

Speed-Flow Characteristics of a Selected Stretch of NH1

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Abstract—Speed flow characteristics are fundamental to planning, design and operation of roads. This paper presents the results of a study conducted on a mid block section of NH1 (Pipli-Karnal road). The road section has 6 lanes with a divider at centre. Speed flow data of the traffic on the road was collected for about 3 hours duration on a typical day of the week. The data are analysed to determine speed distribution of various vehicles and find out traffic composition of the road. 3 hour speed flow study was conducted on selected stretch of NH1 (between pipli and karnal). The carriageway of the road was 6 lane with divider at centre. Speed flow data was collected manually. The section of the road is shown in fig 1.

Keywords: Speed flow characteristics, Planning, Design, Speed distribution, Carriageway.

1. INTRODUCTION

Speed is an important aspect of transportation engineering which is vital to relate to safety, comfort, convenience, time and economics. Studies like spot speed study are conducted to determine vehicle speed characteristics such as percentile speeds which are further used in making any speed decisions. These studies are intended to record speed characteristics under prevailing traffic conditions at any specific location along a roadway. Spot speed study is a very important element in traffic management which is a growing task for traffic engineers. Public financial resources go on decreasing with the increase in traffic volume. Speed and traffic flow study helps in determining among other things, the Level of service and capacity of road.

This study conducted on a selected stretch of NH1 brings out the speed distribution of various types of vehicles and traffic composition of the road.

2. FIELD STUDY

The data for speed flow studies were collected at mid-block section of NH1 (pipli-karnal road) which is six lane divided (three lanes on either side) road in Kurukshetra District. The data were collected manually. The survey was carried out for a period of 3 hours on a typical day of the week. In addition to the traffic data, the physical data like carriageway width,

shoulder width and median width were measured at the survey location. The carriageway width was 10.5 m with paved shoulder of 1.5m width and the width of the median was 4.4 m. cross section of the road is shown in Fig. 1 and the survey location shown in Fig. 2 and Fig. 3.

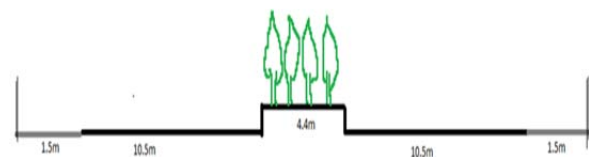


Fig. 1 Section of NH1

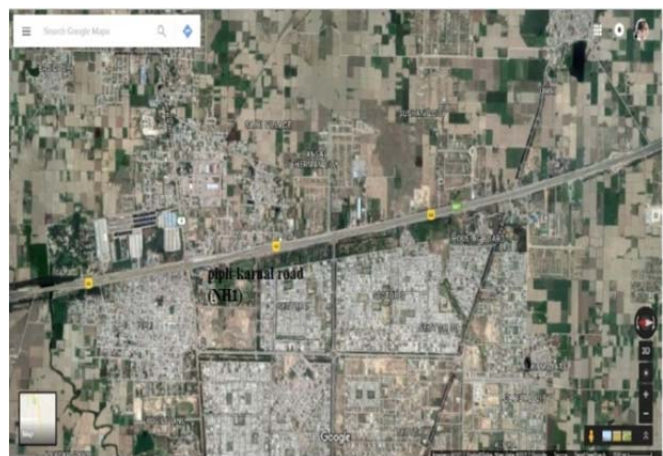


Fig. 2 Study Location



Fig. 3 Study being conducted

Table 1: PCU Values as per IRC:64-1990

Vehicle type	PCU
Car/jeep/van	1
Bus, truck	3
Tractor	1.5
Truck-trailer, tractor-trailer	4.5
2-wheeler	0.5
3-wheeler	1
Cycle	0.5

3. DATA ANALYSIS

As per the analysis carried out, the traffic on the selected stretch was of heterogeneous nature with a prominent %age of cars. Composition of the vehicles and other related elements of traffic are depicted below.

