Traffic Congestion in Mundhwa Chowk Pune : Causes and Solutions

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Abstract - **In modern life we have to face with many problems one of which is traffic congestion becoming more serious day after day. It is said that the high volume of vehicles, the inadequate infrastructure and the irrational distribution of the development are main reasons for increasing traffic jam. The traffic problem in city like Pune is increasing with every day. The major factor for traffic congestion in mundhwa chowk today is the narrow road ,illegal construction on road , high population area ,improper traffic management etc. Congestion occurs when traffic demand exceeds the operational capacity, when vehicle got breakdown, etc of the roadway. To overcome the congestion and to save precious time it is essential to find proper solution for traffic congestion. In this study the data will collect from various sources. In this study traffic congestion problem in mundwa chowk Pune city will be identified and studied for finding out the causes and proposed solution of it. The collected data will be analyzed by using Regression Analysis and the correct suggestions will apply on the basis of severity of the congestion problem.**

Index Terms - **Traffic Jams, Conjunction, Road Broadening, Travel Time, Increasing Population, solutions.**

1.INTRODUCTION

Since immemorial transportation of people and goods from one place to another place has been a vital part of the human life. In olden times carts driven by animals such as horses, elephants and oxen were used for transportation. With the passage of time and discoveries, in the field of motor vehicle and fuels drastically changed the face of transportation which eventually boosted rapid industrialization resulting in different sizes and shapes of vehicles. Along with economic development in India, urbanization took place, people migrating from village to cities at a faster rate in India. It leads to increase in population in cities. Also, the barrier of cost was removed by the motor industry which became affordable for the middle class to buy two or four-wheeler vehicles due to this traffic density is increasing at a faster rate. In past decades, the traffic police controlled the traffic flow smoothly, but as the population and the living standard of the people increased the demand of the private vehicle has also increased hence, it is not easy for traffic police to control the congested traffic. Studies are done to reduce traffic density and the conflicting movement of the vehicle on the traffic congestion which was useful for the alleviation of traffic. Sometimes in traffic congestion area, the traffic information taken from the AHP-TOPSIS model achieve in getting the shortest route defined. Many studies identified the intersection congestion problem from the chronological balanced car data to eradicate traffic congestion problem. To avoid traffic congestion caused by the unwanted structure or encroachment or reconstructions of the structure, good planning for traffic management should be obtained. Planning was done before construction, during construction and after construction. For the uniform flow of traffic on the freeway, appropriate speed limit for safety as well as the smooth flow of traffic should be applied according to the studies done until now. Due to more traffic congestion in developing country will affect indirectly on the economy of that developing country. Some studies analyze the genuine occasion aspect for causing the traffic congestion by considering few parameters like maintenance of the road, lights on the roads, weather conditions etc. Some studies are done on the installations of auxiliary lane on the sag section of the pavement, for the smooth traffic flow. The auxiliary lane should be more than the 1000m. To mitigate the traffic problem not only charging based parking near small areas or in public areas are the better solution, but also gives the suggestions to the public to the maximum use of public transport. Traffic

congestion problem create a serious and bad impact on development of city.

- Jams Decreases down the movement speed of the vehicles tends increase the travel time.
- Traffic congestion not only causes pollution, but also wastes time and energy. The major factor for traffic congestion in mundhwa chowk today is the narrow road, illegal construction on road, high population area, improper traffic management etc.
- The Objectives of our works is to provide a good solutions, Logical and practical ideas and conceptual guidance to manage traffic movement in such way to reduce congestions and decreases the overall impact of it on individual citizens, Travelers and on society.

1.1Objective

The main Aim & objectives of this study and this review paper is as follow,

1. Find out the actual reasons causing traffic congestion.
2. Suggests some practical solutions for traffic management for Pune city to reduced congestion.
3. Decrease the travel time by reducing the traffic jams.
4. Reduce the unpleasant impact of traffic jams on environment and society.
5. Improve traffic movement through proper traffic managements.

