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THE EFFECT OF QUEUING TRUCKS ON THE ROADSIDE ON ROAD PERFORMANCE ON BRIGJEND HASAN BASRI ROAD BANJARMASIN CITY

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ABSTRACT

The performance of traffic flow on Brigjend Hasan Basri Road, Banjarmasin City especially near the Pertamina Kayu Tangi gas Station Area is influenced by the queue of trucks consisting of 4-15 trucks or ±150 m long, thus creating congestion. Analysis of the influence of truck queue vehicles was carried out to obtain traffic performance affected by truck queues and without truck queues, as well as compare the two analysis results. The method of data collection is carried out by observation and direct recording. Data analysis was carried out using conventional methods (Greenshield, Greenberg, and Underwood) and the best model was obtained, namely the Greenshield model. Based on the calculation results, there was a decrease in the maximum Flow by 10.16%, the free flow speed decreased by 19.41% and the maximum density increased by 11.48%. The result of the calculation of the Level of Service, for road conditions without a queue of trucks that have a saturation degree value of > 0.8 occurs in the range of 15.10 – 16.40 Central Indonesian Time and the hour range of 16.30 – 18.00 CIT (zone). As for the condition with the queue of trucks occurring in the range of 14.50 – 18.00 CIT (zone)..

***Keywords**:* Road Performance, Traffic Characteristics, Truck Queue

1. INTRODUCTION

On Brigjend Hasan Basri Road in Banjarmasin City, several obstacles interfere with the flow of traffic on the highway. As the only road used for two-way traffic connecting Central Banjarmasin District and North Banjarmasin District and vice versa, there are still areas that experience congestion. One of the causes of this congestion is that there are many trucks stopped on the side of the road, thus affecting the flow of traffic on the road.

Analysis of road performance conditions is needed to obtain road performance that is affected by obstacles, especially in this study road performance is influenced by truck queues consisting of 4-15 trucks or with a queue length of ±150 m at the time of observation. In this study, an analysis of Flow and speed data will also be carried out in each condition using conventional methods (Greenshield, Greenberg, and Underwood) to

be able to determine the performance of Brigjend Hasan Basri Road based on the Level of Service (LOS)[8].

In general, this study aims to analyze road performance that is influenced by truck queues on the side of the road or without the influence of truck queues on the side of the road. Then, get the influence of truck queues on traffic characteristics by comparing the influence of truck queues on the side of the road with no influence of truck queues on the side of the road.

2. THEORITICAL STUDY

2.1 Road Section Performance

Based on IHCM (1997), the performance of road sections has a definition as a quantitative measure that explains the operational conditions of road section facilities. Measures of the performance of a road are expressed in capacity, degree of saturation, travel speed, free-flow speed, and travel time. While the qualitative measure for states the operational condition of the traffic is the level of service on-road sections[5].

2.2 Traffic Flow Characteristics

The characteristics of the road are at each specific road point where there are important changes in the geometric plan, traffic flow, and side-of-road activities that are the boundaries of the road segment2. Traffic Flow is the number of vehicles passing through a point per unit of time at a given location. Measure the amount of traffic flow, it is usually expressed in vehicles per day, PCU per hour, and vehicles per minute1. The value of a section of the road today consists of several types of vehicles. Therefore, it is necessary to convert all types of such vehicles into Passenger Car Units (PCU)8. The Passenger Car Equivalent is shown in Table 1.

Table 1. PCE Factor For Urban Roads

Num	Types of Literacy	Passenger Car Equivalent
1	Passenger Cars	1.0
2	Minibus	1.8
3	Bus	2.0
4	Light Truck	1.5
5	Medium Truck *)	2.0
6	Heavy trucks	2.5

Num	Types of Literacy	Passenger Car Equivalent
7	Motorcycles	0.33
8	Bicycle (Incorporated)*)	0.5
9	Three-Wheeled Vehicles	1.0

Source : (Radam, 2008)

Speed is the distance that a vehicle can travel on a section of road per unit of time11. In general, there are two types of speed that are commonly used in studies of traffic flow speed, namely Time Mean Speed, and Space Mean Speed. The difference in the analysis is that TMS is a point measurement, while SMS measurement is related to the length of the lane or road4. Traffic density is the number of vehicles occupying a length of a road or lane. It is generally expressed in vehicles per kilometer (Vehicles/km), PCU/kilometer, or vehicles per kilometer per lane (vehicles/km/lane)4.

