Study and Analysis of Traffic in A Typical Hetrogenous Traffic Condition:A Case Study of Bhiwandinizampur City Municipal Corporation

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Abstract- *This study emphasis on analysis and solutions of major traffic congestion points in Bhiwandi and its traffic volume , traffic flow and vehicle distribution. The area was surveyed and the major points were selected according to the traffic volume and traffic congestion. After selecting these points the survey area was finalized from Ratan Talkies to Vanjarpatti. In this survey the traffic count was extracted manually and the further converted into its P.C.U values. The survey day was selected according to the highest traffic day in the week i.e Wednesday and the survey time was selected depending on the peak hours so to obtain comparison between the two. The points were allocated to group of students to extract the data for one hour during both morning and afternoon sessions. The extracted data was analyzed and the result of morning and afternoon sessions were compared with the percent of P.C.U values of vehicles flowing in both the direction. This study will be helpful in reducing the traffic congestion within the survey area and to ensure smooth traffic flow.*

I. INTRODUCTION

Civilizations and traffic have developed with equal pace ever since the earliest bigger human settlements. The same forces that draw inhabitants to congregate in large urban areas also lead to sometimes intolerable levels of traffic congestion on urban streets and thoroughfares. Effective urban governance requires a careful balancing between the benefits of agglomeration and the disadvantages of excessive congestion. Road traffic congestion poses a challenge for all large and growing urban areas. The full report on which this summary is based aims to provide the makers of policy and technical advisors with the strategic vision, conceptual frameworks and guidance on some of the practical tools necessary to manage
congestion in such a way so as to reduce its overall impact on individuals, families, communities and societies as a whole.

Urban traffic congestion is a significant and growing problem in many parts of the world. Moreover, as this problem continues to increase, the old-school approach of “constructing more roads" doesn't always work for a variety of political, financial, and environmental reasons. In fact, building new roads can actual pile on congestion, in certain cases, by inducing greater demands for vehicle travel that quickly eat away the additional capacity? With respect to this backdrop, serious existing and growing congestion traffic control techniques and information techniques are required that can substantially increase capacity and improve traffic flow efficiency. Application of the ITS technologies in areas such as road user information and navigation systems, improved traffic control systems and vehicle guidance and control systems has appreciable potential for relieving traffic congestions. Traffic congestion and the cost of providing mobility are compelling issues to planners,decision makers and members of both the business community and the general public transportation and the degree of efficiency with which it is accomplished, affects us all. Therefore we are constantly in search of solutions to our transportation problems that will give us not only increased mobility, but also greater economic productivity and a cleaner environment. While new road construction can temporarily relieve congestion in the longer term it simply encourages further growth in car traffic through increased travel and a switch away from public transport. Beside this, suitable corridors in our cities for major roadwork’s is becoming more and more problematic, and many of the recent major projects involve turrets to minimize environmental disruption and community opposition, thereby raising costs.

In the past decade, a new wave of Intelligent Transport Systems (ITS) has emerged around the world to provide additional tools to help solve our transport problems. Intelligent Transport Systems can produce major benefits in reducing congestion, accident and environmental impacts, and can make significant improvements to the efficiency of commercial and public transport fleets, and to inter-modal integration. ITS can also reduce the need for expensive new transport infrastructure by maximizing the efficiency of our existing facilities well.

II. OBJECTIVESOFREASEARCH

Following are the objectives of the study:

1. To determine traffic flow
2. To study the composition in heterogeneous traffic condition.
3. To evaluate major congestion points in the study area.
4. To evaluate speed and flow of vehicles (QKV curve).

III. METHODOLOGYOFSTUDY

Types of Traffic Counts

It is essential to know the magnitude of traffic data required or to be collected, which will further determine its quality and type of vehicle classification which is to be adopted. Traffic counting falls in two main categories, namely; a) Manual counts and b) Automatic counts. There is no distinct difference between the two methods, however, the economic use or selection of an appropriate method of traffic counting is a function of the level of traffic flow and the required data quality. This difference can be deduced from the discussions of the respective methods below.

