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Study Of The Congestion Of Road Traffic At Railway Crossing & It's Impact On Road Network

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Abstract - Traffic congestion at railway crossing is one of the biggest problems faced by people now a day. Traffic congestion problem at railway crossing occur due to increase in the use of vehicle, increase the vehicular queuing, gate remain closed for long intervals and improper queuing of vehicle near the railway crossing. The effect of traffic congestion at railway crossing are increase delay and travel time, Fuel consumption, noise pollution , air Pollution and it's also affect nearby area and road network . Traffic congestion can lead to drivers becoming frustrated and rage behaviour.

***Key Words*: Railway Crossing, Congestion, Delay, Classified volume count, Passenger car unit (PCU).**

I. INTRODUCTION

Traffic congestion is a critical problem which happens on roads which make traffic busy because roads full of different type of vehicles. Traffic congestion challenges traffic flow in city and is prevented smooth traffic. A developing town area creates complex problems in daily life with traffic. Traffic Congestion and traffic delay phenomenon cannot be terminated only by applying physical constructing such as: Underpass Bridge, over bridge motorways and increasing road capacity[1]. Approximately, traffic congestion occurs at peak times in the morning or evening when people are going to work or coming from work. The most important causes that increase traffic congestion are overpopulation, lack of planning of city road, using private vehicles widely, road capacity and insufficient and inadequate public transport. As a result of previous causes, a huge impact on the environment, human health, economy, wastage of fuel. As an example of environmental effect, air (due to exhausting air by car) and noise pollution, which lead people suffering from heart diseases , asthma and lung cancer[2].

Vehicular traffic on roads has grown at an uncontrollable rate over the years making travel hapless and time consuming. It is generic thing that when two roads intersect, junction appears and because of both the intersecting roads in the same horizontal plane. These are junctions from where traffic from different directions converges and causing traffic congestion, delay and also accidents. At railway crossing numerous time doors are closed in for long duration there for trade traffic problem created at railway crossing. At time of gate opening, all vehicles are rushed at the same time to cross the railway track the main reason for this traffic delay is overfilling at junctions due to the increased viscosity of traffic from both ways of railway crossing. To avoid this type congestion, flyover or road over bridge were designed which have partially solved the problem of congestion and accidents. As traffic is not only problem of urban area but also the problem of small developing cities in India. Urban areas are well planned having transport system also well - equipped on other hand the developing cities are not so well planned. Vehicular traffic on roads has grown at an uncontrollable rate over the years making travel hapless and time consuming[3][4].

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People of Billimora and other people of nearby town are facing significant traffic problem at railway crossing. People have to wait for several minutes to pass through these railway crossings. They are facing delay many times a day. Also because of more congestion at railway crossing after opening the gate they are facing more delay at crossing. In developing country like India, the traffic is heterogeneous means mixed traffic flow, with vehicles of wide-ranging static and dynamic characteristics. Also the size of

vehicles varies widely, and the lateral and longitudinal placements of vehicles on the carriageway are complex, with no discernible lane discipline. The achromatise inflow, which is the most of the possible value of inflow through colourful railway crossings approach, is an important factor in the analysis of detention.. This traffic congestion also effect on nearby road network, shops, residential area etc.[8].

II. STUDY AREA LOCATION

Bilimora is a city situated on the banks of the river Ambika, in Gandevi taluka and Navsari District of Gujarat state in India. The megacity is roughly 70 kilometers (43 mi) south of the megacity of Surat and is the southernmost point of the Surat Metropolitan Region and the Metropolis of Surat. It's linked to Surat by SH 6 and SH 88. Bilimora is located at 20.75°N 72.95°E. Total area of Billimora city is 9 km^2. It has an average elevation of 4 metres (13'). Total population (2001) of Bilimora is 57,583 and rank of city population density is 62 in Gujarat.

Fig-1: Billimora City

Bilimora is well connected through rail, road and sea. It takes 3 hours maximum by train and 3 to 4 hours by road from Mumbai. The closest domestic airport is at Surat and the nearest international airport is at Mumbai and it's also near to the Dholai port.

A level crossing is an intersection where a railway line crosses a road or path. This railway crossing at Bilimora junction there are two railway crossing. Both are manned railway crossing. Railway crossing is near to the railway station, bus station, market, hospital and other major road connecting Bilimora by other towns. Railway crossing located at 20°46'02"N 72°58'12". It connects major roads of Chikhli & Gandevi to Billimora market area. Due to Railway station, bus station, market, hospital congestion at railway crossing occurred at gate closing time and after train arrival major passenger of train pass through that crossing. Bilimora is the only rail junction in the Mumbai division line of the Western road (India), from which a narrow hand line separates from the broad line to arrive at Waghai in the Dang District. It is said to be that this narrow gauge line is to be converted into broad gauge and will be extended up to manmade. The town of Chikhli is about 10 km to the east, which is on National Highway 48.

