



Proposals and Remedial Measures to Decongest Yelahanka Police Station Junction

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Abstract: Rapid population growth in recent years, mainly because of IT and other associated industries in and around Bengaluru led to an increase in the vehicular population to about 1.5 million, with an annual growth rate of 7-10%. There has been a phenomenal growth in the population of vehicles as well especially the two and four wheelers in this period due to rising household incomes. Two wheelers constitute more than 70% of the total volume, while cars comprise 15%, autos 4% and the remaining 8% includes other vehicles such as buses, vans and tempos. The number of motor vehicles registered has already crossed 49 Lakhs. In the absence of adequate public transport system, people are using the personalized modes which is not only leading to congestion on limited road network but also increasing environmental pollution. Yelahanka police station Junction which connects International air port road with the city is one of the busiest intersections in Bengaluru. This paper examines the traffic problems and sustainable improvement of road intersection at above junction. The causes of traffic congestion were studied and suggested different remedial measures to reduce number of accident and make traffic flow smooth. The three phased signalized intersections at Yelahanka junction was considered as the primary study area. At the intersection present signal timing, classified volume count, stopped delay, queue length and optimum cycle length were measured and analysed. Analysis of the collected data revealed that the improper planning of the junctions, lack of traffic signals and unauthorized parking are the major factors contributing to the traffic congestions. Various remedial measures are also proposed, focusing on junction improvement, alternative operation plan and junction signalization.

Keywords:

Signalised intersection, traffic signal design, stopped Delay, grade separated intersection

I. INTRODUCTION

The world is facing traffic congestion which is a global issue. The growth of vehicles has increased due to urbanization and industrialization. Bangalore is a rapidly growing city. The city core is an old city leading to International Airport Road surrounded by planned development which is currently sprawling within the natural limits. The North part of the city forms the heavy population of the city and is accessed through all direction, which today is amongst busiest street junctions. The streets connecting the junction serve as the major commercial streets, especially towards the eastern side and airport on its northern sides. These junctions and streets were functional without hassle when the city had a very few numbers of motor vehicles. Traffic signal at this junction was designed in 2003 and at that time there were very less number of vehicles but now days due to infrastructure development, due to more vehicles, congestion is taking place. Increase in traffic volume has caused problems in traffic operations like accidents, delay, congestion, fuel consumption, pollution.

1.1 Physical characteristics of the area

1.1.1 Population growth

As of 2011 India census—Yelahanka had a population of 3,00,000. Males constituted 54% of the population and females 46%. The literacy rate was 75%, higher than the national average of 59.5%: male literacy was 80%, and female literacy was 68%. Eleven percent of the population were under 6 years of age.

1.1.2 Growth of motor vehicles

Number of motor vehicles registered in the past has increased which a direct effect in the congestion has caused at Yelahanka junction. The number of people using public transport has



decreased and the private ownership of four wheelers has increased subsequently.

Most number of people who made a trip towards Yelahanka junction is either work related or school or college based trips due to more number of construction companies, offices, colleges and schools in that area.

Nearly 6 lakh vehicles registered in financial year 2018-19. Around 1,750 new vehicles are getting registered in the city every day and the vehicle population in Bengaluru has crossed 80.45 lakh, said Transport Commissioner V.P. Ikkeri. During a briefing on the performance of the department in the just concluded financial year 2018-19, Mr. Ikkeri said in the previous financial year, as of March 2018, the number of vehicles registered was 74.06 lakh. As per the existing provisions of the Motor Vehicle Act, it is not possible to restrict new registration of vehicles. However, in the interest of the environment, registration of e-vehicles is being promoted, he said. Across the State, the total number of vehicles registered went up to 2.10 crore as against 1.93 crore in the previous financial year.

The Transport Department has managed to reach the revenue target fixed by the State government. The department generated revenue of 6,168.58 crore against a target of 6,167.61 crore due to increased registration of new vehicles.

II. Objectives:

Various objectives of the proposed study were

- To identify and address the traffic issues at Yelahanka police station junction.

- To improve the ease of accessibility of vehicular movement and to simplify traffic flow pattern therefore reducing the traffic constraints.

- To analyse the present grade separated intersection.

- To analyse the current signal design and to propose a new one

- To analyse the current geometric dimension of the study area

III. Methodology

The traffic management plan of Yelahanka police station junction was aimed to ease and regulate the travel constraints prevailing within the study area.

A reconnaissance survey was done to identify the issues pertaining to the intersections, pedestrian movement, black spots, etc. As well as identify the traffic circulation pattern in and around the study area.

This was followed by the data collection effort in the form of surveys were carried out to obtain an idea of the traffic scenario of the study area.

The data collected from various agencies comprised of the existing land use patterns and to propose improvements in and around the study area which would have a significant effect on the operation conditions of the roadways.

IV. Study Area and its location:

Yelahanka police station junction is the place taken as the study area.

- Its co-ordinates are 12.9716° N, 77.5946° E.