- **Manual Counting**

The most common method of collecting traffic flow data is the manual method, which consists of assigning a person to record traffic as it passes. This method of data collection can be expensive in terms of manpower, but it is nonetheless necessary in most cases where vehicles are to be classified with a number of movements recorded separately, such as at intersections. At intersection sites, the traffic on each arm should be counted and recorded separately for each movement. It is of paramount importance that traffic on roads with more than one lane are counted and classified by direction of traffic flow. Permanent traffic counting teams are normally set up to carry out the counting at the various locations throughout the road network at set interval. The duration of the count is determined prior to commencement of traffic counting and it is dictated by the end use of data. The teams are managed and supervised by the technical staff to ensure efficient and proper collection of data. (Survey Forms used for manual traffic-counting).

- **Automatic Counting**

The detection of vehicular presence and road occupancies has historically been performed primarily on or near the surface of the road. The exploitation of new electromagnetic spectra and wireless communication media in recent year, has allowed traffic detection to occur in a non-intrusive fashion, at locations above or to the side of the roadway. Pavement-based traffic detection currently relatively inexpensive will be met with fierce competition in the coming years from detectors that are liberated from the road surface. The most commonly used detector types are:

i) Pneumatic tubes:

These are tubes placed on the top of road surfaces at locations where traffic counting is required. As vehicles pass over the tube, the resulting compression sends a burst of air to an air switch, which can be installed in any type of traffic counting devices. Air switches can provide accurate Axle counts even when compressions occur more than 30 m from the traffic counter. Although the life of the pneumatic tubes is traffic dependent as they directly drive over it, it is used worldwide for speed measurement and vehicle classification for any level of traffic. Care should be exercised in placing and operating the system, to ensure its efficient operation and minimize any potential error in the data.

ii) Inductive loops.

Inductive loop detector consists of embedded turned wire from which it gets its name. It includes an oscillator, and a cable, which allows signals to pass from the loop to the traffic counting device. The counting device is activated by the change in the magnetic field when a vehicle passes over the loop. Inductive loops are cheap, almost maintenance-free and are currently the most widely used equipment for vehicle counting and detection. Single loops are incapable of measuring vehicular speed and the length of a vehicle. This requires the use of a pair of loops to estimate speed by analyzing the time it takes a vehicle to pass through the loops installed in series. An inductive loop can also, to a certain degree, be used to detect the chassis heights and estimate the number of axles. By using the inductive loops, the length of the vehicle is therefore derived from the time taken by the vehicle to drive from the first to the second loop (driving time) and the time during which the vehicle was over thefirst and the second loop (cover time). The resulting length is called theelectrical length, and is in general less than the actual length of the passingvehicle. This is caused by the built in detector threshold, the roadsurface material, the feeder length, the distance between the bottom of thevehicle and the loop, but also, to a large extent, the synthetic materialsused in modern cars. The system could be used for any level of traffic.

iii) Weigh-in-Motion Sensor types.

A variety of traffic sensors and loops are used world-wide to count, weigh and classify vehicles while in motion, and these are collectively known as Weigh In Motion (WIM) sensor systems. Whereas sensor pads can be used on their own traffic speed and axle weighing equipment, they are trigged by "leading" inductive loops placed before them on the roadbed. This scenario is adopted where axles, speed and statistical data are required. Some notable traffic sensors are.

- **Bending Plates:** which contains strain gauges that weigh the axles of passing vehicles. Continuous electric signals are sent to the strain gauges, and these signals are altered as the plates are deflected by dynamic vehicular weight and measure the axle of the passing vehicles.

