



PERFORMANCE EVALUATION OF MARKED INTERSECTION AT THE RH-MART INTERSECTION

(Evaluasi Kinerja Simpang Tak Bersinyal Pada Simpang Empat Rh-Mart)

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Abstract

Road intersections are places where traffic conflicts occur. The volume of traffic that the road network can accommodate is determined by the intersection capacity of the road network. This study aims to determine the magnitude of the intersection capacity, degree of saturation, delay and queuing opportunities at the RH-Mart Namlea City intersection, whether the solution or alternative solution to the traffic jam problem at the RH-Mart Namlea City intersection. This research was conducted at the unmarked intersection in the city of Namlea, especially the RH-Mart intersection. The intersection performance analysis includes capacity (C), degree of saturation (DS), delay (D); and the probability of queuing $QP\%$ 'was calculated using the MKJI 1997 method. The results showed that the intersection capacity (C) = 632.30 pcu / hour, the degree of saturation, for all directions at the intersection arm and for all survey days $Ds < 0.75$, namely on working days obtained $Ds = 0.071$ and 0.083 , for short days $Ds = 0.087$ and 0.068 , and on holidays $Ds = 0.068$ and 0.070 . it means that there is no need for improvement of the intersection geometry, control of total intersection currents, and control of the flow with signs to maintain the desired degree of saturation ($DS \leq 0.75$). Because the Ds value obtained is very small there are no delays and queuing opportunities that occur.

Keywords: Unmarked Intersections, Intersection Capacity, Degree of Saturation. Namlea

Abstarak

Persimpangan jalan merupakan tempat terjadinya arus lalu lintas. Volume lalu lintas yang dapat ditampung jaringan jalan ditentukan oleh kapasitas persimpangan jaringan jalan. Penelitian ini bertujuan untuk mengetahui besarnya kapasitas simpang, derajat kejenuhan, delay dan peluang antrian pada simpang RH-Mart Kota Namlea, apakah solusi atau alternatif solusi permasalahan kemacetan di simpang RH-Mart Kota Namlea. Penelitian ini dilakukan di simpang tak bermarkah di kota Namlea, khususnya simpang RH-Mart. Analisis kinerja persimpangan meliputi kapasitas (C), derajat kejenuhan (DS), penundaan (D); dan probabilitas antrian $QP\%$ 'dihitung dengan menggunakan metode MKJI 1997. Hasil penelitian menunjukkan bahwa kapasitas persimpangan (C) = 632,30 smp / jam, derajat kejenuhan, untuk semua arah pada lengan persimpangan dan untuk semua hari survei $Ds < 0,75$ yaitu pada hari kerja diperoleh $Ds = 0,071$ dan $0,083$, singkatnya hari $Ds = 0,087$ dan $0,068$, dan pada hari libur $Ds = 0,068$ dan $0,070$. Artinya, tidak diperlukan perbaikan geometri persimpangan, pengendalian arus persimpangan total, dan kontrol aliran dengan rambu-rambu untuk mempertahankan derajat kejenuhan yang diinginkan ($DS \leq 0,75$). Karena nilai Ds yang didapat sangat kecil tidak ada peluang delay dan antrian yang terjadi.

Kata Kunci: Persimpangan Bermarkah, Kapasitas Persimpangan, Derajat Kejenuhan. Namlea

INTRODUCTION

Road intersections are places where traffic conflicts occur. The volume of traffic that the road network can accommodate is determined by the intersection capacity of the road network. The performance of an intersection is a major factor in determining the most appropriate treatment to optimize the intersection function. The parameters used to assess the performance of an unsigned intersection include; capacity, degree of saturation, delay and queuing opportunity. The intersection is an inseparable part of the road network. In urban areas.

Usually there are many intersections, where the driver must decide to go straight or turn and change roads to reach a destination. An intersection can be defined as a general area where two or more roads join or intersect, including roads and roadside facilities for traffic movement in them (Khisty, 2005). If capacity building traffic flows, congestion starts to occur. The congestion increased as the flow became so great that the vehicles were very close to one another. Total traffic jam occurs when the vehicle has to stop or move very slowly (Ofyar Z Tamin, 2000).

In general, there are 3 (three) types of lanes, namely: (1) level intersections, (2) separation of roads without ramps, and (3) interchanges. A level intersection (an intersection on an incline) is an intersection where two or more roads join, with each road leading out of an intersection and forming a section. These paths are called the legs of the intersection / arm of the intersection or the approach.