- It is first arm connects to Yelahanka old town which further connect to Kempegowda International Airport.
- Its second arm moves towards Yelahanka a satellite town which in turn moves towards Doddaballapur (an industrial hub).
- The third arm's way to Hebbal (Assembly Constituency area).

V. Current Situation and Problems

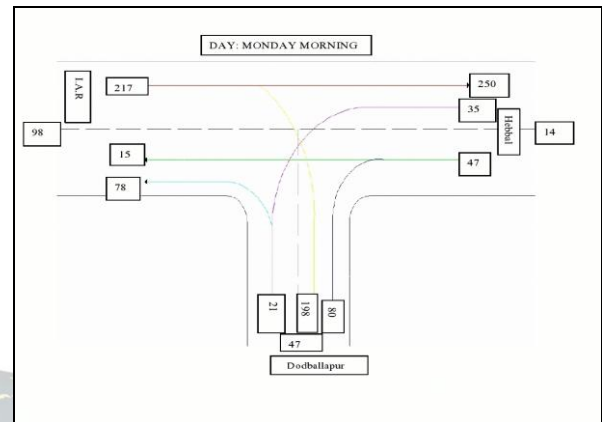
- This signal was design in 2003 and during that time there was very low traffic flow but now days due to increasing number of vehicles there is jam and we need to redesign the signal for smooth flow of traffic
- Traffic signal timings in road network do not just affect total user travel time in network but also create in-equity problems in terms of the variation in travel cost of users traveling between different locations.
- Delays, which may result in late arrival for employment, meetings, and education, resulting in business losses, disciplinary action and other personal losses.
- Due to development at the junction (like RMZ Mall and shopping complex) more number of people are crossing the lanes but there are not enough pedestrian crossings. Due to increase in number of people
 - Road network capacity is inadequate. Most of the major roads are with two lanes or less with limited scope of their widening. This indicates the need for judicious use of available road space. The junctions are closely spaced on many roads. This makes traffic circulation difficult.

- The household travel surveys indicate high share of work trips, school trips and college trips. This segment of travel demand needs to be mostly satisfied by public transport system.
- At present, modal split in favor of public transport is about 46% (exclusive of walk trips). The trends show a decline in this share over the last two decades. This is further expected to fall unless adequate and quality public transport system is provided to the people of Bengaluru. Share of two wheelers and cars in travel demand is disturbingly high. This trend needs to be arrested.
- There is high pedestrian traffic in core area and some other areas in Bengaluru. Footpath facilities are generally not adequate and their condition is deteriorating.
- Parking is assuming critical dimensions in Bengaluru. Parking facilities need to be augmented substantially.

VI. Collection of Volume Data:

- Traffic volume count Traffic volume is defined as the number of vehicles crossing a section of road per unit time at any selected period.
- Traffic volume studies are conducted to collect data on the number of vehicles that pass a point on a highway facility during a specified time period.
- The traffic volume data should be collected during peak & non-peak hour with time interval 15 min or more depending on the anticipated use of the data.

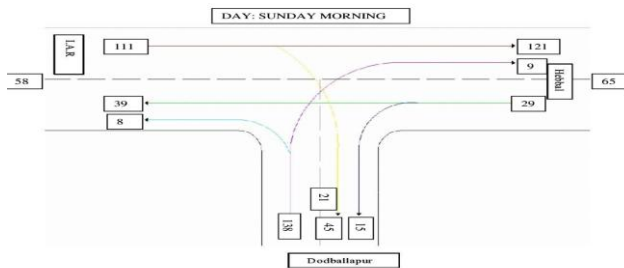
PEAK HOUR MONDAY MORNING



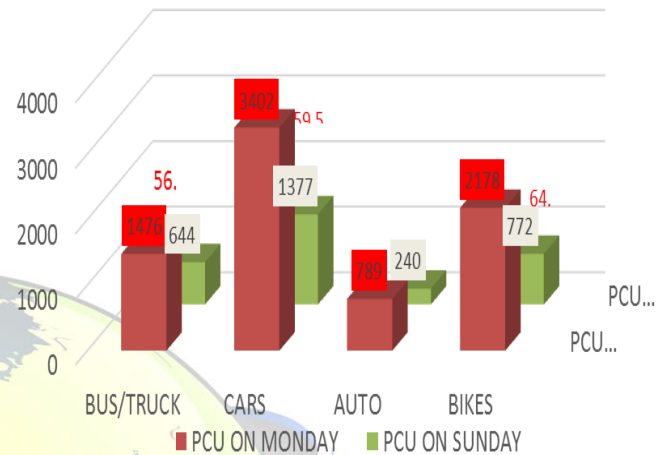
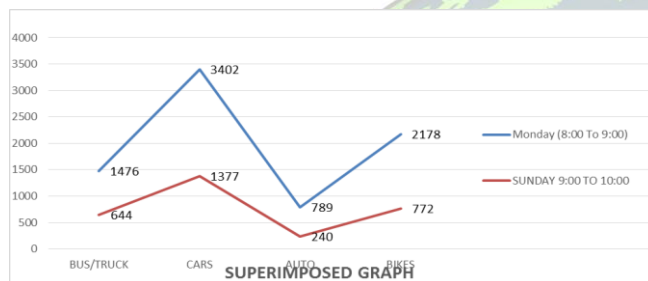
VOLUME IN PCU