- **Capacitive Strip:** is a thin and long extruded metal used to detect passing axles. The force of vertical pressure applied to this strip by a wheel alters its capacitance, which can be converted to a wheel-weight measure when related to the speed of the vehicle. Capacitive strips can be used for both statistical data and axle configuration.

- **Capacitive Mat:** functions in a similar manner as the capacitive strip but it is designed to be mobile and used on a temporary basis only.

- **Piezo-electric Cable:** is a sensing strip of a metallic cable that responds to vertical loading from vehicle wheels passing over it by producing a corresponding voltage. The cable is very good for speed measurement and axle-space registration, and is relatively cheap and maintenance free like a inductive loop if installed correctly.

iv) Micro-millimeter wave Radar detectors.

Radar detectors actively emits radioactive signals at frequencies ranging from the ultra-high frequencies (UHF) of 100 MHz, to 100 GHz, and can register vehicular presence and speed depending upon signals returned upon reflection from the vehicle. They are also used to determine vehicular volumes and classifications in both traffic directions. Radar detectors are very little susceptible to adverse weather conditions, and can operate day and night. However, they require comparatively high levels of computing power to analyse the quality of signals.

v) Video Camera.

Video image processing system utilizes machine vision technology to detect vehicles and capture details about individual vehicles when necessary. A video processing system usually monitors multiple lanes simultaneously, and therefore it requires high level of computing power. Typically, the operator can interactively set the desired traffic detection points anywhere within the system's view area Algorithms are used to extract data required for the detection of the raw data feeds. Due to the complexity of the images, it is not recommended that they should be processed outdoors as this can give poor results. The system is useful for traffic counting and give a +/- 3% tolerance, and is not appropriate for vehicular speed and their classification

3.2 Methodology adopted for this project:

3.2.1 Manual count:

For the present study, data collection was done from various organizations, like BNCMC (BhiwandiNizampur City Municipal Corporation) , Traffic police station etc. Also manual count of vehicle movement by using the CVC method (Classified Vehicle count) at the 3 major strategic junctions and 10 arterial roads was carried out. **About One Hundered and Fifty students were engaged in the survey work**. Students were equally distributed at selected strategic points. This survey was helpful in understanding the flow of vehicle from different directions and prima facie understands the reasons for the unmanageable situation.

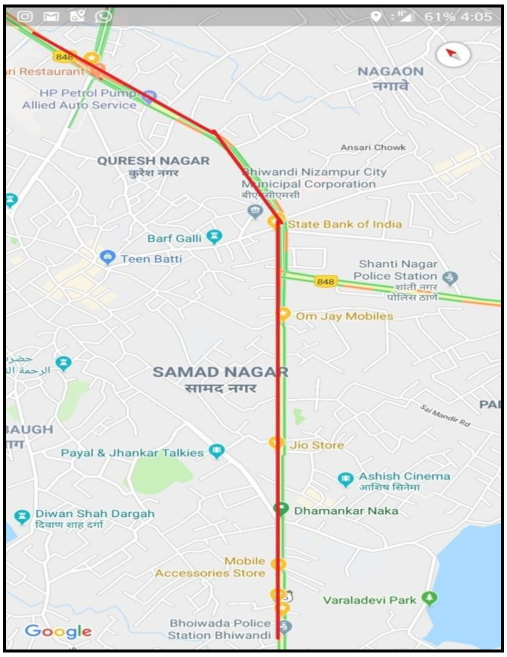

Fig- 3.2.1.5

Fig- 3.2.1.6

Area that was surveyed on the above points as shown in picture no. 5 and 6.

3.2.2 Moving Observer Method:

For a complete description of traffic stream modeling, one would require flow, speed, and density. Obtaining these parameters simultaneously is a difficult task if we use separate techniques. Since we have a fundamental equation of traffic flow, which gives the flow as the product of density and space mean speed, if we knew any two parameters, the third can be computed. Moving car or moving observer method of traffic stream measurement has been developed to provide simultaneous measurement of traffic stream variables. It has the advantage of obtaining the complete state with just three observers, and a vehicle. Determination of any of the two parameters of the traffic flow will provide the third one by the equation $q = u.k$. Thus, moving observer method is the most commonly used method to get the relationship between the fundamental stream characteristics. In this method, the observer moves in the traffic stream unlike all other previous methods.