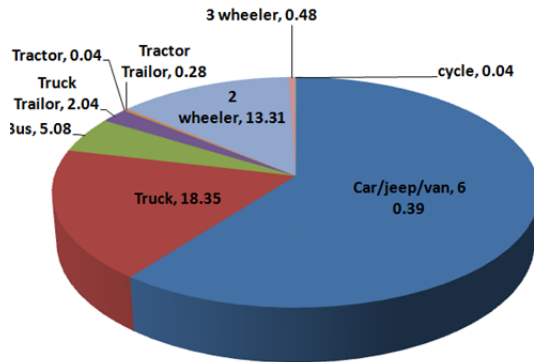


Fig. 4 Composition of traffic in Vehicles

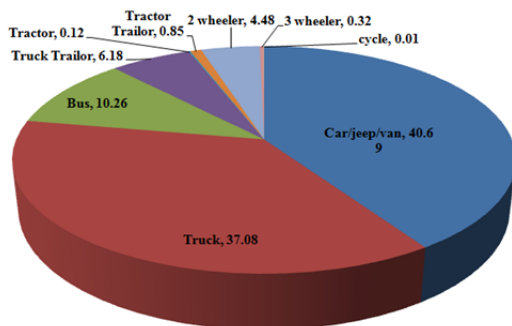


Fig. 5 Composition of traffic in PCU

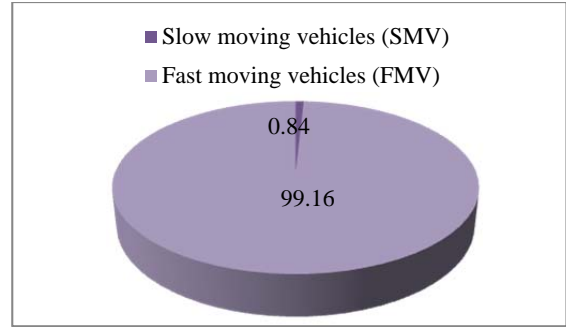


Fig. 6 Proportions of Fast and Slow vehicles

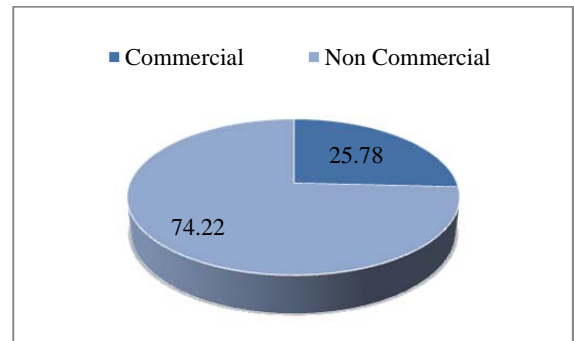


Fig. 7 Proportions of Commercial and Non Commercial vehicles

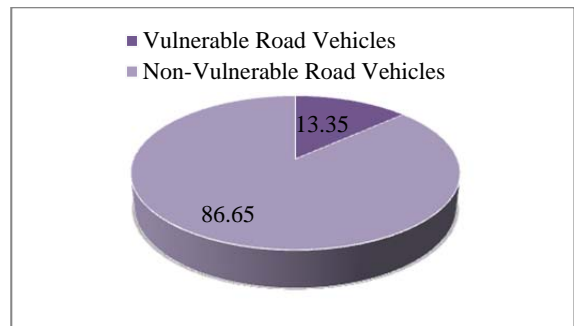


Fig. 8 Proportions of Vulnerable Road Vehicles

Table 1: Composite PCU value

Total number of vehicles	2502
PCU value	3713.5
Composite PCU	1.484213

4. GRAPHICAL ANALYSIS

Traffic is analysed for different percentile speeds and modal speed under different categories like cars, trucks, buses and all vehicles.

Percentile	Speed			
	Cars	Trucks	Buses	All
98%	108.25	76.80	82.50	102.90
85%	85.90	54.61	73.32	81.58
50%	71.78	44.70	64.85	74.29
15%	56.98	36.26	55.23	43.13