2.3 Model of Relations Flow, Speed, and Density

The relationship module between Flow, speed, and density has at least three types of models to describe the relationship of three traffic flow parameters, namely the Greesnshield Model, the Greenberg Model, and the Underwood Model. Every model can be written as its formula6.

2.4 Parking Placement Position

Based on the Directorate General Of Land Transportation Indonesia, The right location or said to be ideal for the needs of off-road body parking should be built not too far from the destination with a distance of about 300-400 m. Because if it is too far, the driver will choose another parking space12. Off-road body parking can be seen in Figure 1 and parking on the road body in Figure 2.

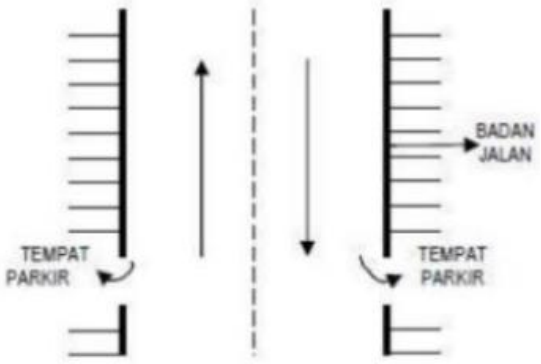

Figure 1. Off-road Bodies Parking[7]

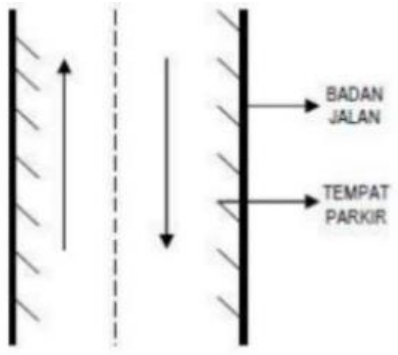

Figure 2. On-Road Bodies Parking[7]

2.5 Stastitical Analysis

Data analysis could be divided into Regression Analysis and Correlation which has its formula10. interpretation of the value of r2 based on the correlation coefficient9 can be seen in Table 2.

Table 2. Interpretation of r^2 Correlation Coefficients

R value[2]	The absolute value of the correlation coefficient	Interpretation
< 0.04	0.00 – 0.199	Little correlation; almost negligible relationship
0.04	0.20 – 0.399	Low correlation; definite but small relationship
0.16	0.40 – 0.699	Moderate correlation; definite but small relationship
0.49	0.70 – 0.899	High correlation; marked relationships
0.81	0.90 – 1.000	Very high correlation; very dependable relationship

Source : (Radam et al, 2015)

3 METHOD

The study was conducted for 12 hours from 06.00 Central Indonesian Time (Zone) to 18.00 Central Indonesian Time (Zone). Then, the data is retrieved at intervals of every 10 minutes. Data collection will be carried out on one of the days between Monday and Friday. Where the implementation of data collection is carried out on only 1 (one) selected day The research was carried out on Jalan Brigjend Hasan Basri, Banjarmasin City. With a review only on one direction of the type road (2/1), namely from the Central Banjarmasin District towards North Banjarmasin. Each area is taken at a distance of approximately 100 m with the consideration that there are no other obstacles except the influence of truck queues on the performance of the Brigjend Hasan Basri Road section. The length of the truck queue at the site under review consists of 4-15 trucks or ±150 m long. The area plan of the study site can be seen in Figure 3.

Figure 3. Sketch of the Research Location Area on Brigjend Hasan Basri Road

The primary data collection will be analyzed by conventional methods (Greenshield, Greenberg, and Underwood). By choosing the most relevant model, a characteristic relationship will be obtained for each condition of the destination. Based on the value of the characteristic relationship, a comparison of the value of each condition will be obtained, and then measured the quality of service from the road section with the Level of Service (LOS) for each condition reviewed.

4 RESULTS AND DISCUSSION

The implementation of data collection is only carried out on 1 (one) day. The effect of truck queues on the side of the road on-road performance which is an overview is each truck that queues on the side of the road in front of or before Pertamina Kayu Tangi gas stations. Based on the observation results, the length of the queue of trucks on the edge of the road section consists of between 4-15 trucks or approximately 150 meters long.

