



Analysis of Vessel Scheduling on The Mintin – Anjir Sampit Track, Pulang Pisau District, Central Kalimantan Province

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Abstract. Mintin River Port is one of the river ports in Pulang Pisau Regency, Central Kalimantan Province. Mintin River Port has a total of 5 ships operating at this port, with the LCT type. Which is used by local people to cross from origin and destination. This crossing has an average sailing time of 15 minutes but there is no fixed schedule. So irregular ship operations often occur due to the lack of lay over time provisions. Apart from that, from direct observations the number of passenger and vehicle productivity at this port is quite dense with a passenger load factor of 73%. Load factor is one of the things that really influences scheduling. With load factor analysis, it can be identified whether or not it is necessary to increase the number of fleets at the port. This research aims to determine the size of the ship's load factor, ship productivity to organize ship schedules based on analysis of the number of ship trips. Then it was analyzed using several methods to overcome these problems, including load factor analysis, prediction analysis of passenger and vehicle growth in the next 5 years using simple linear regression, ship frequency analysis, ship number requirement analysis, and scheduling analysis. From this analysis, it was concluded that ships operating at the Mintin River port had met the ideal load factor requirements, namely 65% or it could be said that passenger demand was heavy, but there was no fixed scheduling. Scheduling that occurs at the Mintin River Port is still based on the capabilities of the ship operator. Apart from that, the ideal number of ships at Mintin River Port is 2 ships, whereas in existing ones there are 5 ships and 3 ships are operated in shifts.

Keywords: Load Factor, Scheduling

1 Introduction

Mintin Harbor is one of the river ports in Central Kalimantan province. Mintin Port has irregular and irregular routes because the scheduling that occurs at Mintin Port is still based on the capabilities of the ship operator, which means income and rates per ship vary. Based on the results of observations made in the field for 30 days, productivity at Mintin Port is quite busy but there is no fixed and regular scheduling. Apart from that, during ship operations at Mintin Port there is no accurate time for loading and unloading so that passengers and vehicles wishing to cross have to wait.

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Mintin Port has 5 ships operating with LCT type ships which are used as a means of access for passengers to cross from Mintin Village to Buntoi Village and vice versa. This crossing transportation is very helpful and useful for local residents because if traveled by land it has a distance of around 60 km. Ships operating at this port are operated alternately, namely 3 ships a day.

Apart from using analysisload factor, when scheduling you must also pay attention to the number of existing piers. Mintin Port has 1 pier so that ships at Mintin Port cannot be operated completely and this causes ships at this port to be off/resting. Apart from that, with analysisload factorwhich is conductedload factorvehicles at this port have not yet reached the minimum limitload factor namely 65% so that the vehicles transported are not transported optimally and make the ship operator's income less due to losses in fuel used.

So to increase revenue, determine rates per ship, and operational services at ports, port services can be improved by optimizing the number of ship trips and the ideal number of ships so that passengers and vehicles can be transported optimally. Apart from that, it can determine the schedule of departure and arrival times for ships so that passengers and vehicles wishing to cross do not have to wait any longer due to untimely loading and unloading. Based on the background that has been described, this research discusses the analysis of ship scheduling on the Mintin - Anjir Sampit route, Pulang Pisau Regency, Central Kalimantan Province.

2 Research Methods

The type of research used in this research is quantitative research. Research according to Dr. Wahidwarni, M.Pd (2017:1) Quantitative research methods are a method used to answer research problems related to data in the form of numbers and statistical programs. To be able to properly explain the approach and type of research, population and sample, research instruments, data collection techniques, and data analysis in a proposal and/or research report.

The analysis used in this research is load factor analysis, analysis of passenger and vehicle growth predictions for the next 5 years, analysis of fleet size, analysis of ship departure frequency, and analysis of optimal ship scheduling under current conditions at Mintin Port. The primary data taken in this research are 30-day passenger and vehicle productivity data, sailing time data and lay over time data at Mintin Port. Meanwhile, the secondary data used in this research are passenger and vehicle productivity data for the last 1 year, average ship speed data, ship characteristics data and data used as literature such as laws, books, journals, articles related to research.

3 Results and Discussion

3.1 Analysis Of Passenger and Vehicle Departure Frequency

So that the load factor on the Mintin - Anjir Sampit route can carry maximum passengers and vehicles, it is necessary to analyze the frequency of ship departures based on passengers and vehicles using the following formula:

1) Based on passengers

$$Fp = \frac{Np}{365 \times K \times LF \times M}$$

$$Fp = \frac{184.628}{365 \times 0,9 \times 0,65 \times 30}$$

$$Fp = \frac{184.628}{6.405,75}$$

$$Fp = 29 \text{ Trip/hari}$$

2) Based on Vehicle

$$Fk = \frac{Nk}{365 \times K \times LF \times M}$$

$$Fk = \frac{2051038}{365 \times 0,9 \times 0,65 \times 193}$$

$$Fk = \frac{2051038}{41.210,3}$$

$$Fk = 50 \text{ Trip/ hari}$$

3.2 Analysis Of Ship Trip Capability

To determine the ship's trip capability under current conditions, you can use the port operational time formula divided by the RTT (Round Trip Time). As for The ship's trip capability can be calculated using the following formula:

$$KT = \frac{\text{Ship operating time at port}}{\text{Round Trip Time}}$$

$$KT = \frac{1.440 \text{ Menit (24 Jam)}}{70 \text{ Menit}}$$

$$KT = 21 \text{ trips/boat}$$

To find the ship's round trip time, use the following formula:

$$RTT = (\text{Running Time} + \text{Lay over time}) \times 2$$

$$RTT = (15 \text{ Minutes} + 20 \text{ Minutes}) \times 2$$

$$RTT = 70 \text{ Minutes}$$

3.3 Analysis Of The Number Of Fleet Required

For conditions that are in accordance with the current requests of service users according to the results of calculations using the frequency of ship departures based on passengers, the following is the calculation of the number of ships needed:

a) Based on Passengers

$$\text{Number of facilities needed} = \frac{FP}{KT}$$

$$\text{Number of facilities needed} = \frac{29}{21}$$

$$\text{Number of facilities needed} = 1 \text{ Kapal}$$

b) Based on Vehicle

$$\text{Number of facilities needed} = \frac{FK}{KT}$$

$$\text{Number of facilities needed} = \frac{50}{21}$$

$$\text{Number of facilities needed} = 2 \text{ Kapal}$$

Based on the results of the calculations above, the number of ships based on vehicles suitable for 2023 is 2 ships. Meanwhile, in the current existing conditions, the number of facilities available on the Mintin – Sampit route is 5 ships.

3.4 Scheduling Analysis

Based on the results of the analysis carried out, the schedule can be prepared by considering the port operating time and current conditions. So, to prepare a ship's arrival and departure schedule, you can use the analysis results as follows:

RTT	= 70 minutes
Lay over time	= 20 Minutes
Headway	= 28 minutes
Port Operation Time	= 24 hours = 1440 Minutes
Travel Time	= 15 minutes
With the ship's departure operation time starting from 07.00 am.	
Early departure time	= 07:00
Arrival time	= Running Time + Lay over time
	= 15 minutes + 20 minutes
	= 35 minutes
With departure time	= 07.00 AM
Then the arrival time of the ship	= 08.00 + 35 Minutes
	= 08.35 WIB

Table 9 Schedule of Ship Arrival and Departure Plans at Mintin Port

BOAT	PORT NAME			
	MINTIN		ANJIR SAMPIT	
	Q	B	Q	B
K1		07.00	07.15	07.35
K2		07.28	07.43	08.03
K1	07.50	08.10	08.25	08.45
K2	08.18	08.38	08.53	09.13
K1	09.00	09.20	09.35	09.55
K2	09.28	09.48	10.03	10.23
K1	10.10	10.30	10.45	11.05
K2	10.38	10.58	11.13	11.33
K1	11.20	11.40	11.55	12.15
K2	11.48	12.08	12.23	12.43
K1	12.30	12.50	13.05	13.25
K2	12.58	13.18	13.33	13.53
K1	13.40	14.00	14.15	14.35
K2	14.08	14.28	14.43	15.03
K1	14.50	15.10	15.25	15.45
K2	15.18	15.38	15.53	16.13
K1	16.00	16.20	16.35	16.55
K2	16.28	16.48	17.03	17.23
K1	17.10	17.30	17.45	18.05
K2	17.38	17.58	18.13	18.33
K1	18.20	18.40	18.55	19.15
K2	18.48	19.08	19.23	19.43
K1	19.30	19.50	20.05	20.25
K2	19.58	20.18	20.33	20.53
K1	20.40	21.00	21.15	21.35
K2	21.08	21.28	21.43	22.03
K1	21.50	22.10	22.25	22.45
K2	22.18	22.38	22.53	23.13
K1	23.00	23.20	23.35	23.55
K2	23.28	23.48	00.03	00.23
K1	00.10	00.30	00.45	01.05
K2	00.38	00.58	01.13	01.33
K1	01.20	01.40	01.55	02.15
K2	01.48	02.08	02.23	02.43
K1	02.30	02.50	03.05	03.25
K2	02.58	03.18	03.33	03.53
K1	03.40	04.00	04.15	04.35
K2	04.08	04.28	04.43	05.03
K1	04.50	05.10	05.25	05.45
K2	05.18	05.38	05.53	06.13
K1	06.00	06.20	06.35	06.55
K2	06.28	06.48	07.03	07.23

Based on existing conditions, the current fleet size is 5 ships, but based on the analysis results, the ideal fleet size is 2 ships. So that the ship can carry the number of passengers and vehicles with load factor maximum, then a pattern of operating 2 ships a day is created and this is carried out alternately for the following day according to the schedule that has been made.

For ships that do not operate according to schedule/days, they can be used as charter ships and become a backup if there is a surge in passengers with the aim of ensuring that the ship operator continues to earn income when the ship does not operate according to the existing schedule.

4 Conclusion

Based on Analysis load factor which was carried out for 30 days at Mintin Harbor has an average load factor departures were 72% for passengers and 57% for vehicles. Based on the analysis of passenger growth predictions, the number of passengers will increase every year. So in 2027 with the amount load factor amounting to 137%, it is necessary to increase the number of fleets. Based on the analysis of existing ship

needs at Mintin Port, the ideal number of ships currently is 2 ships, while the current condition is 5 ships. However, in the operational system, ships at the Mintin port do not operate regularly because there is no fixed schedule at the port. Currently there is no scheduling at Mintin Port taking into account port operating times and current conditions. With this, ships serve passengers and vehicles less than optimally and departure schedules are uncertain.

Based on the results of the analysis of passenger and vehicle growth in the next 5 years, it is necessary to re-analyze the number of ship trips according to the needs of service users. Improve service to service users by reviewing ship load factors, especially for vehicles, so that they reach the ideal limit of 65%. It is necessary to review the number of ship trips according to the needs of service users based on the ideal number of ships so that maximum passengers and vehicles can be transported. It is necessary to arrange schedules according to the number of trips and ships that have been previously analyzed in order to increase comfort for service users.

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