

Study of Road Traffic & Management: A Case Study at Katraj and Nalstop Intersections In Pune City

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ABSTRACT: The increasing number of vehicles in the city, leading to traffic congestions is the major hurdle in the development of the city. Thus there is a need for proper road traffic demand management for the city. The objectives of the paper are to study the various problems faced by the city for two locations (viz. Katraj Intersection and Nalstop Intersection), and also presents solution for the traffic demand management at the intersections. The study is based on the road resources and characteristic of the urban traffic found from the video recordings done at the junction for 8 days during the peak and non-peak hours. Based on the Vehicular Volume Data and Turning Movement Survey observed at these intersections, the paper discusses the solution to the increasing congestion and its effect on the traffic.

KEYWORDS: Non-Peak Hours, Peak Hours, Road Traffic Demand Management, Traffic Congestion, Turning Movement Survey, Vehicular Volume Data

I. INTRODUCTION

The city of Pune is the second largest district in the state of Maharashtra and covers 5.10% of the total geographical area of the state. The roads and rail networks connect the district with the state capital and surrounding district headquarters. The road network of the city comprises of Express Highways, National Highways, State Highways, Major District Roads and village roads. The total length of roads in the district is 13,642 km of roads (2001) of which 39.54% roads have Bituminous surface, 26.05% roads are of water bound macadam surface and 34.41% roads are other surface roads i.e. unmetalled road. Of the total road length in the district, National Highways covers 331 km road length; State Highways cover 1368 km road length. Almost all the villages are well connected by water bound macadam road. Transport policies such as road widening, construction of flyovers, etc. have already been implemented in the city. But the traffic congestions still exist as the policies do not meet the increasing traffic demand. The traditional solution of "building more roads and constructing more road infrastructure to accommodate the increasing number of vehicles" will not be able to meet the traffic demand management of the city. In order to improve the traffic demand management and traffic planning of the city, it is necessary to guide the increasing traffic demand along with the road widening and road infrastructure development. This can lead to a better, comfortable, reliable, economic as well as environment-friendly solution to the existing problem.

The research work studies two intersections in the city (i.e. Katraj intersection and Nalstop intersection), the former situated in the outskirts of the city and the later in the heart of the city. The two intersections are one of the busiest intersections in the city. There are a number of factories and small scale furniture industries located in a radius of 10 to 15 km near Katraj intersection. Also the continuous development of the areas in the outskirts necessitates the import and export of materials and other items from the bypass, thus increasing the number of multi axle vehicles at the Katraj intersection. The intersection also has a main PMPML bus depot, thus making the intersection more congested. The Nalstop intersection has a major district road going from Deccan to Kothrud and vice versa. In addition to it, is a road

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coming from Mhatre Bridge at the Nalstop intersection. The traffic flows at the two intersections is as shown in the Fig. 1 (a) & (b).

