel yang digunakan dalam penelitian ini adalah *Convenience Sampling*. Sampel yang digunakan dalam penelitian ini adalah jumlah kapal yang di perbaiki dalam kurun waktu sampai 13 bulan. Alat analisis yang digunakan adalah Analisis Teori Antrian (*Queueing Theory*) model *multi channel-single phase*. Hasil penelitian menunjukkan bahwa diperoleh rata-rata tingkat kedatangan kapal per bulan adalah sebanyak 9 unit kapal, sedangkan rata-rata lama dok sebanyak 3 unit kapal/bulan. Maka dari data ini, dapat dilihat bahwa tingkat pelayanan kurang optimal untuk menekan tingkat kedatangan kapal, dan peluang menganggur sebesar 2. Olehnya itu kedatangan kapal lebih banyak dari tingkat pelayanan kapal pada PT. Dokp dan Perkapalan Waime Ambon.

Kata Kunci: Waktu Tunggu, Tingkat Pelayanan

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INTRODUCTION

In the field of marine transportation, the maintenance of ships in the field of sea transportation is one of the most important activities because it can determine the feasibility

of a ship. In addition, ship maintenance is one of the very complex and dynamic processes with interdependence between variables that are quite high, one of which is information. However, most of the information scattered in several stages of the process is generally incomplete and reliable. The level of accuracy of the estimated duration of ship maintenance affects the quality of shipyard service and becomes very important as a result of the shipyard's business process. If the maintenance duration is too long, then the shipyard will become unespective and if the duration becomes shorter, then the material supply schedule will fall apart and reduce the quality of workers' work performance due to unrealistic duration (Srdoc et al. 2006).

The shipyard is a place designed to build, maintain and repair ships. Currently there are about 240 domestic shipyard companies spread across Indonesia, 37% on the island of Java, 26% on the island of Sumatra, 25% in Kalimantan and 12% in the eastern region of Indonesia, with a ship building capacity of 140,000 GT (Gross Tonnage) per year (Windyandari, 2008).

Queues, is a phenomenon that often occurs when the demand for a service at certain times exceeds the capacity of the service. In general the busy period can be described with the process of the queue system starting when the customer arrives, then waiting, and will end when the customer leaves the system. Throughout busy periods there is always at least one customer in the system (Ferreira, 2011:195). The occurrence of queues and human behavior becomes something that is inseparable from the problem of queues, this is one of the factors of uncertainty (randomize) and also very influential in the service system. One way that can be used to observe systems that contain uncertain factors is to use a single service queue system method and that will present a real system, with which it is possible to be able to observe how this method system behaves. The more capable the service system imitates the real system, the better the method.

PT. DOKP and Shipping Waiaime Ambon, is one of the shipyards that has been established since 1965. 42% share ownership is owned by the Government of Maluku and 58% owned by the central government through PT. DOKP and Shipping Surabaya. Pt. DOKP and Waiaime Ambon Shipping became central to ship repair and new shipbuilding in eastern Indonesia. Area of PT. DOKP and Shipping Waiaime Ambon is 5 (five) Ha, Watter Front 720 M, with a depth of 8-20 M, with shipyards can be seen in table 1 below.

Table 1. Slip Way Facilities and Air Bag Dock Facility PT. DOKP and Shipping Waime Ambon

No	Dock	Shipyard Line	Capacity
1	Slip Way	I	200 TLC
		II	500 TLC
2	Air Bag System	I (West)	200 TLC
		II (Central)	200 TLC
		III (East)	500 TLC

Source: PT. DOKP And Shipping Waime Ambon 2016

PT. DOKP and shipping waime Ambon, can perform ship repair and maintenance such as: Ship engine overhaul, Propeller repair, anchor chain maintenance, welding, drilling, also painting and zinct-anado. There are 4 types of ship maintenance service system in PT. DOKP and Shipping Waime Ambon. Where it is listed in table 2 below.

Table 2. Types of Ship Maintenance Service System at PT. Waime Ambon Dock and Shipping

System I	Overhaul → propeller repair → anchor chain maintenance → welding → drilling → painting → zinct-anado
System II	Overhaul → propeller repair → painting
System III	Overhaul → anchor chain maintenance
System IV	Overhaul → welding → drilling → painting → zinct-anado.

