Traffic Impact of BRTS- A case study of Indore BRTS

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***Abstract*— The BRTS was constructed on one of the busiest routes of the city. This paper analyzes the traffic impact of Indore BRTS on mixed vehicle lane of some intersection which suffered with heavy traffic congestion before the implementation of the BRTS. For the evaluation of the BRTS various traffic surveys were carried out at selected intersections along the BRTS corridor which includes traffic volume study, Volume capacity analysis, congestion index study, intersection saturation study, queue length study. The analysis reveals that the implementation of BRTS reduced the running width of the MV lane which directly affected the traffic flow along the route.**

***Index Terms*— Bus rapid transit system (BRTS), evaluation of BRTS, Traffic impact, MV lane, performance analysis.**

I. INTRODUCTION

Indore is a commercial center of the state. It is a premier center for education, medical institutes and is a major industrial hub of central India. The city is having highest per capita income in the state of Madhya Pradesh. As a historical as well as a modern city, it is attracting number of industries and is undergoing an economic surge. The rapid industrial and commercial development coupled with the rise in population in the recent past has contributed to a large scale increase in traffic in the city. Problems are bound to grow in magnitude unless advance actions are undertaken now. Keeping this in mind Indore government sketched out a plan for bus rapid transit system (BRTS) which comprises of 7 corridors, out of these 7 corridors only the ab road pilot corridor has been constructed.

Indore BRTS is of about 11.3 km length and includes 22 bus stations. There are two right of way one is 31.5m which includes 7 bus stations and stretches from LIG square to navlakha square, and the other is 61.5m which include 15 bus stations and stretches from niranjanpur to LIG and navlakha to Rajeev Gandhi. As the BRTS was constructed on the busiest route of the city this paper intends to analyze the effect of the BRTS on the mixed vehicle lane along the major intersections.

II. OBJECTIVE OF THE STUDY

Indore BRTS was constructed with full specification and detail on one of the busiest route of the city. Hence the main objective of the paper is to study the impact of the BRTS on the mixed vehicle lane at some major intersections which suffered with congestion and high traffic flow before the implementation of BRTS.

III. METHEDOLOGY

Keeping in mind the main objective of the study a proper methodology was proposed which includes the collection of traffic data by various traffic surveys i.e. traffic volume survey, spot speed survey, congestion index study, intersection saturation study and analysis of the collected data and recommendation based upon the findings from the data.

IV. SITE INTRODUCTION

To study the impact of BRTS on MV lane three major intersection of the 31.5m ROW i.e. industry house, palasia, and geetabhavan were selected for the study and two major intersection of the 61m ROW i.e. vijay nagar and bhawar kuan were selected. These intersections were selected as they have dense commercial/official land use.

Fig.1 ab road corridor

V. DATA COLLECTION AND ANALYSIS

5.1 Traffic volume count

The survey was carried out for both direction to quantify the volume of traffic during different hours of the day. The traffic volume survey was conducted on a fair day for a period of 16 hours at the selected intersections on the BRTS corridor.

5.1.1 Average daily traffic (ADT)

The intensity of traffic at intersection location is presented in table 1. It was observed that the traffic at different intersection varies from 80499 PCU's (117170 vehicles) at palasia to 62550 PCU's (83191 vehicles) at vijay nagar.

Sr. no.	Name of intersection	Grand total (nos.)	Grand total (PCU's)
1	Industry house	117170	80499
2	Guitar chowk	94781	68672
3	Palasia	117170	80499
4	Vijay nagar	83191	62550
5	Bhawar kuan	90535	70337

Table 1: Intensity of traffic at intersections

5.1.2 Peak hour traffic characteristics

The morning peak, evening peak hour traffic and at intersection location is given in table 2. The morning peak hour volume varies from 6894 PCU's at palasia to 5609 PCU's at vijay nagar and evening peak hour volume varies from 7731 PCU's at palasia ro 5834 PCu's at vijay nagar. The morning peak hour were obsereved at 10:00 to 11:45 and evening peak hour were observed at 18:45 to 20:30.

Sr. no.	Intersection name	Morning peak	Evening peak
1	Industry house	5632	6160
2	Guitar chowk	5732	6573
3	Palasia	6894	7731
4	Vijay nagar	5609	5834
5	Bhawar kuan	5452	5857

Table 2: peak hour traffic at intersections

5.2 Capacity analysis of surveyed intersection

The capacities of the intersections have been worked out from the practical capacities observed on road. In addition IRC codes have also been referred.

The maximum volume observed is at the arm toward palasia from industry house with a v/c ratio 1.13. Figure 2 gives a comparison of the volumes and capacities of the intersections. The desirable VC ratio is 0.7 representing level of service 'C'. The graph clearly shows that out of the surveyed intersections only the two i.e. vijay nagar and bhawar kuan have vc ratio less than 0.7. At the intersections of midblock the vc ratio is higher than 0.7 thereby indicating reduced level of service at these roads.