4.1.Traffic Survey Data

To obtain the Flow of traffic in Passenger Car Units (PCU), the data on the number of vehicles every ten minutes obtained from the survey result is multiplied by the PCU equivalence factor for each type of vehicle and then add it up so that traffic flow is obtained. The Flow of traffic when there is no truck queue can be seen in Figure 4, and the traffic Flow of the condition in the presence of a truck queue is in Figure 5.

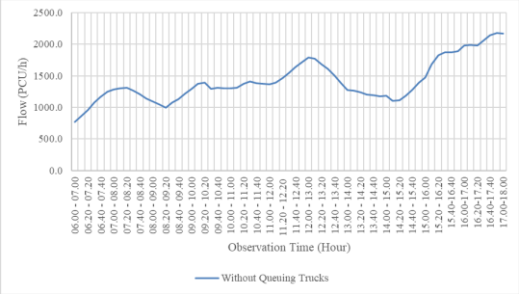

Figure 4. Traffic Flow When There are no Truck Queues

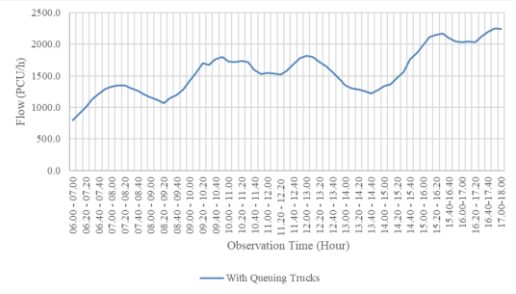

Figure 5. Traffic Flow When There are Truck Queues

From Figure 4, it was obtained that the largest traffic Flow occurred at 16.50-17.50 CIT of 2181.60 PCU/hour. Meanwhile, from Figure 5, it was found that the largest traffic Flow occurred at 16.50-17.50 CIT of 2249.80 PCU/hour.

The speed data has the understanding that the data is the average vehicle speed data in the desired period. Traffic speed when there is no truck queue can be seen in Figure 6, and Traffic speed conditions in the presence of truck queues as shown in Figure 7.

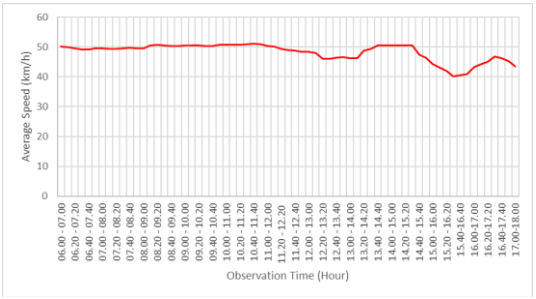

Figure 6. Traffic Speed When There are no Truck Queues

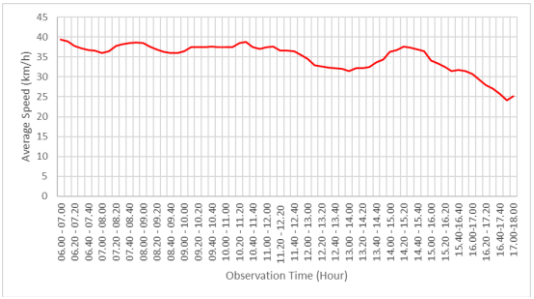

Figure 7. Traffic Speed When There is a Truck Queues

From Figure 6, it is obtained that the largest traffic speed occurs at 10.40-11.40 CIT of 51.11 km/hour. From Figure 7, it is obtained that the largest traffic speed occurs at 06.00-07.00 CIT at 39.33 km/hour

4.2.Analysis of Road Conditions without the Influence of Truck Queues

In the condition of Jalan Brigjend Hasan Basri without any queues, data trucks were taken at a distance of ±100 meters after the Pertamina Kayu Tangi gas station. With Microsoft Excel *Software* tools, data are analyzed to obtain parameter values from all three models with consideration of the correlation generated by the relationship of density (D) and speed (S) as well as realistic free variable values. The correlation value under consideration is the value that describes the relationship between the variable as strong (>0.699) and the value of the free variable (x) at the

condition (y) ≈ 0 is realistic. The results of the model of the equation of S-D relationships and correlations on-road sections of conditions in the absence of truck queues can be seen in Figure 8.