The reduced performance of an intersection will cause losses to road users due to increased speed, increased delays, and vehicle queues which result in increased vehicle operation and decreased environmental quality. In contrast to signalized intersections, drivers at unsigned intersections take actions that lack positive directions, drivers aggressively decide to end

the necessary maneuvers when entering the intersection (Abubakar, 1995).

In principle, drivers who have respect for their priority rights pass passengers from other drivers at unmarked intersections. The driver's decision on this situation and the impact on capacity considerations is typically reflected by a statistical method approach which considers the frequency distribution of both accepted and rejected gaps on the main road to the vehicle from the intersection Alamsyah, A., (2005).

The Indonesian Road Capacity Manual (MKJI 1997) states that traffic performance measures include Level of Performance (LoP). LoP means a quantitative measure that describes the operational conditions of a traffic facility as limited by the road builder. (Generally expressed in terms of capacity, degree of saturation, average speed, travel time, delay, queue opportunity, long queue and the ratio of vehicle stops).

The following measures of performance of the unsigned intersection can be estimated according to geometric, environmental and traffic conditions: Capacity (C), Degree of Saturation (DS), Delay (D), Chance of queuing (QP%).

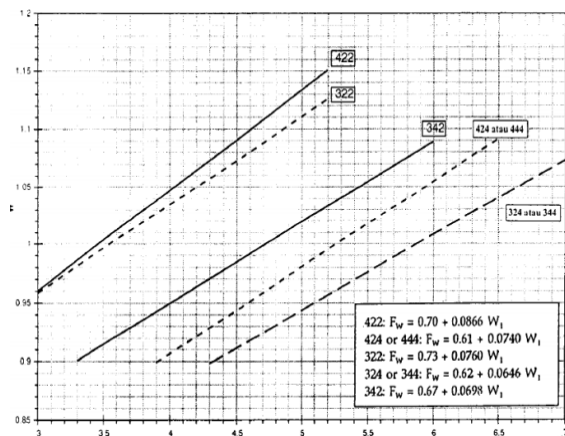
Below will present the Junction Type Code (IT)

Tabel 1. Kode Tipe Simpang (IT)

Kode IT	Jumlah Lajur		
	Simpang	Mener	Maju
1/1	3	2	2
2/1	3	4	2
4/2	4	2	2
4/4	4	2	4

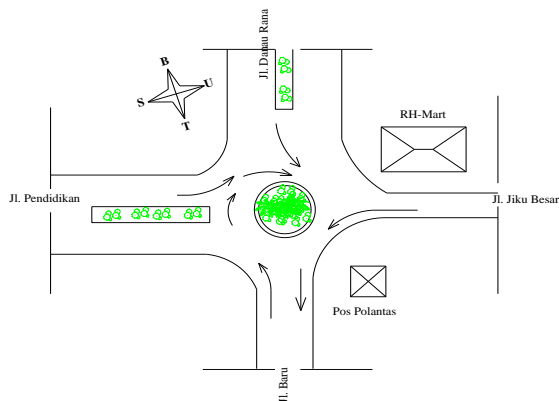
Figure 2. The Intersection Approach

Sumber: MKJI 1997



RESEARCH METHOD

This research was conducted at the unmarked intersection in the city of Namlea, especially the RH-Mart intersection. The intersection performance analysis includes capacity (C), degree of saturation (DS), delay (D); and the probability of queuing QP% 'was calculated using the MKJI 1997 method. This research was conducted at a four-way intersection with the RH-Mart roundabout in Namlea City



Lay Out of the Unmarked Intersection.

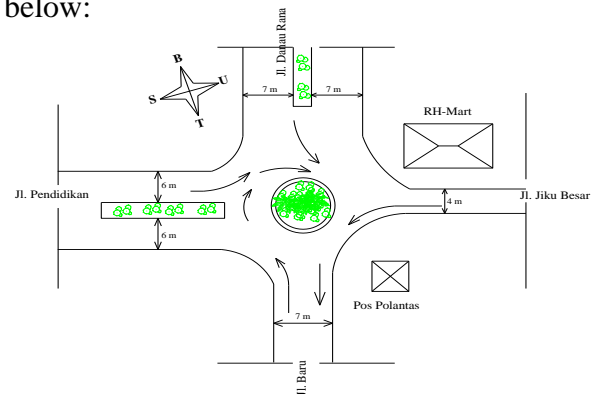
To make it easier to study the data in the field, technical data collection is carried out using the following procedure: a) Marking the observed road sections using duct tape, which is mounted across a 5 meter-wide road segment (command for one lane of road); b) Using a camcorder to record the movement of vehicles installed outside the road that is being observed and placed at a height of 1.5 meters so as not to

interfere with traffic flow and all objects can be seen clearly; c) Members of the surveyor group on each road section to calculate the traffic flow that passes and is divided according to the direction of movement.