Source : PT. DOKP And Waime Ambon Shipping, 2016

During the period of 13 months there were 5 (five) units of ships that retreated from the queue. The cause is the ship's waiting time which exceeds 15-20 days. Then the ship's company may withdraw from the queue list or choose to move to another ok-dock. The impact of ships that disembark or retreat from the queue is PT. Dokp And Waime Shipping refunds the costs paid by the ship company and with an additional 20% of the fee paid by the ship company. So in this case PT. Dokp and Waime Ambon Shipping will suffer losses.

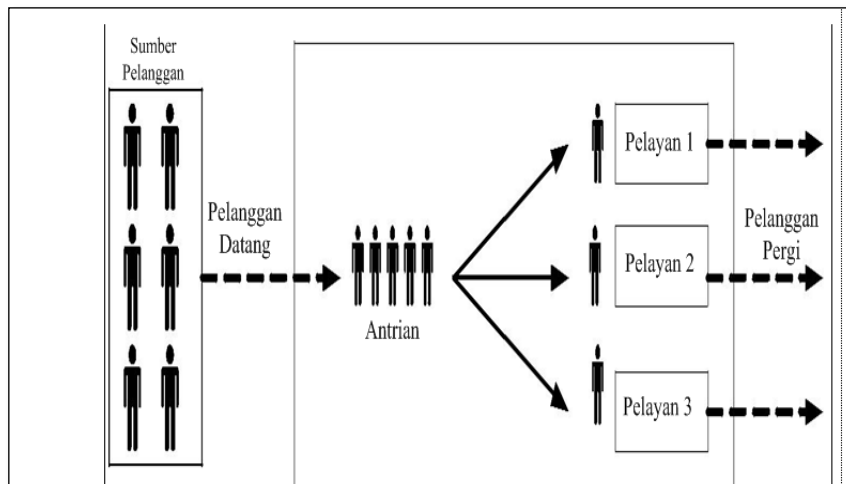
PT. DOKP and Shipping Waime Ambon has a requirement for each ship docking, for each company that will do doking, namely (a) fill out the ship company form, (b) the weight of the ship must comply with the weight of the shipyard, (c) agree to the contract to pay a fine of 20% from the ship to PT. DOKP and Perkapalan Waime if the ship declared disembarking from the galanagan suda in the process of work, (d) Agreed to a contract to pay a fine of 20% of PT. DOKP and Perkapalan Waime Ambon to the ship if the party declared

to withdraw from the queue list too long, and (e) After the process on board the new ship bias conducted checks.

METHOD

This research is descriptive research, which is research conducted to find out the value of independent variables, either one variable or more (independent) without making comparisons or connecting between variables with each other (sugiyono, 2011). The population in this study is the entire number and type of ships ever docked at PT. DOKP and Waime shipping for 13 months. The sampling method used in this study is Convenience Sampling which is a convenient sampling conducted by choosing a free sample as desired by the researcher (Jogiyanto: 2009). The samples used in this study were the number of vessels repaired within a period of up to 13 months. Data collection techniques used in this study are observations, interviews, and documentation.

The analysis method used in this study is quantitative analysis method, where there are 3 (three) components in the queue system that will be measured, namely: 1) arrival, population to be served (calling population); 2) queue; and 3) service facilities. The analysis tool used is queue by using multi channel-single phase method. Multi channel–single phase is a method that occurs (there) anytime two or more service facilities are watered by a single queue, to find out can be seen in the following scheme.



The queue formula for the M/M/s model is as follows.

