

Traffic Characteristics in Urban Areas

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Abstract: The rapid population growth and increasing economic activities have resulted in tremendous growth of vehicles which is considered as one of the primary factors responsible for increasing the traffic volume in metropolitan cities of developing countries, including Tiruchirapalli in India. The first phase of the project was the determination of reduced percentile spaced between the places Uraiyur and Tennur. The second phase of the project was the determination of the design of National Highway-227 in the area of Tolgate to Lalgudi to analyse the traffic in that road and to design that road according to it. The road safety level in National Highway is majorly based on two parameters, namely reduced percentile speed and design of that road. Thus the study is primarily confined in obtaining the percentile speed and design of the road. The design of the road is majorly based on the Indian Road Congress (IRC).

Keywords: Indian Road Congress, National Highway, Percentile speed, Traffic volume.

I. INTRODUCTION

The importance of the road sector in India cannot be underestimated. It is one of the key sectors in the economic social development of the nation. India with 33,00,000 km of roads as the third largest network of roadways in the world half of which are un surfaced roads. As per economist 1% in the GDP growth rate of 9% in the future. Hence the infrastructure sector should also grow at this rate. The road transportation in India carries 80% of the passenger traffic and 60% of the good traffic. Moreover, the national and state highway which carry 70% of all passengers and freight traffic in India, constitute only 2% but carries 40% of total traffic. Moreover, the vehicular traffic in India is growing at the rate of 10% while the road sector in India is growing at the rate of 6%. The national highways act as an indicator for the economic development of the country. The prosperity brigade of a nation normally comprises of intelligentsia, hard labour, infrastructures available and lastly smooth functioning of its highways. Due to the increased volume of traffic, speed is decreased.

II. DATA COLLECTION AND PREPARATION

The very important area in any traffic or transportation engineering project is the data collection part. As this is a road safety management project, much care was taken in collection, modification and compilation of data. Since an error in this may lead to disaster results in the analysis part of the study.

A. Traffic Flow Data

The volume of the traffic changes with respect to time and place. The data was collected during the month of (January to February 2013) .To calculate the observed speed of the vehicles. The traffic data used in this study was observations. The traffic flow was different locations. Depending upon the data and time of observations the value of traffic flow changes. The traffic flow was observed for one hour continuously in various locations.

B. Speed Data

The spot speeds measured at any particular location will depend upon a number of traffic conditions of the road, environmental influences the human element associated with individual drivers and characteristics of vehicles. As a result the observed data makes it possible to understand speed characteristics. This chapter is concerned with the analysis of speed data by statistical methods. The field survey is done in two different locations for light vehicle and heavy vehicle. The time of entry and time of exit of each vehicle is noted at a distance of 81m. The difference between them gives the time taken for the time taken for the vehicle to travel 81m. $Speed = distance/time$

III. MIX DESIGN

The formatted data were analyzed to investigate relationship among speed and sight distance. A separate analysis was performed to examine the effects of vehicle types.

A. Cumulative Frequency Curve

Cumulative frequency is used to determine the number of observation that lie above (or) below a particular curve. The cumulative frequency is found from a stem and a leaf table of a frequency distribution table by adding each frequency to the sum of its predecessor. The last value will be always equal the total, for all observations, as all frequencies will have to be added. For continues or discrete variables: cumulative frequency is calculated from a frequency distribution table.

B. Analysing Result

The above figs from 6.1 to 6.4 shows cumulative frequency curve. The horizontal axis represents the speed of vehicle and the vertical axis represents the cumulative frequency. This is very commonly used in determining the percentile speed. The percentile speed is the speed below which specified percentage of vehicle is travelling.

The percentile speed of interest to a traffic engineer are:

- i. 98th percentile speed, the speed below which 98% of the vehicles travel is used as a design speed in geometric design. Sometimes 95th percentile speed is used for this purpose.
- ii. 85th percentile speed, the speed below which 85% of the vehicles travel is used for determining the speed limits traffic regulations.
- iii. 50th percentile speed, or medium speed is the speed at which there are many vehicles going faster as they are going slower.
- iv. 15th percentile speed, the speed below which 15% of the vehicles travel is used to determine the lower speed limit on major highway facilities such as expressway. Vehicles travelling below this speed cause interference with traffic stream and may cause hazards.
- v. From the Fig. 1 to 4, the percentile speed of light and heavy vehicle for URAIYUR road and TENNUR road were taken.

C. Road Design Based on the Calculated and Known Values

The width of the road where the project was done is of the width 5.50m. The average amount of the vehicle that is crossing in the area is about 20490. The CBR value of that soil is said to be known. The time of the construction type of the road where the construction is to be done is known.