FINDINGS AND DISCUSSION

Traffic Data

The survey conducted in this study, took traffic data on weekdays, short days and holidays. For workdays it is taken on Wednesday, the short day is taken on Friday, and for holidays it is taken on Sunday. And the traffic geometry at the RH-Mart four signal intersection is shown in Figure 3 below:



Traffic Volume Analysis Q (pcu / hour)



In calculating the traffic volume on the roads in the study area, real calculations are carried out through the traffic counting carried out on these roads. The Average Daily Traffic is carried out by simple calculations, namely by calculating the number of vehicles in the field directly,

while the passenger car unit method is a continuation of the calculation of the average daily traffic in the study area by multiplying the calculation results with the method. traffic counting with a standard comparison of vehicle types according to MKJI (Indonesian Road Capacity Manual). The following is an example of calculating traffic volume in passenger cars on Jln. Education - Jln. Jiku Besar in the time period 07.00 - 08.00

$$\bullet \text{ LV} = 1$$

$$\bullet \text{ HV} = 13$$

$$\bullet \text{ MC} = 45$$

$$Q = (1 \times 1) + (13 \times 13) + (0.5 \times 45)$$

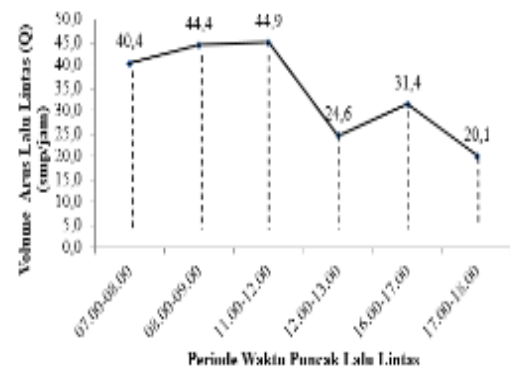
$$= 40,4 \text{ simp/jam}$$

Furthermore, the calculation of traffic volume in units of pcu / hour for other time periods is shown in the table below;

Tabel. Volume lalu lintas Arah Jln. Pendidikan - Jln. Jiku Besar Rabu

Periode Waktu Puncak Lalu Lintas	Volume Arus Lalu Lintas (Kendaraan/jam)			Volume Arus Lalu Lintas (Q) (simp/jam)
	Kendaraan Ringan (LV)	Kendaraan Berat (HV)	Sepeda Motor (MC)	
07.00-08.00	1	13	45	40,4
08.00-09.00	5	13	45	44,4
11.00-12.00	1	8	67	44,9
12.00-13.00	1	7	29	24,6
16.00-17.00	4	8	34	31,4
17.00-18.00	0	7	22	20,1

(Sumber : Analisis Data Pradi Takut Sani PT. Unesa 2015)

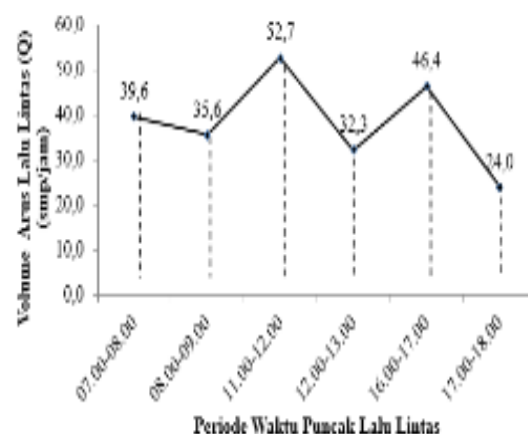


Picture. Graph of Relationship between Peak Traffic Volume Vs Peak Time Period of Traffic Direction Jln. Education - Jln. Big Jiku (Wednesday)