III. PROBLEMS AT RAILWAY CROSSING

The Rail crossing at Bilimora junction has a 3 gauge lines. Two of them are Broad gauge and one is narrow gauge line. Railway station is near to the crossing as well as school, bus station, main market of city, hospital is near to the crossing. And the traffic congestion at the Railway crossing is due to the following conditions:

- The Labours are walking or gathering near exactly at the Crossing in morning.
- No Gate closure visibility available at turning.
- There exists market, commercial buildings (shopping complex, hospital, Temple, etc), school, Bus station, Railway station near to the Railway crossing.
- There exists a Bus Station Nearby, due to which there are incoming and outgoing buses which acquires lot of space during peak hours.
- Heavy Crowding occurs during the Morning Shift and at the time when the workers, employees leave their workplace and returning to home.

IV. TRAFFIC VOLUME STUDY

Traffic Volume is the number of vehicles crossing a section of road per unit time at any select period. Traffic volume is used as a volume measure of inflow; the generally used unit is vehicle per day and vehicles per hour. A complete traffic volume study may include the classified volume study by recording the volume of various type and classes of traffic, the distribution by direction and

turning movements and distribution by direction and turning movement and the distribution on different lanes per unit time.
The object and of traffic volume studies are given below:

- Traffic volume is generally accepted as a true measure of the relative importance of roads and in deciding the priority for improvement and expansion.
- Traffic volume study is used in planning, traffic operation and control of existing facilities and also for planning and designing the new facilities.
- This study is used in the analysis of traffic patterns and trends.
- Classified volume study is useful in structural design of pavement, in geometric design and in computing roadway capacity.
- Volume distribution study is used in planning one way thoroughfares and other nonsupervisory measures.
- Turning movement study is used in the design of intersections, in planning signal timings, channelization and other control device.
- Pedestrian Business Volume study is used for planning sidewalks, cross walks galleries and rambler signals.

V. FREQUENCY OF TRAFFIC COUNTS

In order to prognosticate business inflow volumes that can be anticipated on the road network during specific ages, cognizance should be taken of the fact that business volumes changes vastly at each point in time. There are three cyclical variations that are of particular interest,

- **Hourly pattern**

The way traffic flow characteristics vary throughout the day and night; typical hourly patterns of traffic flow, particularly in urban areas, generally show a number of distinguishable peaks. Peak in the morning followed by a spare inflow until another peak in the middle of the autumn, after which there may be a new peak in the late evening. The peak in the morning is frequently sharper by reaching the peak over a short duration and incontinently dropping to its smallest point. The afternoon peak on the other hand is characterized by a generally wider peak. The peak is reached and dispersed over a longer period than the morning peak. However, in urban satellite towns, the morning peak may be too early and evening peak may be too late in comparison to the principal towns without significant midday peak.

- **Daily Pattern**

In a daily pattern, the data of the 24 hour traffic volume recorded on the daily basis. It is day to day variation throughout the weekdays and weekends of the particular week.

- **Monthly and yearly Pattern**

For months, the data is recorded for particular location on the basis of month to month variations & for a year, the data is recorded for full 365 days of the year.

VI. DATA COLLECTION AND ANALYSIS

There is to collect data with manual counts method for 2 route of Rail crossing. As, it take more human sources for collecting data. So here we are doing videography method for traffic volume study. We have done the videography method for one working day (Tuesday). Camera is fixed at the bridge of railway station and recorded the traffic of above mentioned day. Road Inventory Survey was also done by taking dimension (Width & length) with the help of measuring tape and field visual inspection was also acted at the site location. The overview of the site plan is shown in figure. Classified volume-count sheet is extracted from recorded videos by watching them over and over again. Its common practice to consider the passenger auto as the standard vehicle unit to convert the other vehicle classes and this unit is called Passenger Auto Unit or PCU. So, the different vehicle is converted into the common equivalency factor i.e. PCU.

VII. RESULT

In our project regarding work, we carried out videography survey at railway crossing near bilimora city. Our traffic congestion road length is 25 to 40 m. In our problem, we covered all the vehicles passing through our proposed traffic location. We noted entry and exit timings of the vehicles due to which it's causes congestion and thus the road network is impacted. We carried out videography fully two morning peak hours and two evening peak hours. All the movements of vehicles and pedestrians are recorded. After collection of data through videography, we analysed the data on laptop or computer screens. Gate opening time and closing time of railway crossing are recorded. The entry and exit time of the all the vehicles are noted. The data is collected thus very important as its permanent record of traffic volume count. The distance travelled by the vehicle per unit time on a particular proposed location road is figured out. The analysis of the data are time consuming work so we can assess all the data by replying or repeat mode of the videos on computer screens, laptops, DVD's etc.