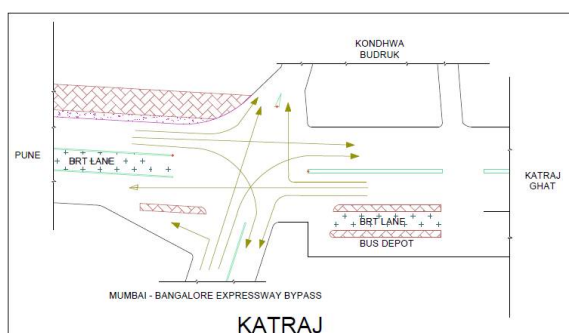


Fig. 1 (a) Katraj Intersection

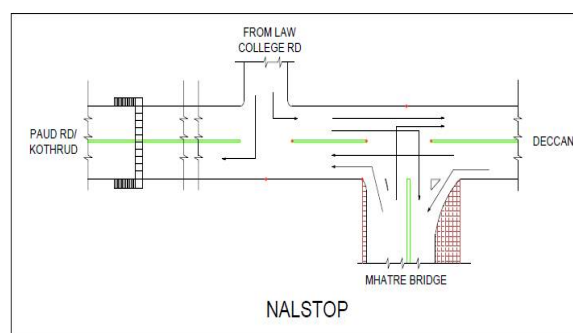


Fig. 1 (b) Nalstop Intersection

II. RELATED WORK

The literature survey brought many technologies to the notice for implementing efficient traffic planning and management. Increasing traffic at a higher pace is proving to be a big problem in the city of Pune. The developing infrastructure for tackling the traffic problem has not eased the problem. Thus, there is a need for effective traffic planning and management system for Pune city [6,9,10]. There are various methods to tackle traffic such as Traffic management by work flow technique, Intelligent Transport System (ITS) for Indian Cities, Intelligent BRT, ecoMove Approach, Road traffic congestion in Developing World, BRT, Multi-agent system, and Quantitative problem approach [12]. Linear regression analysis can be used to find the passenger car equivalent values for the intersection. Video recording can be used to determine the exact number of vehicles passing at an intersection manually [2].

III. METHODOLOGY

To understand the flow of traffic and traffic characteristics at the two intersections, various surveys were carried out manually as well as by conducting video recordings for 6 hours (peak hours during morning and evening; and non peak hour during afternoon) over a period of 8 days. The vehicle volume survey and the turning movement survey were then carried out at the two intersections. The data was then analysed manually using computer and video viewing application. The survey was conducted for peak times during the morning and evening. The non peak hour during the afternoon was also surveyed and the recordings of the same were also obtained.

A speed and delay survey at the intersection was also done by moving car observer method. The average delay time required by vehicle at the junction is noted and the average speed of travel was also noted in the required formats.

From the data obtained, the PCU (Passenger Car Unit/ Passenger Car Equivalent) values are found according to Indian standards. The graphs of hourly variation of traffic, traffic composition at the intersection were also plotted.

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IV. ANALYSIS AND OBSERVATIONS

Following values for Passenger Car Equivalent¹ were adopted for the analysis according to IRC 106-1990:

Table1: Passenger Car Equivalent

Type of Vehicle	PCE
Two wheelers	0.5
Auto rickshaws	1.2
LCV and Cars	1.4
Buses & Trucks	2.2
Agricultural Tractor and Trailers	4

From the survey done at Katraj intersection, following observations were noted about vehicle flow characteristics:

- (a) For the traffic coming from Mumbai Bangalore Expressway Bypass, 75.9% traffic moves toward Kondhwa Budruk and 24.1% traffic moves towards Katraj.
- (b) For the traffic coming from Katraj, 19.3% traffic moves towards Mumbai Bangalore Expressway Bypass; 75.5% traffic moves towards Pune and remaining 5.2% traffic moves towards Kondhwa Budruk.
- (c) For the traffic coming from Pune, 23.7% traffic moves towards Kondhwa Budruk; 45.6% traffic moves towards Katraj; and remaining 30.7% traffic moves toward Mumbai Bangalore Expressway Bypass.

From the survey done at Nalstop intersection, following observations were noted about the vehicle flow characteristics:

- (a) For the traffic coming from Kothrud, 58.5% traffic moves towards Deccan; and 41.5% traffic moves towards Mhatre Bridge.
- (b) For the traffic coming from Mhatre Bridge, 81.1% traffic moves towards Deccan; and 18.9% traffic moves towards Kothrud.
- (c) For the traffic coming from Deccan, 84.5% traffic moves towards Kothrud; and 15.5% traffic moves towards Mhatre Bridge.