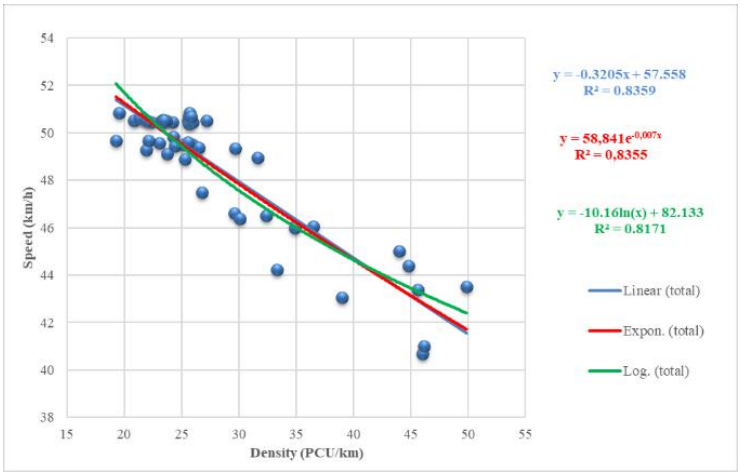

Figure 8. Relationship Graph of Three Speed Equations – Density without Truck Queues

From Figure 8, a model of the equation between speed and density is obtained as shown in Table 3.

Table 3. **Speed Equation Model – Density and correlation Without Truck Queue**

Relationship	Model Press.	r^2	r	x	Des.
Greenshield	***y = -0.3205x + 57.558***	0.8359	0.9143	180	Very High
Greenberg	***y = -10.16ln(x) + 82.133***	0.8171	0.9039	8406	Very High
Underwood	***y = 58.814e-0.007x***	0.8355	0.9141	3242	Very High

A graph of characteristic road conditions without the influence of truck queues can be seen in Figure 9.

From Figure 10, a model of the equation between speed and density is obtained as shown in Table 4**.**

Table 4. **Speed Equation Model – Density and correlation With Truck Queues**

Relationship	Model Press.	r^2	r	x	Des.
Greenshield	***y = -0.2317x + 43.386***	0.9083	0.9530	200	Very High
Greenberg	***y = -12.21ln(x) + 81.982***	0.8426	0.9179	824	Very High
Underwood	y = ***49.712*** ***e-0.007*** x	0.9077	0.9527	7102	Very High

A graph of characteristic road conditions with the influence of truck queues can be seen in Figure 11.

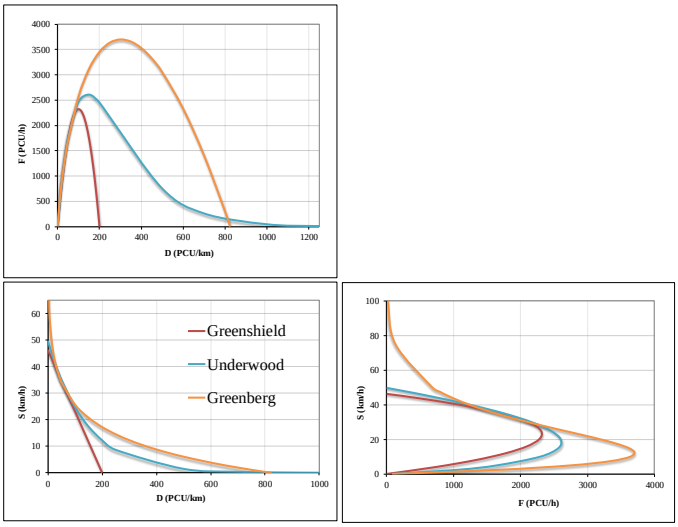

Figure 11. Graph Relationship of Traffic Characteristics without the Influence of Truck Queues

4.4.Comparison of Road Performance without the Influence of Truck Queues and Roads with the Influence of Truck Queues

The results of estimating the parameters of the Greenshield Model obtained regression analysis techniques obtained a model of the relationship between traffic speed (S) - Traffic density (D) so that a Flow value (F) was obtained as can be seen in Table 5.