V. DATA COLLECTION

The datacollected during the survey at the site, was extracted and then analyzed. It suggests some trends in terms of traffic distribution at the selected site . The collected data was then further analyzed, where it was seen through the glass of P.C.U. i.e. Passenger Car Units. The P.C.U. shows the effect a vehicle has on road and traffic with respect to its speed, dimensions, headway, density etc.

Total 7 major spots were finalized. Which included 3 flyovers that is Dhamankarnaka, Kalyannaka, Vanjarpatti. counting of vehicles were carried out and further converted into P.C.U.

VI. DATA ANALYSIS

6.1 PCU comparison

6.1.1

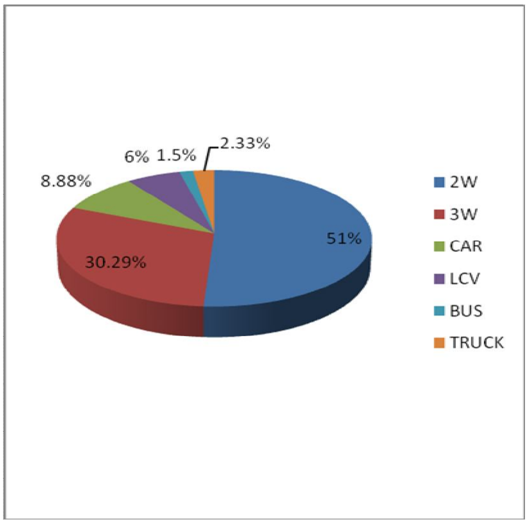

Figure 6.1.1:Vehicles moving towards Vanjarpatti in (morning)

This is average percentage distribution of vehicles moving towards Vanjarpatti in the morning period. It can be analyzed that the volume of 2-wheeler is the maximum throughout which is 51% followed by 3-wheeler which is around 30.29% of total traffic volume. Car and LCV occupies 8.88% and 6% respectively, truck occupies 2.33% of the traffic volume and the least is bus with 1.5% of total traffic volume.

2-wheelers are most preferred vehicle for common people and in such traffic zone and road conditions it is more suitable, therefore the percentage of 2-wheeler is the maximum.

6.1.2

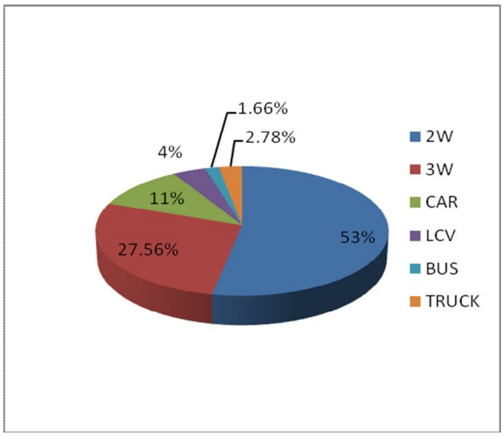

Figure 6.1.2: Vehicles moving towards Anjurphata in (morning)

This is average percentage distribution of vehicles moving towards Anjurphata in the morning period. we can analyze that the volume of 2-wheeler is the maximum throughout which is 53% followed by 3-wheeler which is around 27.56% of total traffic volume. Car and LCV occupies 11% and 4% respectively, truck occupies 2.78% of the traffic volume and the least is bus with 1.66% of total traffic volume.

2-wheelers are most preferred vehicle for common people and in such traffic zone and road conditions it is more suitable, therefore the percentage of 2-wheeler is the maximum.