With the help of this values the wet mix macadam , granular sub base, bituminous macadam, semi dense bituminous concrete are known with the help of the following software.

TABLE I: TYPES OF VEHICLES VS PCU FACTOR

S.No	Types of Vehicles	PCU Factor
1	Two wheeler	0.5
2	Cycle	0.5
3	Car	1.0
4	Auto	1.0
5	Bus	3.0
6	Lorry	3.0
7	Truck	3.0

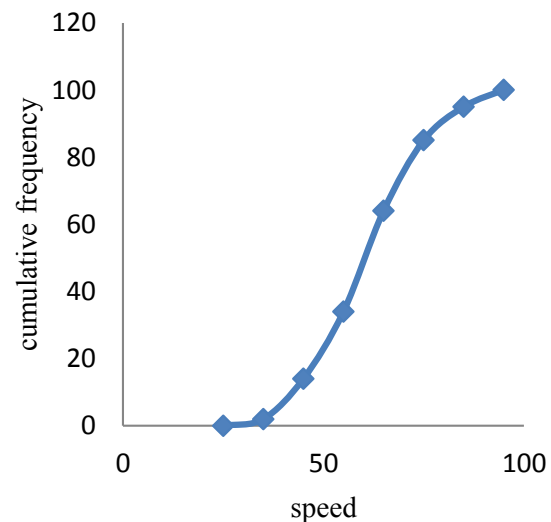


Fig. 1: Cumulative Frequency Curve of Light Vehicles

From the graph,

98th percentile speed = 85 km/hr

85th percentile speed = 67km/hr

TYPE OF VEHICLE : HEAVY VEHICLE

LOCATION : URAIYUR

TABLE II: FOR CUMULATIVE FREQUENCY

Speed Class	Mid-Point Speed	No. of Vehicle	Frequency	Cumulative Frequency
20-29.9	25	0	0	0
30-39.9	35	2	2	2
40-49.9	45	26	12	14
50-59.9	55	24	20	34
60-69.9	65	3	30	64
70-79.9	75	26	21	85
80-89.9	85	2	10	95
90-99.9	95	17	5	100

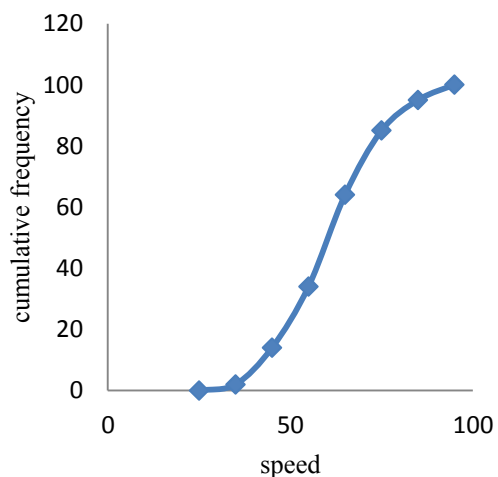


Fig. 2: Cumulative Frequency of Heavy Vehicles

From the graph,

98th percentile speed = 83 km/hr

85th percentile speed = 62 km/hr

TYPE OF VEHICLE : LIGHT VEHICLE

LOCATION : TENNUR

TABLE III: FOR CUMULATIVE FREQUENCY

Speed Class	Mid-Point Speed	No. of Vehicle	Frequency	Cumulative Frequency
5-9.9	7.5	0	0	0
10-14.9	12.5	7	7	7
15-19.9	17.5	9	9	16
20-24.9	22.5	16	16	30
25-29.9	27.5	22	22	55
30-34.9	32.5	25	25	82
35-39.9	37.5	14	14	96
40-44.9	42.5	4	4	100

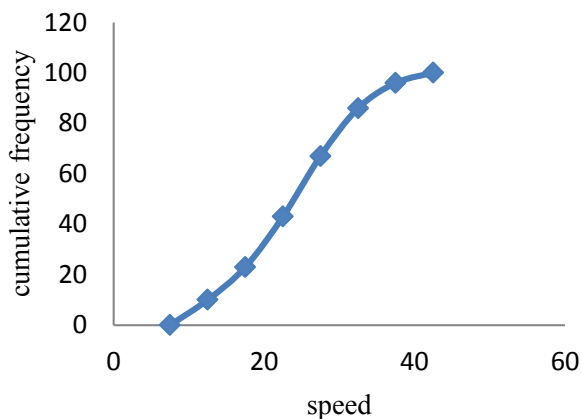


Fig. 3: Cumulative Frequency Curve of Light Vehicle

From the graph

98th percentile speed = 38 km/hr

85th percentile speed = 34 km/hr

TYPE OF VEHICLE : HEAVY VEHICLE

LOCATION : TENNUR

TABLE IV: FOR CUMULATIVE FREQUENCY

Speed Class	Mid-Point Speed	No. of Vehicle	Frequency	Cumulative Frequency
5-9.9	7.5	0	0	0
10-14.9	12.5	10	10	10
15-19.9	17.5	13	13	23
20-24.9	22.5	22	20	43
25-29.9	27.5	25	24	67
30-34.9	32.5	14	19	86
35-39.9	37.5	12	10	96
40-44.9	42.5	4	4	100