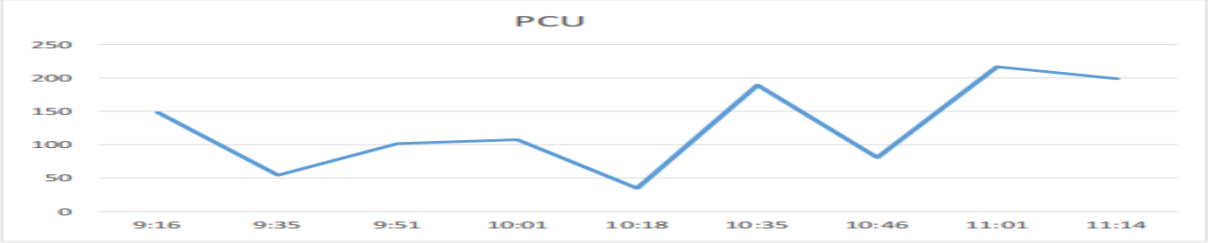

Figure-1: Direction of vehicle from Market to Bus station

The figure 1 shows that PCU's (passenger car unit) of different class of vehicles with respect to time frequency. This chart show that the traffic is at peak during in morning hours 11:00am to 11:30pm time duration. The majority of the PCU occupied by 2 wheeler as compare to other vehicles.

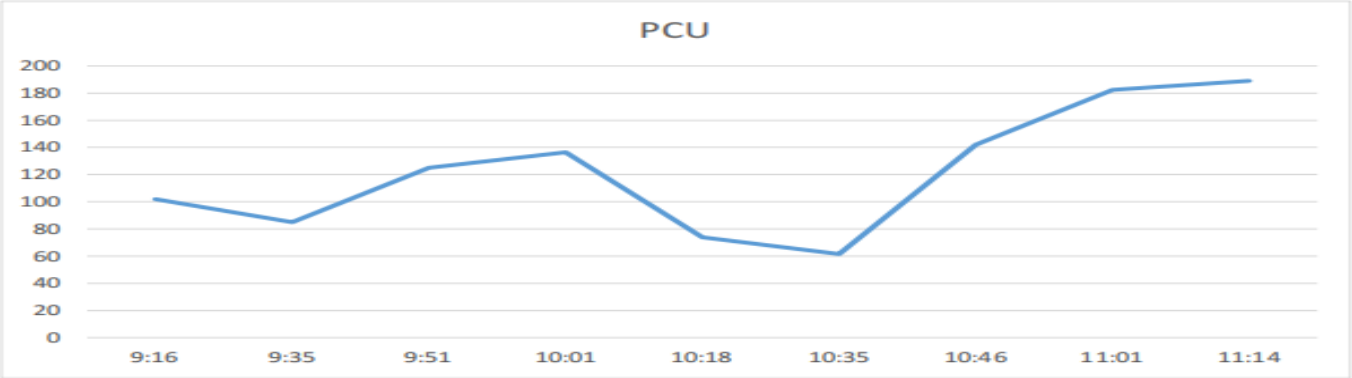

Figure-2: Direction of vehicle from Bus station to Market

The figure 2 shows that PCU's (passenger car unit) of different class of vehicles with respect to time frequency. This chart show that the traffic is at peak during in morning hours 11:00am to 12:00pm time duration. The majority of the PCU occupied by 2 wheeler as compare to other vehicles.