Table. Traffic volume Direction Jln. Danau Rana - Jln. Just Wednesday

Periode Waktu Puncak Lalu Lintas	Volume Arus Lalu Lintas (Kendaraan/jam)			Volume Arus Lalu Lintas (Q) (simp/jam)
	Kendaraan Ringan (LV)	Kendaraan Berat (HV)	Sepeda Motor (MC)	
07.00-08.00	4	7	53	39,6
08.00-09.00	1	12	38	35,6
11.00-12.00	4	19	48	52,7
12.00-13.00	3	11	30	32,3
16.00-17.00	5	13	49	46,4
17.00-18.00	0	10	22	24,0

(Sumber : Analisis Data Pradi Takut Sani PT. Unesa 2015)



Picture. Peak Traffic Volume Relationship Graph vs Time Period Puncak Traffic Direction Jln. Danau Rana - Jln. New (Wednesday).

Table. Traffic volume Direction Jln. Education - Jln. Jiku Besar Friday

Periode Waktu Puncak Lalu Lintas	Volume Arus Lalu Lintas (Kendaraan/jam)			Volume Arus Lalu Lintas (Q) (simp/jam)
	Kendaraan Ringan (LV)	Kendaraan Besar (HIV)	Sepeda Motor (MC)	
07.00-08.00	1	9	51	39.2
08.00-09.00	5	12	43	42.1
11.00-12.00	4	13	68	54.9
12.00-13.00	2	10	30	30.0
16.00-17.00	1	11	39	34.8
17.00-18.00	0	4	20	15.2

Sumber : Analisis Data Pradi Teknik Sipil FT Uniba 2015

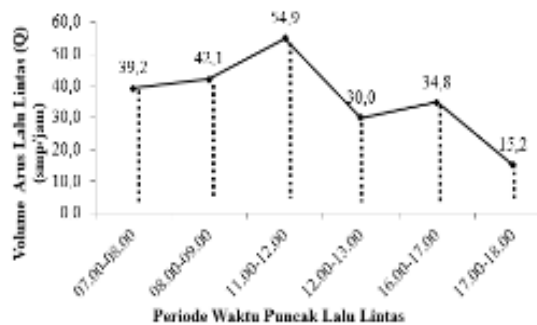
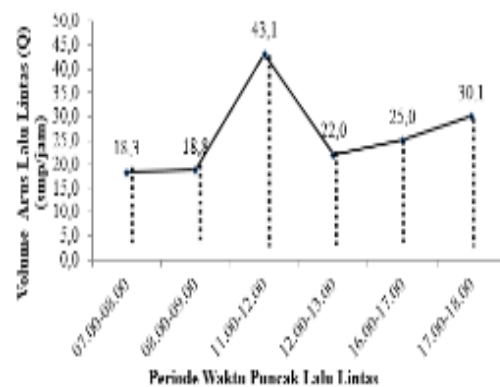


Figure 4.4. Flow Volume Relationship Graph Peak Traffic Vs Time Period Puncak Traffic Direction Jln. Education Jln. Big Jiku (Friday)

Periode Waktu Puncak Lalu Lintas	Volume Arus Lalu Lintas (Kendaraan/jam)			Volume Arus Lalu Lintas (Q) (simp/jam)
	Kendaraan Ringan (LV)	Kendaraan Besar (HIV)	Sepeda Motor (MC)	
07.00-08.00	2	6	17	18.3
08.00-09.00	1	6	20	18.8
11.00-12.00	1	7	66	43.1
12.00-13.00	3	5	25	22.0
16.00-17.00	1	5	35	25.0
17.00-18.00	1	7	40	30.1

Sumber : Analisis Data Pradi Teknik Sipil FT Uniba 2015



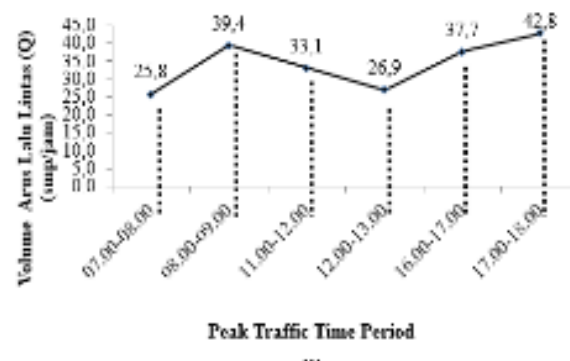
Picture. Peak Traffic Volume Relationship Graph vs Time Period Puncak Traffic Direction Jln. Danau Rana - Jln. New (Friday)