2.LITERATURE REVIEW

Kushagra Birendrasingh Thakur, Shubham Pravin Lunkad, Charudatta Ramesh Shinde, Nandkishor Chandu Ram, Vishal Indralal Purohit. Congestion of Traffic at Gunjan Chowk Junction, Pune. 2017.

Pune is city in the West of India, in the state of Maharashtra and is roughly 160 km east of Mumbai. The city lies approximately 3 miles along a river. The heart of the city is much older than the rest of the city. It has winding roads, many of which follow the natural slopes of the mountainous terrain and end at the rivers feeding the city. As the city expanded unevenly, a large number of roads were built around the central portion of the city, including the major highways which link the city to other parts of the country. Some of the highways linking the city are maintained by the State of Maharashtra and are the State Highways. Pune is also connected by two National Highways, NH50 and NH4. Streets perform certain basic functions in the built environment such as providing routes for vehicles and public transport.

accommodating utility services and drainage systems. The design of a street affects how successful it is in performing these functions, and it can also vitally affect the urban character of a neighbourhood and influence how people use the street and interact with each other on it. The quality of a street and its connections can affect whether people choose to walk or cycle or take the car. It can affect whether people feel safe. Thus, the character of the street needs to be developed in such a way so that along with the functions which it has to perform, other purposes could also be served such as encourages public transport, creating interactive neighbourhood etc. Under the current project, the identified streets in Aundh area of Pune have been taken up to the above aspects of usable and friendly streets. It is proposed to undertake the work of redesigning of the street, retrofitting of footpath and road, placemaking on road, junction redesigning etc amongst other improvements on the street.

3.METHODOLOGY

Pune is one of the developing urban area in Pune district, Maharashtra, India. Four major roads meet at the Mundwa chowk in pune : the main central pune road, magarpatta road, manjari road, Ghorpadi road, Magarpatta road. Gas station, bridge, temples of various religion are keyed out at the mundwa chowk. Fig 1 shows the detailed map of Mundwa Chowk

along with various roads joining it. The main reason for the traffic was inadequacy of road width, encroachment, unsignalised road, improper parking space, unconstitutional trading along roadsides and need of pedestrian services are also recognized within the area under contemplation.

The remarkable nature of mundwa chowk was looked upon to the abovementioned problems. In order to differentiate the troubles owing to the traffic issues in the mundwa chowk, direct ground survey was performed to collect significant data. Peak hour volume count of all type of vehicles in all the directions was counted to identified the vehicular movement. For the simplicity purpose the data of all vehicles was taken separately. Conflicting movements of the vehicle at the intersections were familiar during the morning and the evening peak hour. The entry and exit of public transport like buses are counted near Mundwa Chowk intersection during morning and evening peak hours respectively.
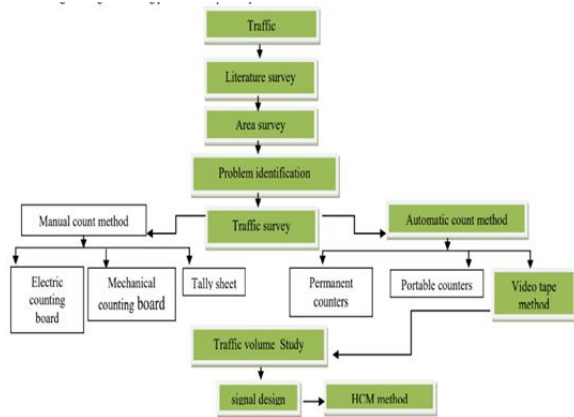