6.1.3

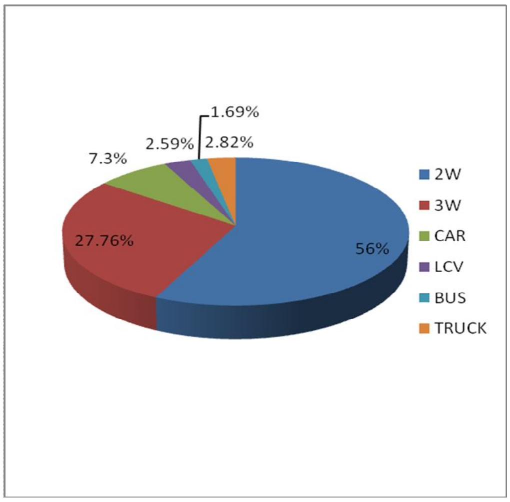

Figure 6.1.3: Vehicles moving towards Vanjarpatti in (afternoon)

This is average percentage distribution of vehicles moving towards Vanjarpatti in the morning period. we can analyze that the volume of 2-wheeler is the maximum throughout which is 56% followed by 3-wheeler which is around 29.6% of total traffic volume. Car and LCV occupies 7.3% and 2.59% respectively, truck occupies 2.82% of the traffic volume and the least is bus with 1.69 % of total traffic volume.

2-wheelers are most preferred vehicle for common people and in such traffic zone and road conditions it is more suitable, therefore the percentage of 2-wheeler is the maximum

6.1.4

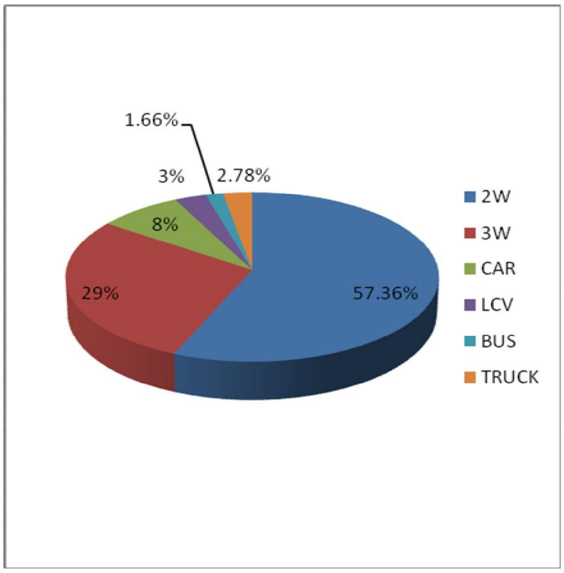

Figure 6.1.4: Vehicles moving towards Anjurphata in (afternoon)

This is average percentage distribution of vehicles moving towards Anjurphata in the morning period. we can analyze that the volume of 2-wheeler is the maximum throughout which is 57.36% followed by 3-wheeler which is around 29% of total traffic volume. Car and LCV occupies 8% and 3% respectively, truck occupies 2.78% of the traffic volume and the least is bus with 1.66% of total traffic volume.

2-wheelers are most preferred vehicle for common people and in such traffic zone and road conditions it is more suitable, therefore the percentage of 2-wheeler is the maximum.