Average number in queue (Lq)

$$Lq = \frac{\lambda^2}{\mu (\lambda - \mu)} \dots \dots \dots (1)$$

Average number in the system (L_s)

$$L_s = \frac{\lambda}{\lambda - \mu} \dots\dots\dots (2)$$

Average time in queue (W_q)

$$W_q = \frac{\lambda}{\mu (\lambda - \mu)} \dots\dots\dots (3)$$

Average time in the system (W_s)

$$W_s = \frac{1}{\lambda - \mu} \dots\dots\dots (4)$$

Probability there are 0 customers in the system (P_0)

$$P_0 = 1 - \frac{\lambda}{\mu} \dots\dots\dots (5)$$

Service level of The Shipyard Line (P)

$$P = \frac{\lambda}{\mu} \dots\dots\dots (6)$$

RESULTS

Queue System Model PT. DOKP And Shipping Waiaime Ambon

Type of queue system used by PT. DOKP and Waiaime Shipping in Ambon City is a multi-channel single phase queue system, where there are 2 (two) shipyards namely Slip Way Shipyard (Line I and Line II) and Air Bag System Shipyard (West, Central and East Line) provided to serve each ship unit, but only one phase is passed to transact through the treasurer of PT. Dokp and Waiaime Shipping. In general, the process of stages in the dosing as follows.

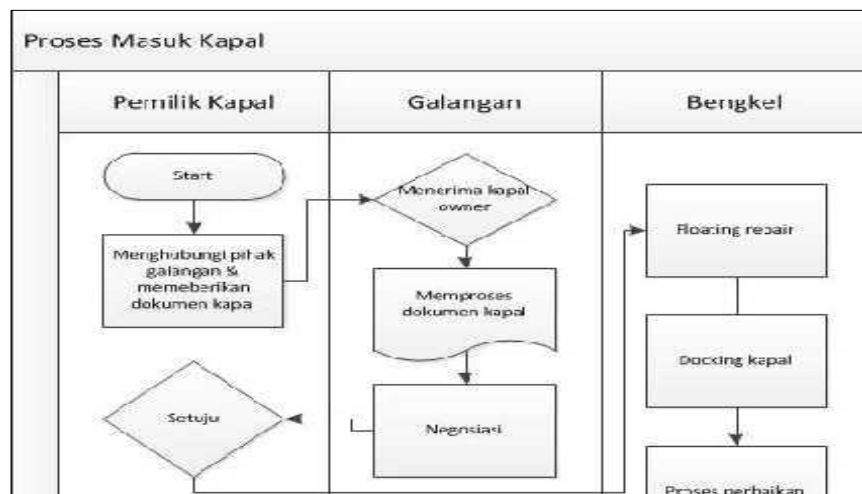


Figure 2. Cross Functional Flowchart Ship Entry Process

Shipbuilding Process

The work when the ship enters the shipyard or the repair process are:

Table 2. Ship Maintenance Service System at PT. Waime Ambon Dock and Shipping

No	Maintenance		Explanation
1	Overhaul		Overhaul is the first stage of maintenance and repair for cleaning, measurement, analysis, replacement of new tools on the material parts of the machine that have been damaged.
2	Propeller	Repair (Propeller Repair)	Repair by removing the propeller and cleaned, then repair dun propeller if there is damaged or bent.
3	Anchor maintenance	chain	Anchor care on the anchor rod (Shank), Nail anchor hook (throat) and anchor chain by cleaning the rust and salt of sea water and cleaning between the anchor rope holes with a brush and special oil.
4	Welding		Repair of the ship starting from inside the ship part is the construction profile or skeleton of the ship, then following the leather part of the ship and hull in the form of plates.
5	Drilling		Maintenance of the vessel by drilling the hull plate that has been thinned or perforated due to rust or collision and replacing the plate with the same thickness as the part that is not drilled.
6	Painting		The painting process is done after the ship in blasting, the use of paint for ships on PT. Waime Ambon dock and shipping are basic paint, AC paint (anti-rust paint), AF paint (anti-marine animal paint, mushrooms and marine plants
7	zinct – anado.		A mixture of Tin, aluminum, magnesium, which is used to protect the iron against corroation or rust attached to the hull and attached to the ship's plate.

Source : PT. DOKP and Ship Waime Ambon 2016

Queue System Performance PT. DOKP and Waime Ambon Shipping

Data acquisition of ship waiting time and docking length by directly observing the number of ships entering the shipyard line Air Bag System Central Line and East Line PT. DOKP and Waime Ambon Shipping. The results of observation of the level of arrival of ships at PT. DOKP and Waime Ambon Shipping can be seen in the following table.