A. Cars

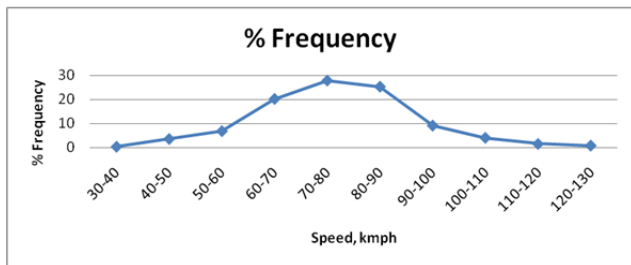


Fig. 9 %Frequency curve of Cars

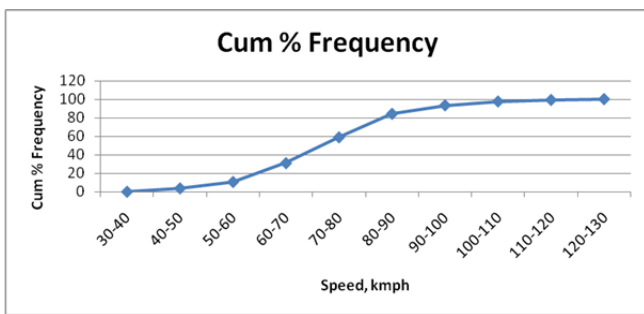


Fig. 10 Cum % Frequency curve of Cars

B. Trucks

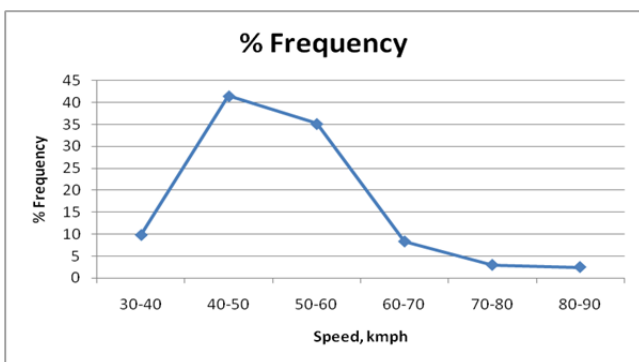


Fig. 11 % Frequency curve of Trucks

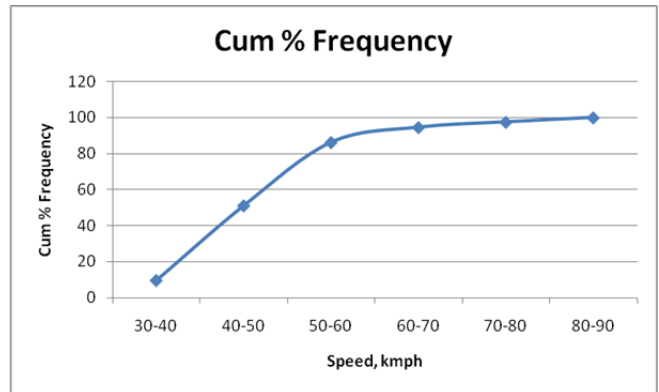


Fig. 12 Cum % Frequency curve of Trucks

C. Bus

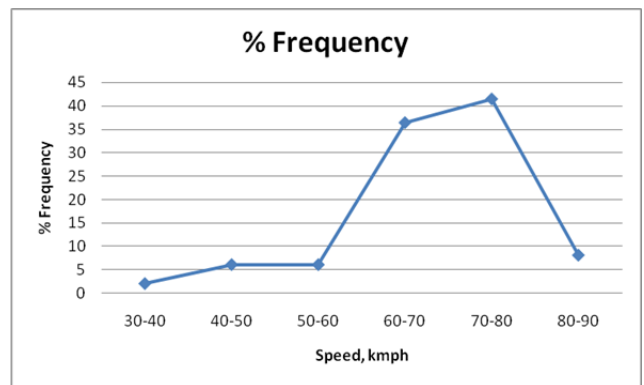


Fig. 13 % Frequency curve of Buses

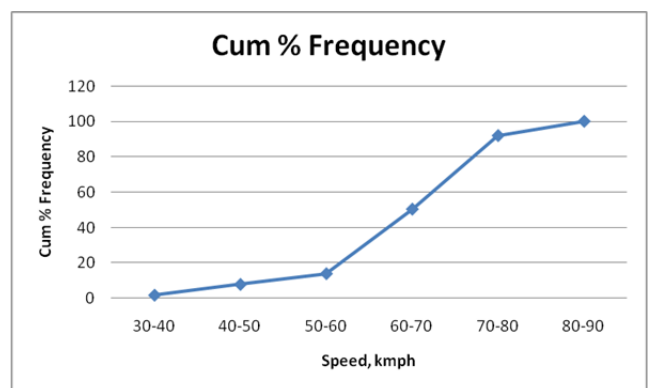


Fig. 14 Cum % Frequency curve of Buses

D. All

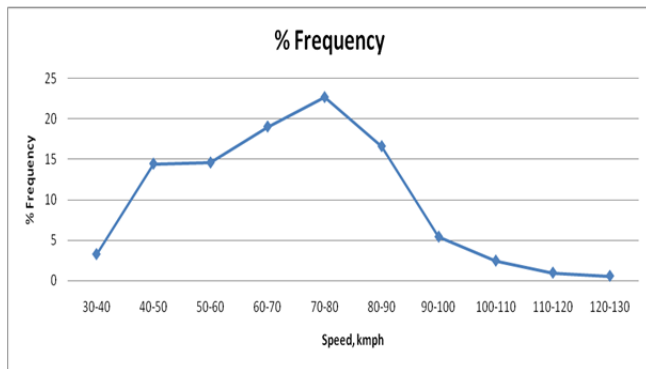


Fig. 15 % Frequency curve of All Vehicles

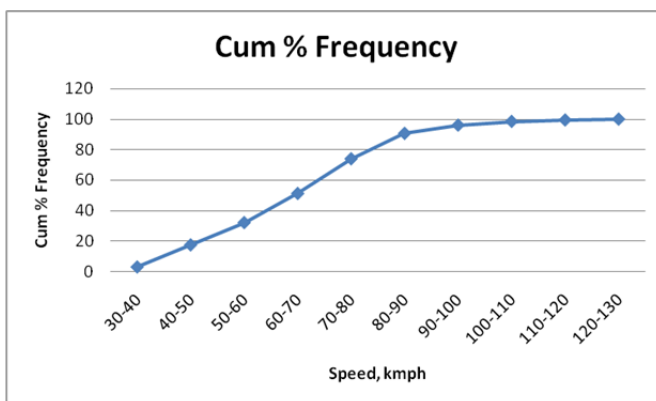


Fig. 16 Cum % Frequency of All Vehicles

5. RESULTS AND DISSCUSION

Traffic on the road consists of 60% Cars, 20% Trucks, 5% Buses, 13% two wheelers and rest other vehicles.

Fig. 5 shows in terms of PCUs the traffic consists of 41% cars, 43% Trucks, 10% Buses, 4% two wheelers and rest other vehicles.

Fig. 6 shows that proportion of Slow Moving Vehicles is negligible on the road.

Fig. 7 indicates that commercial vehicles in the traffic stream are about 26%.

Vulnerable road vehicles consisting of motorised two wheelers and cyclists are about 13% of the traffic.

Composite PCU value can be used for easy conversion of the vehicles into PCUs. In this study, composite PCU value was found to be 1.48.

Speed frequency curves in respect of cars, buses and trucks indicate the modal speed as 75, 45 and 75kmph for cars, trucks and buses respectively.

The cumulative speed frequency curves for cars, buses, trucks and all vehicles indicate 98%ile speed as 108, 82, 76 and 102.9kmph respectively.

IRC 073-1980 recommends a design speed of 100kmph for National highways in plain areas. The study indicates that the design speed recommended by IRC needs to be revised in view of the results of 98%ile speeds given above.

85th %ile speed obtained from Fig. 10, 12, 14, 16 in respect of cars, trucks, buses and all vehicles was found to be 85, 54, 73 and 81kmph respectively. As 15%ile speed gives us the safe speed limit, it indicates a speed limit of 90kmph for cars, 75kmph for buses and 55kmph for trucks. These speed limit values are found to be more or less in conformity with the speed limit values for these vehicles imposed on this section of the road.

6. CONCLUSIONS

The paper has presented the results of speed flow study conducted on a mid block section of NH1 on its pipli-karnal section having 6 lane divided carriageway. The traffic composition indicates that traffic stream has about 60% cars, 20% trucks, 5% buses and 13% two wheelers and negligible slow moving vehicles. The commercial vehicles in the traffic stream are about 26%. The speed analysis indicates that design speed for National highways needs to be revised. The speed limits presently imposed on the road are found to be more or less right.

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