Chart -1: Methodology flow chart

Pedestrian movement were measured for sideways and irregular movement directions with esteem to the roads were noted. In this study, first the field survey of the Mundwa chowk was done, and widths of all roads at each node were recorded. Then volume count was conducted for 13-hour period (from 08:00 A.M. to 09:00 P.M.) at Mundwa chowk to study the rate of traffic fluctuation at the intersection. The traffic data was analyzed and signal time was designed for efficient and smooth flow of traffic at Mundwa chowk. Looking to the traffic volume adapting manual count method was impossible so the traffic count with the help of video tape was opted. Using the video tape, facilitated separation the vehicles for the simplification and separation of the arm data, for the
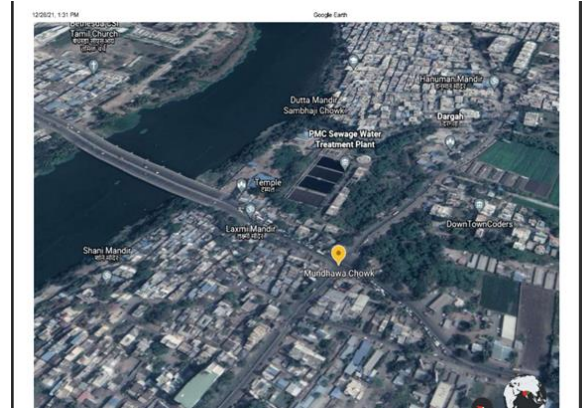
calculating the signal design. The count was done at 15-minute interval for the simplification of the calculation. The traffic count was done at each different node. After doing the field survey, designing was done by Highway Capacity Manual method . In order to avoid such traffic congestion and conflicts, it is proposed to introduce signaling system at this intersection.
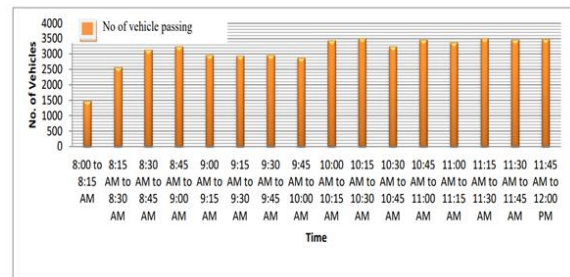

Fig. III Traffic flow analysis (Morning)

Fig.III Indicates the total morning traffic at Shivaji chowk. It includes all five nodes which come towards the Shivaji Chowk along with vehicular traffic at junction such as two wheeler, three wheeler, car. It is pragmatic to be having lofty traffic density in the morning time.
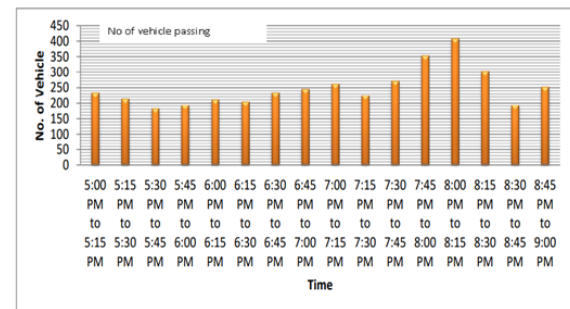

Fig.IV Traffic flow analysis (Evening)

Lack of road marking, breaking of the traffic rule, illegal road crossing increased volume of traffic and congestion during the morning peak hour. Fig.IV indicates the total evening traffic at Shivaji chowk. It

includes the all Four nodes which come towards the Mundwa chowk along with vehicular traffic at junction such as two wheeler, three wheeler, car etc. Designing part is mainly dependent on the above mentioned peak hour data. The signal was designed by the highway capacity manual method. Comparison of both the methods was done and minimum time required method was selected for designing purpose.

I. Data Analysis

The principle issue has been distinguished which offers lead to the movement inconveniences in the Mundwa chowk region, the collected field information was investigated and its deductive thinking was done. In the accompanying areas, the aftereffects of the examinations are introduced. I Signal design by highway capacity manual method (HCM) HCM method is used for signal designing. It is basically operation-driven methodology. This method presents macroscopic psychoanalysis techniques to identify and assess traffic operation problems that could be easily reduced with enhanced signal timing, more utilization of signal phase, change in intersection of lane, and improves actuation.

A. Design steps for signal development

Designing of signal has done with the Highway Capacity Manual method, the traffic data used for the designing is shown in Table 1. Table 1 shows the peak value for each node obtained during the observation. The following steps were used for the designing of signal which was adopted from highway capacity manual.