Table 3. Observation Of Waiting Time And Ship Dock Time At PT. Dokp And Waiaime Ambon Shipping In January 2016 – February 2017

Shipyard Line	Ship Name	Arrival Time	Long Wait (days)	Docking Time		Long Dock Time (Day)
				Dock ride	Get off the dock	
Air Bag System Central Line	TK. LPN – 03	09-01-2016	10	19-01-2016	03-05-2016	104
	MT. BERKAT ANUGERAH - 02	29-05-2016	7	04-06-2016	17-08-2016	74
	MT. BERKAT ANUGERAH - 03	12-08-2016	6	18-08-2016	24-09-2016	35
East Line Air Bag System	KMP. LAYUR	20-09-2016	2	22-10-2016	18-11-2016	27
	TK. CAPRICORN – 15	30-11-2016		30-11-2016	09-02-2017	71
	KMP. TEMI	10-02-2016		10-02-2016	23-02-2016	15
	KMP. WAYANGAN	15-03-2016		15-03-2016	24-03-2016	25
	KMP. INILAKA	20-04-2016	7	27-04-2016	22-05-2016	8
	KMP. TATIHU	20-07-2016		20-07-2016	08-08-2016	30
	KMP. ROKATENDA	05-08-2016	6	11-08-2016	03-09-2016	11
	KMP. LOBSTER	09-09-2016		09-09-2016	02-10-2016	17
	KMP. BADA LEONI	29-09-2016	7	06-10-2016	17-10-2016	73
	KMP. ERANA	20-10-2016		20-10-2016	01-11-2016	20
	KMP. TANJUNG KABAT	04-11-2016		04-11-2016	17-11-2016	9
	KMP. TANJUNG SOLE	09-11-2016	9	18-11-2016	29-11-2016	30
	KMP. DANAU RANA	20-11-2016	9	29-11-2016	20-12-2016	14
	Amount		63			563
	Average		7			9

Source : Observation Results in 2017

The longest waiting time for shipyard service is at the Central Line Air Bag System Shipyard for 10 days, namely on 09-01-2016 with a dock time of 104 days, namely on 19-01-2016 until 03-05-2016 and the fastest time tunggu shipyard service for 2 days that is on 20-09-2016 with a length of dock time for 27 days that is on 22-10-2016 to 18-11-2016.

Tabel 4. Average Length of Time Dock Ship On Shipyard Air Bag System Middle Line And East Line

Jalur Galangan Kapal	Total Lama Dock	Lama Tunggu	Rata-Rata Lama Dok
Air Bag System Jalur Tengah	311	25	12.44
Air Bag System Jalur Timur	252	38	6.63

Sumber : Hasil Pengamatan (data diolah) Tahun 2017

Queue Process

On this model the distributed arrival of poisson and exponential service time. In this situation, the arrival forms a single line to be served by a single station. It is assumed that the system is in the following conditions.

1. Arrivals are served on the basis of First Come First Serve (FCFS) and each arrival waits to be served, regardless of the length of the queue.
2. Arrivals are not tied to previous arrivals, it's just that the average number of arrivals does not change by time.
3. Arrival is illustrated by poisson probability distribution and comes from an infinite (very large) population.
4. Service time varies from one ship to the next and is not tied to each other, but the average level of service is known.
5. Service time corresponds to the distribution of negative exponential probability.
6. The level of service cannot keep up with the level of ship arrival.

M/M/s Queue Model Analysis Results

According to Heizer and Render (2009), some common queue models one of which is Multi Chanel Single Phase that occurs if there are two or more service facilities are flowed by a single queue, just like the model of shipyard service line Air Bag System Middle and East Line at PT. Dokp and Perkapalan Waime Ambon which has 2 capacities (200 TLC and 500 TLC) with one-stage service.