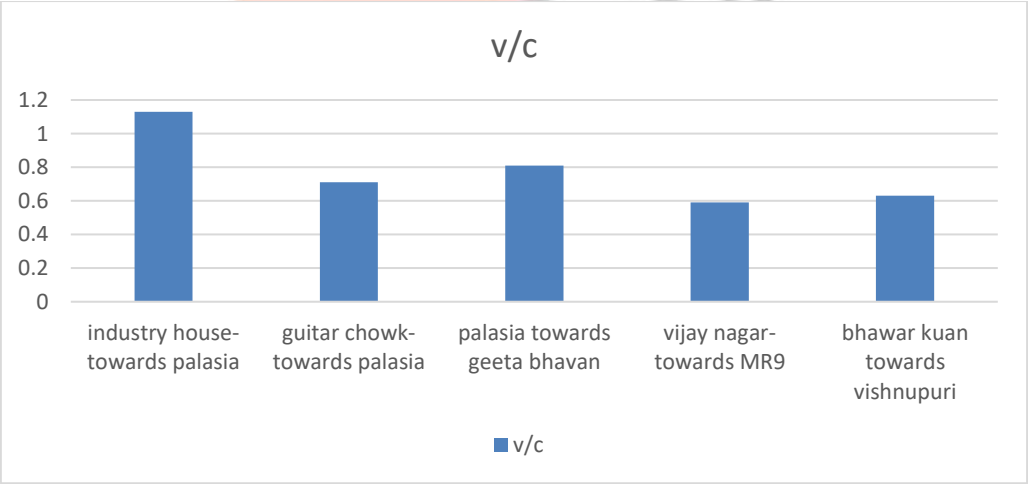

Fig. 2: volume capacity ratio at intersections

5.3 congestion index

Congestion index is an indicator of the combined effects of the intensity of the traffic volume, road width available for traffic movement and the degree of congestion. This in turn is the indicative of the journey speeds on the network.

It is formulated as: $ci = (Dc*V)/(N*Lc)$

$Dc = \{(Sp-So)*100\}/Sp$

Where,

Ci- congestion index

Dc-degree of congestion

N -number of lanes

Lc- lane capacity
V- Traffic volume
Sp- maximum posted speed (in kmph)
So- observed speed (in kmh)

Intersection name	Peak hour		Off peak hour	
	Degree of congestion	Congestion index	Degree of congestion	Congestion index
Industry house 1. towards palasia 2. towards vijaynagar	 94.8 76	 64.79 39.49	 90.52 60	 61.86 31.18
Guitar chowk 1. towards palasia 2. towards vijaynagar	 89.4 94.8	 45.59 42.66	 78.45 90.52	 40.01 40.73
Palasia 1. towards geeta bhawan 2. towards vijaynagar	 72 89.4	 17.56 43.37	 60 78.45	 14.63 38.07
Vijay nagar 1. towards MR9 2. towads dewasnaka	 78.7 76.6	 25.04 22.26	 69.99 64.58	 22.26 18.77
Bhawar kuan 1. towards navlakha 2. towards asarambapu square	 60 60	 41.44 30.11	 50 50	 34.53 25.1

Table 3: degree of congestion and congestion index at intersections

5.4 Saturation capacity

The saturation capacity (Y) is an indicator of the intersection capacity up to, which organized flow can be maintained by controlled measures. It is a value derived from the inflow/525*width of approach arm of the intersection. However, to get a relative comparison, saturation capacities for all surveyed major intersections so identified is computed and given in table 4.

Sr. no.	Intersection name	Saturation capacity
1	Industry house	1.34
2	Guitar chowk	1.15
3	Palasia	.97
4	Vijay nagar	.77
5	Bhawar kuan	.88

Table 4: saturation capacity at intersections

The highest value of saturation capacity is observed at industry house intersection (1.34) followed by guitar chowk (1.15). Out of the selected intersection two intersections i.e. industry house and guitar chowk have saturation capacity value greater than 1.

5.5 Queue length

Queue length survey was conducted at all the selected intersections of BRTS corridor. The queue build-up along the BRTS corridor at several intersection is due to the controlling of signals. From the collected data it was observed that the midblock section commonly known as the bottle neck section of the BRTS are heavily congested during morning and evening peak hours and leads to the formation of long queue's at these intersections. The results of the queue length survey are shown in table 5.

Intersection name	Peak hour	Off peak hour
Industry house	122	63
Guitar chowk	96	55
Palasia	133	68
Vijay nagar	78	28
Bhawar kuan	73	26

Table 5: queue length at intersections

VI. CONCLUSION

This research tried to study the impact of the BRTS on the mixed vehicle lane. Various surveys were done along the BRTS corridor at selected locations and following is the conclusion:

1. The traffic volume count survey and VC ratio indicates that the traffic flow between the bottle neck section in high and exceeds the capacity of the section.
2. The industry house intersection seems to be heavily congested and saturated which calls for the redesigning of this intersection.
3. The queue length observed at 31.5m section i.e. the bottle neck section of the BRTS corridor is high as compared with the other similar raods and intersection around the city.

4. There is a heavy congestion along the 31.5m section which reduces the speed of the MV lane and so the running width of this section needs to be increased and properly designed.

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