TYPE OF VEHICLE	VOLUME IN PCU
BUS/TRUCK	644
CARS	1377
AUTO	240
BIKES	772

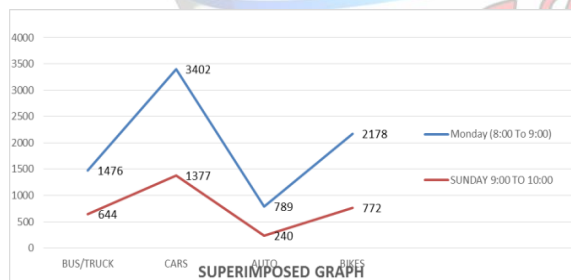
TIMINGS	DIRECTIONS	HEAVY VEHICLES	CARS	AUTO	BIKES	PCU/hr.
9:00 TO 10:00	HEBBAL TO I.A.R	12	45	28	92	192
9:00 TO 10:00	HEBBAL TO DODBALLAPUR	48	32	16	96	816
9:00 TO 10:00	DODBALLAPUR TO HEBBAL	152	308	56	240	840
9:00 TO 10:00	I.A.R TO DODBALLAPUR	192	364	68	216	1460
9:00 TO 10:00	I.A.R TO HEBBAL	240	628	72	128	180
	TOTAL	644	1377	240	772	3488



SUPERIMPOSED GRAPH WEEKLY



COMPRASION B/W MAXIMUM PCU AND MINIMUM PCU AND PERCENTAGE INCREASED IN THE VOLUME



VIII.SIGNAL DESIGN

8.1 Webster's method:

The optimum signal cycle is given by relation

$$C_0 = (1.5L + 5) / (1 - Y)$$

Where

L = total lost time per cycle, sec = $2n + R$

n = number of phases

R = all red time

$$Y = y_1 + y_2$$

$$\text{Here } Y_1 = q_1/s_1, \quad Y_2 = q_2/s_2$$

REVISED SIGNAL TIMINGS

TIMINGS DATA							
YELAHANKA ROAD JUNCTION			PHASE				CY CLE TIME
	R	FROM	1	2	3	4	
	O						
	A						

COMPRASION B/W MAXIMUM PCU AND MINIMUM PCU AND PERCENTAGE INCREASED IN THE VOLUME

Cycle length= 131seconds

Scenario 1: G1=35sec., RED=94sec., A=2

Scenario 2: RED=37sec., G2=39sec., RED=53sec., Y=2

Scenario 3: RED=78sec., G3=41sec., All red time ≈ 10s

The following conclusions and recommendations were developed based on the data and analysis:

1. Peak hour volume was found to be on **Monday morning (8am to 9am)** and off peak hour volume was found to be on **Sunday morning (9am to 10am)**
2. Volume of car is **3402 pcu/hr** which is the highest in peak hour on Monday (8am to 9am)
3. Volume of car is found to be highest on each day from the graph which shows that there is a significant large amount of four wheelers commuting on this junction.

1,2 AND 3
RESPECTIVELY.



4. Volume of car has increased to **59.52 %** when compared between maximum pcu(Monday morning) and minimum(Sunday morning) pcu during peak hours and off peak hours.
5. The field observations conducted during pleasant weather on a weekday showed high pedestrian and vehicle volumes along international air port Road intersection.
6. The high pedestrian and vehicle usage (and the observed vehicle race) along the intersection indicate that this is a popular destination and central business district, therefore, providing improved facilities along Road for pedestrians and vehicles may significantly decrease the delay and traffic accident.
7. The presence of vehicle stops cabs near the Road intersection and the Rmz mall combined with different business centers attracts pedestrian.
8. The installation of pedestrian signal heads and addition of pushbutton-actuated pedestrian phasing with walk, flashing don't walk and don't walk intervals is recommended at both signalized intersections.
9. The shortage of continuous paved shoulders or continuous sidewalks along either side of Road, combined with a narrow lane width, is potentially hazardous for pedestrians and drivers. Therefore, the installation of a continuous shoulder of consistent width, or a sidewalk, along at least one entire side of Road is recommended
10. As per the studies conducted the peak and off peak hour's traffic volume in pcu/hour were obtained
11. It is observed that the volume of the cars is more which is already shown in pie charts and bar graphs
12. The peak hour volume on the working day that is day is found to be **7575** pcu/hour and on off peak hour is found to be **3488** PCU/hour
13. Hence a modified 3-phase signal of signal cycle **131 seconds** is designed at this intersection
14. The green time of **35 sec** the red time of **94 sec** and the amber time of **2 sec** is adopted after the design of signal by Webster method for phase 1.
15. New bus bays are introduced 75 meters away from the intersection as per IRC requirements
16. Additional traffic sign boards are proposed for the safety of road users
17. A separate auto-rickshaw stand can be provided.

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BIOGRAPHY



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