Table 5. Performance Results of Model M/M/s Queue System on PT. DOKP And Shipping Waime Ambon

1 Month Time Period	Queue System Performance					
	Lq	Ls	Wq	Ws	P_0	P
30 days	4,5	1,5	180	0,17	2	3

Source : Observations of data processing in 2017

Based on the calculation of table 5 above, within a period of 30 days (1 month) it can be explained that:

1. The average number of ships in the queue (L_q) is 4.5 units / month.
2. The average number of ships in the system that are being served at the shipyard (L_s) is 1.5 units / month.
3. The average waiting time of the ship in the queue (W_q) is 180 days.
4. The average waiting time of a ship in the system (W_s) was 0.17 months (141 days).
5. Probability of 0 units of ships in the system or the level of possibility of idle service (P_0) is 2%.
6. The service level of The Shipyard Line (P) is 3% per month.

DISCUSSION

The results of the study conducted by the author at PT. Dokp And Shipping Waiaame Ambon is to determine the best service system that can be applied by PT. Dokp and Shipping Waiaame Ambon so that the waiting time can be reduced. Pt.. Dokp And Shipping Waiaame Ambon has 2 capacities on 2 Line Shipyard Air Bag System namely 200 TLC for The Middle Line and 500 TLC for the East Line, it shows that the channel used is double (Multi Channel).

The structure of the queue model that occurs in PT. Dokp And Shipping Waiaame Ambon is a Multi Channel Single Phase. By implementing the First Come First Serve (FCFS) system, which is where the ship comes first will be served first. During the period of 13 months there were 5 (five) units of ships that retreated from the queue. Which is where the cause is the waiting time of the ship that exceeds from 15-20 days. Then the ship's company could have backed out of the queue list or chosen to move to another ok-dock. The impact of ships that disembark or retreat from the queue is PT. Dokp And Waiaame Shipping refunds the costs paid (panjar) by the ship company and with an additional 20% of the fee paid by the ship company. So in this case PT. DOKP And Shipping Waiaame Ambon will suffer losses.

PT.DOKP And Waiaame Shipping serve ships for 6 working days a week, and 9 hours of work on a daily basis. At the time of service starting from the observation time there is that the longest shipyard service waiting time is at the Central Line Air Bag System Shipyard with a waiting time of 10 days with a dock time of 104 days, while the waiting time of the shipyard service is the fastest for 2 days with a dock time of 27 days. The results showed that the average rate of ship arrival per month is as much as 9 units of ships, while the average docking time is 3 units of ships / month. Therefore, from this data, it can be seen that the level of service is less optimal to reduce the level of ship arrival, and the chance of idleness

by 2. Therefore the arrival of ships is more than the level of service of ships at PT. DOKP and Waiaime Ambon Shipping.

Rambat Lupiyoadi (2006) suggests that services are all economic activities whose results are not products in physical or construction form, which are usually consumed at the same time as the resulting time and provide added value (such as convenience, entertainment, pleasure or health) or solutions to problems faced by consumers. Meanwhile, according to Stevenson (2009) explained that the management of the system or process that creates goods and / or provides services. And Herjanto (2003) Operations management is inseparable from the understanding of management in general, which contains elements of activities carried out by coordinating as activities and resources to achieve a certain goal.

CONCLUSION

Based on the results of the research that has been done following submitted the conclusion that PT. Dokp And Shipping Waiaime Ambon has 2 capacities on 2 Line Shipyard Air Bag System namely 200 TLC for The Middle Line and 500 TLC for the East Line, it shows that the channel used is double (Multi Channel). While the transaction process on the treasurer PT. DOKP And Shipping Waiaime Ambon shows there is only one stage (Single Phase). So, the structure of the queue model that occurs in PT. DOKP and Shipping Waiaime Ambon is a Multi Channel Single Phase. By Implementing a First Come First Serve (FCFS) system. Pt.. DOKP and Waiaime Shipping serve customers for 6 working days a week, and 9 working hours on a daily basis. The service time starts from 08.00–17.00 WIT. During the observation time there is that the longest waiting time of the shipyard service is at the Central Line Air Bag System Shipyard for 10 days, while the fastest shipyard service tuggu time for 2 days is. the average rate of ship arrival per unit time is as much as 9 units of ships, while the average dock length is 3 units of ships. Means the average arrival rate is greater than the service level

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