Table 5. **Comparison of Maximum Flow, Speed, and Density values of Roads Without Truck Queues and With Truck Queues**

Scenario	Sf	Fc	Dj
Condition Without Truck Queues	57.56 km/h	2548.18 PCU/h	179.59 PCU/km
Condition There is a Truck Queue	46.39 km/h	2321.60 PCU/h	200.20 PCU/km
Percentage of Demotion and Improvement of Conditions Without Effect of Truck Queues On Conditions With The Effect of Truck Queues	Decreased by 19.41%	Decreased by 10.16%	Experienced an increase of 11.48%

4.5.Level of Service (LOS)

The Level of Service of each road section in view is obtained from the division of Flow (V) that occurs against the maximum capacity (C). The capacity value of the road in question is equal to the Maximum Flow value (Fc) of the selected model. For road capacity without truck queues are 2584.18 PCU/h and the capacity for roads with truck queues is 2321.60 PCU/h. In this study, the service level was divided into 2 scenarios, namely conditions without truck queues and conditions with truck queues. The Division of the Level of Service can be seen as shown in Figure 12.

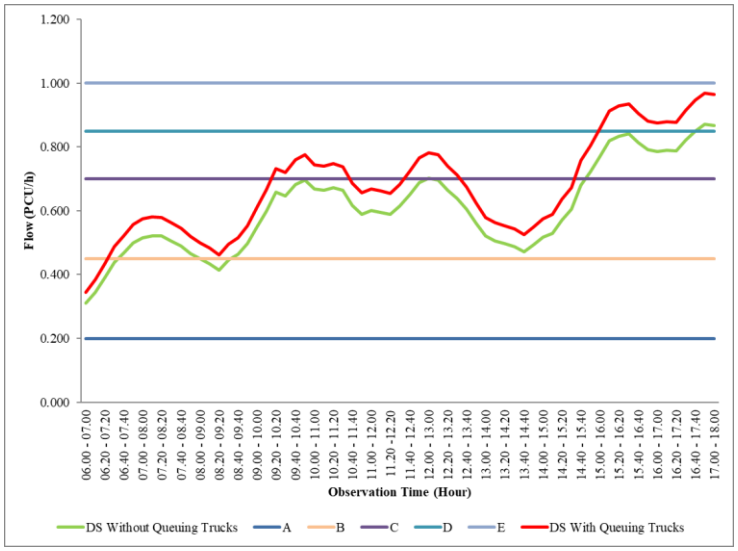

Figure 12. Level of Service Graph without Truck Queues and with Truck Queues

Road Service Level is a qualitative measure that explains the operational situation on traffic flow and the views of motorists[3].

5 CONCLUSIONS AND SUGGESTIONS

Based on the results of data processing and work analysis on the Brigjend Hasan Basri Road section caused by a queue of trucks consisting of 4-15 trucks or along the ±150 m, several conclusions can be drawn as follows. From the results of the study, it was obtained that the traffic characteristics on Jalan Brigjend Hasan Basri, the relationship between Flow (F), Speed (S), and Density (D) obtained the value of the correlation coefficient (r) with the Greenshield method in conditions without truck queues with a value of 0.9143. Analysis with the Greenshield relationship model resulted in a Free Flow Speed (Sf) value of 57.59 km/h, a Maximum Density (Dj) value of 179.59

PCU/km, and a Maximum Flow (Fc) value of 2584.18 PCU/h. In road conditions without truck queues, according to dominant observations, it shows LOS C (67%). The current condition is unstable, the speed sometimes stops in the range of 16.50 – 18.00 CIT.

From the results of the study, traffic characteristics on Jalan Brigjend Hasan Basri related to Flow (F), Speed (S), and Density (D) obtained the value of the correlation coefficient (r) with the Greenshield method in conditions with the presence of truck queues with a value of 0.9530. Analysis with the Greenshield relationship model resulted in a Free Flow Speed (Sf) value of 46.39 km/h, a Maximum Density (Dj) value of 200.199 PCU/km, and a Maximum Flow (Fc) value of 232.60 smp/h. Road conditions with truck queues according to dominant observations showed LOS C (37%). The current condition is unstable, the speed sometimes stops in the range of 15.00 – 18.00 CIT.

When traffic is affected by the presence of truck queues on the side of the road, the maximum Flow decreases by 10.16% from conditions without the influence of truck queues, the maximum speed decreases by 19.41% from conditions without the influence of truck queues and for maximum density, there is an increase of 11.48% from conditions without the influence of truck queues. This can happen because of a queue of trucks that stop in front of Pertamina Kayu Tangi gas stations, thus making the flow unstable until there can be congestion.

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