The variation of the traffic divided in two categories(viz. Public and Private vehicles) in peak and non peak hours in terms of PCU is found and represented in the figure 2 and figure 3 below:

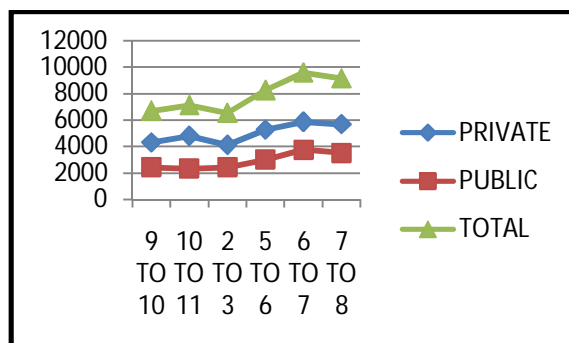


Figure 2: Hourly variation of traffic at Katraj Intersection

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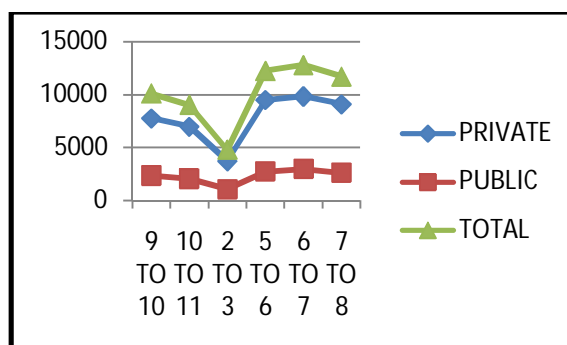


Figure 3: Hourly variation of traffic at Nalstop Intersection

From the plots of hourly variation found and the turning movement survey done at the intersection, it was found that, the traffic increases drastically and is at peak during the evening period of 5:30 pm to 6:30 pm.

From the survey done at the two intersections, following are the reasons for the traffic congestions observed at the two intersections:

- The road capacity at the two intersections do not fulfil the increasing number of vehicles and the increasing traffic demand.
- The traffic is improperly organised causing haphazard movement of traffic in all the directions.
- People do not follow the traffic rules and regulations, leading to congestions at the two intersections.
- Lane discipline is not followed by people that hampers the smooth flow of traffic at the intersection.
- Adding to the congestion are the Auto rickshaw drivers that drive very rough, risking the traffic moving around.
- At the Katraj intersection, a large number of trucks, buses and multi axle vehicle flow which cause slow movement of vehicle in traffic thus leading to longer delays at junction creating long queues.
- At the Katraj intersection, the Auto rickshaws and the six seaters occupy a large space which reduces the road width by 3 meters.
- The Bus depot at Katraj also creates chaos at the intersection.
- The signal system on the Deccan Paud road is dis-organised.
- One of the major reasons for traffic congestions at the Nalstop intersection is the frequent Breakdown of BRT which occurs generally at the rate of twice a week.
- The pedestrian traffic at the two intersections also create problem in smooth movement of traffic.

V. CONCLUSIONS

From the variation in traffic and the traffic characteristics observed at the Katraj intersection, it is found that the major traffic volume moves from Pune to Katraj; Pune to Mumbai Pune Expressway bypass; Mumbai Pune Expressway bypass to Kondhwa budruk; and from Katraj to Pune.

At the Nalstop intersection, the major traffic flow occurs from Kothrud to Deccan; Deccan to Kothrud; Kothrud to Mhatre bridge; and from mhatre bridge to Deccan. The TDM strategies that can be applied at the two intersections are:

- Increasing the Intelligent Transport System by redesigning the signal system at the two intersectionsto accommodate the increasing traffic.
- Traffic claiming can be done at the Katraj intersection by providing a Y-flyover, whose one arm shall be for traffic coming from Pune and going to Katraj; and the other arm for traffic coming from Pune and going to Mumbai Bangalore Expressway Bypass. In addition to it the signal system at Katraj intersection also needs to be redesigned for the increasing traffic.

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3. Traffic claiming can be done at the Nalstop intersection by providing a two way underpass for the traffic coming from Kothrud and going to Deccan; and vice versa. In addition to it the signal system at Nalstop intersection also needs to be redesigned for the increasing traffic.
4. The traditional Transit system at the Katraj intersection needs to be improved and the Depot needs to be improved to facilitate number of buses.

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