6.2 comparison of P.C.U values at flyover

6.2.1

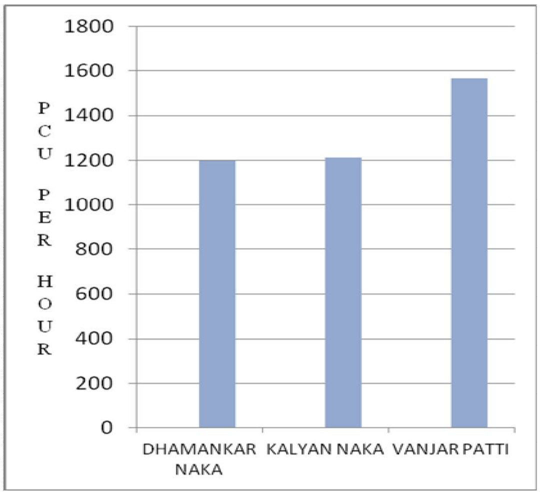

Figure 6.2.1: Comparison of PCU values at flyovers

This is the comparison between all three flyovers in the survey area showing the PCU values in the peak hour's morning. It can be analyzed that Vanjarpatti flyover has the maximum number of PCU traffic at that time which is 1567 PCU, followed by Kalyannaka with 1210 PCU, and the minimum was at Dhamankarnaka that is 1199 PCU. Percentage of these three flyover is Vanjarpatti 39.50%, Kalyannaka 30.50%, and Dhamankarnaka 30%.

Since Vanjarpatti flyover connects Bhiwandi with Nashik,Wada and other important places hence it is occupied more.

6.2.2

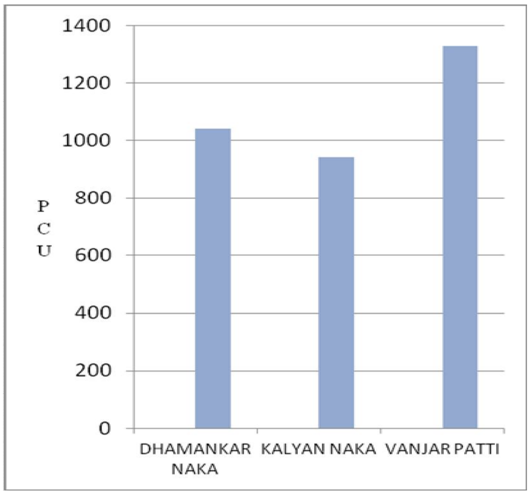

Figure 5.2.2: Comparison of PCU values at flyovers

This is the comparison between all three flyovers in the survey area showing the PCU values in the afternoon period. It can be analyzed that Vanjarpatti flyover has the maximum number of PCU traffic at that time which is 1329 PCU, followed by Kalyannaka with 942 PCU, and the minimum was at Dhamankarnaka that is 1042 PCU. Percentage of these three flyover is Vanjarpatti 40.11%,Kalyannaka 28.42%, and Dhamankarnaka 31.45%.

Since Vanjarpatti flyover connects Bhiwandi with Nashik,Wada and other important places hence it is occupied more.

VII. CONCLUSIONS

We have concluded that Region of BhiwandiNizampur City and Municipal Corporation has a huge traffic volume flow. And in the survey zone it was found that the area is occupied with high volume of vehicles. As Bhiwandi is an industrial zone as well as commercial zone people travel to Bhiwandi for their work travelling through public transport or by personal vehicle. Bhiwandi also connects major cities to each other making a pathway to one city to another.Three flyovers Dhamankarnaka, Kalyannaka, Vanjarpatti in the survey area it was analysed that vehicles uses the side road or below road as compared to the flyovers. This was observed at almost same even at afternoon and in both the directions. It can be concluded that maximum traffic volume coming from different ways or different cities enters Bhiwandi city as it a commercial zone as well as industrial zone. It was analysed that the volume of 2-wheeler is the maximum throughout . 2-wheelers are most preferred vehicle for common people and in such traffic zone and road conditions it is more suitable, therefore the percentage of 2-wheeler is the maximum which was above 50% of total traffic volume. Traffic congestion was more observed at ST stand as there is also rickshaw stand just before ST stand which creates more congestion, and big buses entering depot making turns from opposite side. Which results into delay and traffic jams. Traffic flow pattern of survey zone was studied during morning and afternoon, it was than evaluated that traffic volume was high during morning period as compared to afternoon. It was also analysed that traffic flow was more towards Ratan talkies as compared flow towards Vanjarpatti during both morning and afternoon survey.

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