Step I: Critical Volume (Vc)

For each node, one of the movement have highest traffic volume and this amount is known as the critical volume. Two lane critical volume for each lane have to be considered. In this study we have five arm so we divided the peak hour value of each arm by two for calculation of total critical volume (Vc) in vehicles/hr.

Step II: Evaluation of Saturation Flow (Si)

An intersection's approach signal is to stay green for an entire hour and the flow of traffic through this intersection with as dense as could be expected, the saturation flow rate should be the amount of passenger car units that passed through this intersection during that hour. $Si = (3600/hs)$, Assuming saturation headway (hs) = 2 sec. where Si is 1800. If in case our

Vc > Si then we have to increase the number of lanes and if Vc < Si so no need to increase the lane.

Cycle length $C = [N \times tl] / [1- (Vc/Si)]$
Eq.(I) where, Eq. (I), represent the cycle length for evaluation of infiltration flow. In Eq. (1) N represent the number of lane, tl represent the initial loss time. Assuming the initial loss time tl is 2.5 sec.

Step III: Evaluation of Green splitting

Evaluation of Green splitting defines the separation of indication of green time for particular each phase. In this Step we have to calculate the green interval of each phase by using below formula.

$Gi = [Vcl/ Vc] \times [Co-(N \times tl)]$
Eq.(II) Eq. (II) represent the separation of green time splitting for every node. where Gi represent the green interval, Vc l represent the loss of critical volume for each arm, and Co indicate the optimal signal cycle foe green splitting.

Step IV: Evaluation of Actual green time

In this Step we have calculated the actual green time by removing the stander amber time and adding the initial loss time in the following equation.

$G1 = g1 - y + tl$
Eq.(III) Eq. (III) represent the actual green time. In eq. (III) gl represent the actual green splitting for evaluation of actual green time, y represent the amber time for evaluation of actual green time, and the tl represent the initial loss time for evaluation of actual green time.

Step V: Evaluation of Pedestrian green time

Evaluation of Pedestrian green time defines the time in which the pedestrian cross the road safely from traffic. In this step we calculated the pedestrian green time by using following formula.

$Pt = ts + (dx/Vp)$
Eq.(IV) Where eq. (IV) represent the pedestrian green time. In eq. (IV) Pt represent the pedestrian green time, ts represent the start up loss time for pedestrian green time, dx represent the crossing distance in metres for pedestrian green time, and Vp indicate the walking speed of pedestrian. after this Step we have to calculate the total cycle length by following formula. Total

cycle length= Actual green time + Amber time + Pedestrian time.

Cycle length = [N x L x Xc] / [Xc-(Vc/Si)]
(Non-uniform flow)   Eq.(v)
Where eq. (V) represent the cycle length for non uniform flow. In eq. (V) Considering quality factor (Xc) = 0.95. By adopting above method we got the signal timing for smooth flow of traffic. Total signal timing by this method was 132 sec. By doing above calculations it seems that, total traffic flow is more towards the Nasik road to Shilphata road.

4.RESULTS AND DISCUSSIONS

In this paper, the traffic analysis is carried by video tape method. The 13-hour data was collected for the study, with interval of the 15-minutes and one hour peak period was selected for the signal design. For signal designing, analysis was made by using Highway capacity manual method.

5.CONCLUSION

The following conclusions can be get based on the discussion presented previously
In this study we see that the main reason of traffic jams in mundwa chowk Pune is unauthorized and illegal road side parking and also road side construction . Also there is lot of deficiencies both in operational efficiencies and infrastructure.
And due to that's traffic jams, there is possibility of accidents because of traffic jams.
This Traffic jams can be improvised by various strategies such as road broadening, improving road infrastructures and constructing a Fly over.
 Traffic Jams make an improper negative impact on environment, Societies and as well as on development and economy of city. It involves long queuing, slower speeds of traffic movement and lots of travel time.