Periode Waktu Puncak Lalu Lintas	Volume Arus Lalu Lintas (Kendaraan/jam)			Volume Arus Lalu Lintas (Q) (simp/jam)
	Kendaraan Ringan (LV)	Kendaraan Besar (HIV)	Sepeda Motor (MC)	
07.00-08.00	1	6	34	25.8
08.00-09.00	2	8	54	39.4
11.00-12.00	4	7	40	33.1
12.00-13.00	1	8	31	26.9
16.00-17.00	0	14	39	37.7
17.00-18.00	4	16	36	42.8

Sumber : Analisis Data Pradi Teknik Sipil FT Uniba 2015

Table. Traffic volume Direction Jln. Education - Jln. Jiku Besar Sunday

Table b. Traffic volume Direction Jln. Danau Rana - Jln. New Friday



Picture. Peak Traffic Volume vs Time Period Relationship Graph

Tabel. Volume lalu lintas Arah Jln. Danau Rana – Jln. Baru Hari Minggu

Periode Waktu Puncak Lalu Lintas	Volume Arah Lalu Lintas (Kendaraan/jam)			Volume Arah Lalu Lintas (Q) (smp/jam)
	Kendaraan Ringan (LV)	Kendaraan Berat (HV)	Sepeda Motor (MC)	
07.00-08.00	2	8	17	20.9
08.00-09.00	2	4	20	17.2
11.00-12.00	2	7	66	44.1
12.00-13.00	5	6	25	25.3
16.00-17.00	4	5	35	28.0
17.00-18.00	1	7	40	30.1

(Sumber: Analisis Data Hasil Taksat Smp PT. Unesa 2015)

Analysis of Degree of Saturation

o calculate the degree of saturation, Q is taken at the peak hour of each intersection arm direction for each of the following survey days, an example of calculating the Degree of Saturation (Ds) on a working day is given in the direction of Jl. Education - Jln. Big Jiku

$$Q = 44.9 \text{ pcu / hour}$$

$$C = 632.30 \text{ smp. Hours}$$

$$Ds = Q / C$$

$$= 44.9 / 632.30$$

$$= 0.071 < 0.75 \text{ (no need for improvement)}$$

The purpose of (no need for improvement) is that there is no need for intersection geometric improvements, total intersection flow control and current regulation with signs to maintain the desired degree of saturation ($DS \leq 0.75$). Then for the calculation of Ds in another direction and on another day it is shown in the table below:

Day	Path	Q Peak (pcu / hour)	C (smp/jam)	Ds	Ket.
Week	Jln. Pendidikan - Jln. Jiku Besar	44.9	632.3	0.071	Ds < 0.75 (No Need for Repair)
	Jln. Danau Rana - Jln. Batu	52.7	632.3	0.083	
Short	Jln. Pendidikan - Jln. Jiku Besar	54.9	632.3	0.087	
	Jln. Danau Rana - Jln. Batu	43.1	632.3	0.068	
Holiday	Jln. Pendidikan - Jln. Jiku Besar	42.8	632.3	0.068	
	Jln. Danau Rana - Jln. Batu	44.1	632.3	0.070	

(Source: Data Analisis for Civil Engineering Stud. Program, PT. Unesa 2015)

CLOSING

Based on the description in the previous chapter and the purpose of writing this final project, the authors can draw the following conclusions: Based on the results of data analysis, it is obtained: a) Junction capacity (C) = 632.30 pcu / hour, b) Degree of saturation, for all the direction at the intersection of the arms and for all survey days $Ds < 0.75$, that is, on weekdays it was obtained $Ds = 0.071$ and 0.083 , for short days $Ds = 0.087$ and 0.068 , and on holidays $Ds = 0.068$ and 0.070 . it means that there is no need for improvement of the intersection geometry, control of total intersection currents, and control of the flow with signs to maintain the desired degree of saturation ($DS \leq 0.75$). c) Because the Ds value obtained is very small, there are no delays or queuing opportunities that occur. $Q = 44.9$ pcu / hr $C = 632.30$ smp.jam $Ds = Q / C = 44.9 / 632.30 = 0.071 < 0.75$ and based on the description in point 1 above, there is no need for a solution or alternative solution to the problem of traffic jams at the RH-Mart intersection Namlea City.

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