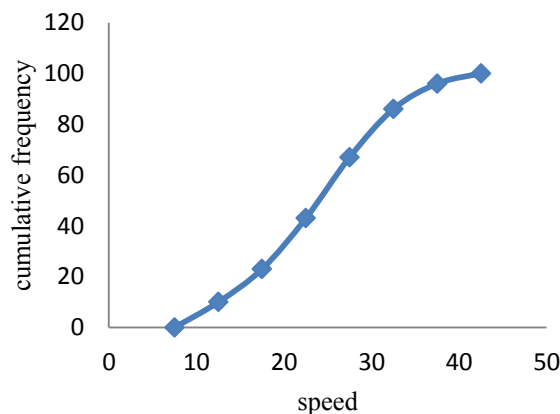


Fig. 4: Cumulative Frequency of Heavy Vehicles

From the graph

98th percentile speed = 37 km/hr

85th percentile speed = 35 km/hr

TABLE V: FOR PERCENTILE SPEED IN VARIOUS LOCATION

Location	Percentile Speed for Light Vehicle (km/hr)		Percentile Speed for Heavy Vehicle (km/hr)	
	98 th	85 th	98 th	85 th
Uraiyur	85	67	83	62
Tennur	38	34	37	32

From the above Table V the percentage of reduced percentile speed for light and heavy vehicles are listed below

LIGHT VEHICLE

98th percentile speed – 55%

85th percentile speed – 47%

HEAVY VEHICLE

98th percentile speed – 56%

85th percentile speed – 40%

D. Software Used

Name of Work		Widening of the road from TOLGATE to LALGUUDI National Highway-227
Terrain		Rolling/Plain Terrain
Carriageway lanes		Two-lane single carriageway road
Construction period in Years		1
Year of Traffic Census Taken		2012
Current year		2013
Annual growth rate of CV		7.50 %
Initial Traffic Volume	CV in BOTH direction	18087 cv/day
CBR		5
Classification of road		NH
Granular Base (GB)		WMM
Initial Traffic Volume after completion		19444
Vehicle Damaging Factor, VDF		4.5
Lane Distribution Factor, LDF		0.75
Click for RESULT		

Fig. 5

IV. CONCLUSION

The National Highways are meant for high speed transportation but surprisingly maximum number of vehicles cannot achieve the speed of National highways. According to IRC recommendations, traffic growth is increased up to 7.5% per year. This will lead to the increase in Traffic volume. The primary duty of the National Highway Authority of India (NHAI) is not concerned in constructing new highways but also to check whether the present highways satisfy the increase in traffic volume. In this fast moving world, people want to move faster and reach their destination quicker.

V. FUTURE USE

The suggestion for extending of road from Tolgate to Pullambadi stretch Section of NH-227 which aims at reducing the transport constraints on National economic activity and improved institutional capabilities to manage road program, assets and services on a more commercial basis. To do a speed survey and to find the percentile speed of the specific area to reduce the traffic and to reduce the accidents in the area of Uraiyur and Tennur.

REFERENCES

- [1] V. T. Arasan, and S. S. Arkatkar, "Enhancing the accuracy of estimation of passenger car unit for vehicles of heterogenous traffic," *Highway Research Journal*, vol. 1, no. 1, pp. 61-69, 2008.
- [2] L. R. Kadiyali, *Traffic Engineering and Transport Planning*, Khanna Publishers, New Delhi, 1999, pp. 142-160.
- [3] R. R. Laboratory, *Research on Road Traffic*, H. M. S. O, London, 1965.
- [4] S. Khan, and P. Maini, "Modeling heterogeneous traffic flow," *Transportation Research Record: Journal of Transportation Research Board*, vol. 1678, pp. 234-241, TRB, National Research Council, Washington, D. C. 2000.
- [5] C. J. Khisty, and B. K. Lall, *Transportation Engineering – An Introduction* (3rd ed.), Prentice Hall of India, New Delhi, pp. 337-382, 2002.