REFERENCES

[1] Thi phuong Linh Le "Encouraging Public Transport Use to Reduce Traffic Congestion and Air Pollutant: A Case Study of Ho Chi Minh City", Procedia Engineering 142 (2016), 236-243.

[2] Divya L."Sustainable Traffic Improvement for Urban Road Intersection of Developing Countries", Procedia Technology 25 (2016) ,115-121.

[3] Harvey J. Miller "GIS-based Dynamic Traffic Congestion Modeling to Support Time Critical Logistics",1999

[4] Jingfei YU "Study on the Status Evaluation of Urban Road Intersections Traffic Congestion Based on AHP-TOPSIS Model" Procedia- Social and behavioral science 96 (2013), 609-616.

[5] Lin Xu "Identifying Urban Traffic Congestion Pattern from Historical Floating Car Data", Procedia- Social and behavioral science 96(2013), 2084-2095.

[6] Yanli Wang "Reasons and Countermeasures of Traffic congestion under urban land redevelopment" Procedia- Social and behavioral science 96 (2013) 2164-2172.

[7] Rui Sun, "Variable Speed Limit Design to Relieve Traffic Congestion Based on Cooperative Vehicle Infrastructure System", Procedia- social and behavioral sciences 138(2014) 427-438.

[8] Huimin Wen. "Study of Traffic Congestion Pattern of Large City in China Taking Beijing as an example", Procedia engineering 77 (2014) 37-44.

[9] Mir Shabbar Ali "Estimation of Traffic Congestion Cost-A Case Study of a Major Arterial in Karachi", Procedia engineering 77 (2014) 37-44.

[10] Ansar Yasar "Analyzing the Real Time Factors: Wich Causing the Traffic congestion", Procedia computer science 32 (2014) 413-420.

[11] Feifei He " A Traffic Congestion Assessment Method For Urban Road Networks Based On Speed Performance Index", Procedia engineering 137 (2016) 425- 433.

[12] Li Yong "Research on the Critical Value of Traffic Congestion Propagation Based on Coordination Game", Procedia engineering 137 (2016), 754-761.

[13] Jian Xing "Effective Installation of Auxiliary Lane at Sag Section to Mitigate Motorway Traffic Congestion", Procedia engineering, volume 15, 2016, 187-197.

[14] DingXin Cheng "Modification of Webster's Minimum Delay Cycle Length Equation Based on HCM 2000", 2003

[15] Martin waches "Highway Capacity Manual", 2003

[16] Alexander Paulson "collaboration in Public Transport Planning", Research in transportation economics, 69 (2018) 377-385.

[17] Jain k. "Traffic Flow Characteristics for Multilane Highways in India, Transportation Research procedia 17(2016), 468-477.

[18] Anthony Mbakwe "Alternative Method of Highway Traffic Safety Analysis for Developing Countries Using Delphi Technique and Bayesian Network, 2016.Electrical resistivity survey in soil science: Areview September 2005 Soil and Tillage Research 83(2):173-

[19] Leak Detection in underground pipelines of Municipal Water Distribution – M Blazevic, I Samardzic, Z Kolumbic (2005)

[20] A Simple Resistivity

[21] Correlation between electrical resistivity and water content of sand – a statistical approach by Sudhir Bhatt, Pradeep K. Jain in IASIR (Online) ISSN 2328-3580 AIJRSTEM 14-342 (2014)

[22] A review of methods for burst/leakage detection and location in water distribution systems Rui Li, Haidong Huang, Kunlun Xin and Tao Tao

[23] https://www.google.co.in

[24] Detection of Leakages in Underground Water Storage Tanks Using Electrical Resistance Methods – A Ramirez, W Daily (1996)

[25] Using the resitivity method for leakage detection in blind test at reseviour embankment dam test facility in Norway

[26] Surface investigation of ground water: NPTEL(Youtube.com)

[27] Hydrgeology : Indroduction to Resitivity Surveys (Youtube.com)

[28] Electrical Resitivity method/Lecture

[29] Groundwater Exploration By geological Method : MIT Mysore Civil (Youtube)

[30] Google scholar.com