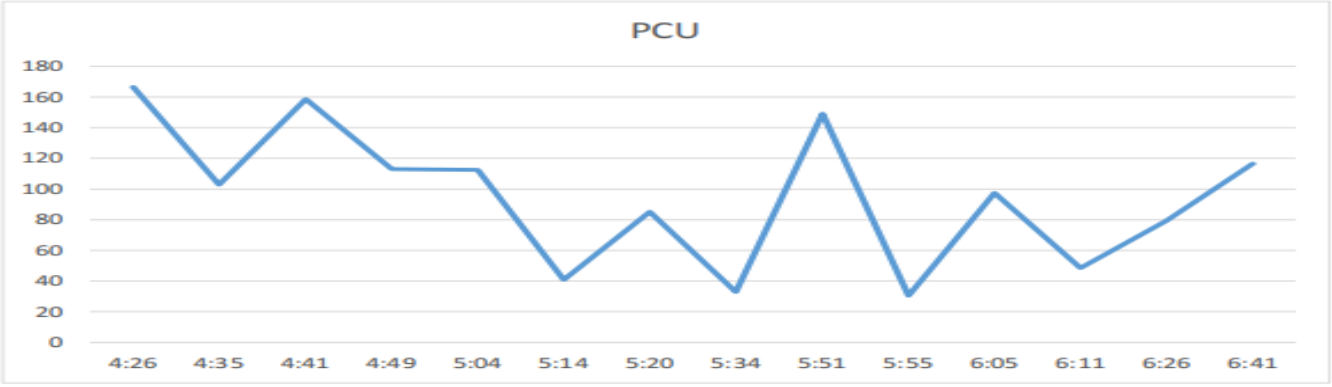

Figure-3: Direction of vehicle from Market to Bus station

The figure 3 shows that PCU's (passenger car unit) of different class of vehicles with respect to time frequency. This chart show that the traffic is at peak during in morning hours 05:30pm to 06:00pm time duration. The majority of the PCU occupied by 2 wheeler as compare to other vehicles.

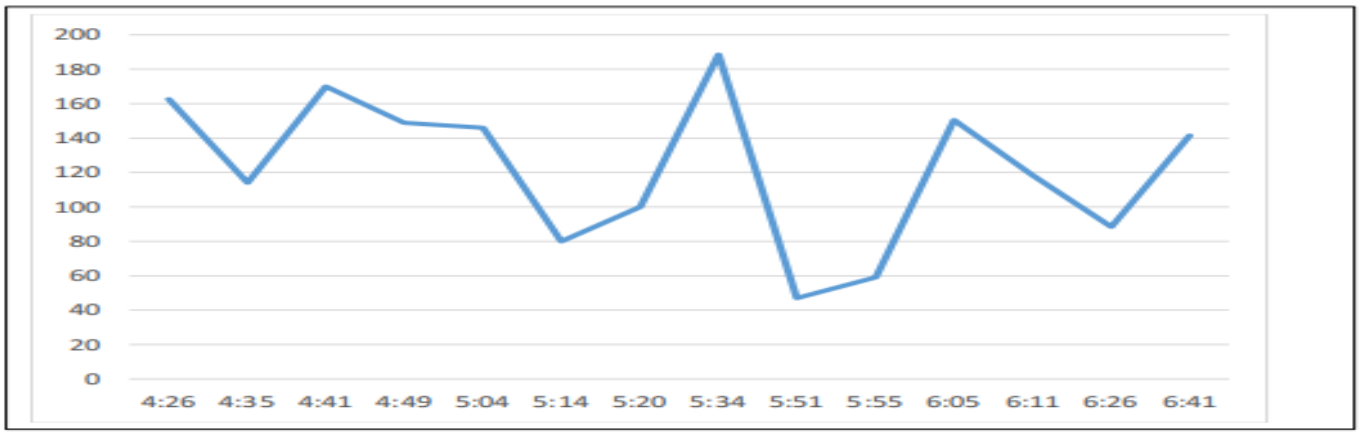

Figure-4: Direction of vehicle from Bus station to Market

The figure 4 shows that PCU's (passenger car unit) of different class of vehicles with respect to time frequency. This chart show that the traffic is at peak during in morning hours 05:30pm to 06:00pm time duration. The majority of the PCU occupied by 2 wheeler as compare to other vehicles.

From above all the chart results, it shows that traffic approaching the crossing is very high,

- 166.5 max PCU/hour during morning peak hour.
- 189 max PCU/hour during evening peak hour.

VIII. CONCLUSION

After conducting respective surveys such as vehicle volume surveys, vehicle distribution surveys along with road inventory surveys, we conclude the following. Comparatively, pedestrians cross at a higher rate than three-wheelers, four-wheelers, and other passenger car unit (PCU) vehicles. There are no rules for pedestrians. At gate closure, people congregate in both lanes, causing congestion. These also increase chances of accidents at railway crossing. Some people are unaware of the underpass bridge, which is a short distance from where two- and four-wheel vehicles can cross. Thus after the understanding of survey and data analysis we can provide proper gate closure warning signals at turning point near the road to the bus station which coming from chilkhli village and also same from road coming from bilimora city. The pedestrian are also in very large number causes congestion near the rail crossing, thus we should provide under Pass Bridge with suitable pedestrian facilities also to overcome the congestion problem. The out dated gate design should also be improved. Given proposed solutions should be effective measure regarding congestion at the railway crossing near the bilimora city.

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