DESIGNING EFFICIENT SIGNAL TO AVOID TRAFFIC CONGESTION WITH DELAY ANALYSIS OF VEHICLES ON EXISTING ROAD INTERSECTIONS

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ABSTRACT

The study is to assess the effect of increasing traffic Burdon on present road structures and Traffic management system. For study purpose, Amravati-Paratwada urban Highway passing through Panchvati Area of Amravati, Maharashtra is selected with corridor length of 3.9kms. This study includes collection of data from site by means of manual observations, previously available survey/video/photo records. Data collected is analysed by suitable delay models which suits heterogeneous traffic conditions in spite of choosing traditional models for Delay analysis. Collected data in terms of volume count of a peak hour traffic is then converted into passenger car unit factors. The study uses VISSIM simulation software model to compare delays in forms personal delays, overall delays at each individual intersection in the corridor by means of nodal analysis. Along with delays, queue lengths forming has also been studied under this study. signalized intersection's signal cycle redesigning and phase redesigning is suggested after analysis of present and suggested scenario to cope up with the vehicular delays and congestion problem in the selected corridor.

Keywords: Delay Analysis, Signal Time, Passenger Car Unit, Signal Synchronization, Peak hour traffic

INTRODUCTION

Background

Travel time is considered as one of the major categories of transportation costs and time saving in travelling is considered as one of the major benefits of Transit systems. Traffic congestion can disrupt free movement of vehicles resulting in various types of delays. Handling heterogeneous traffic in a systematic manner is indeed a challenging task for traffic engineers and traffic management authorities. High traffic growth, lack of proper road traffic management, and lane indiscipline lead to delay to the vehicles particularly at intersection locations.

Objective of research work

The objectives of research work mainly include the followings.

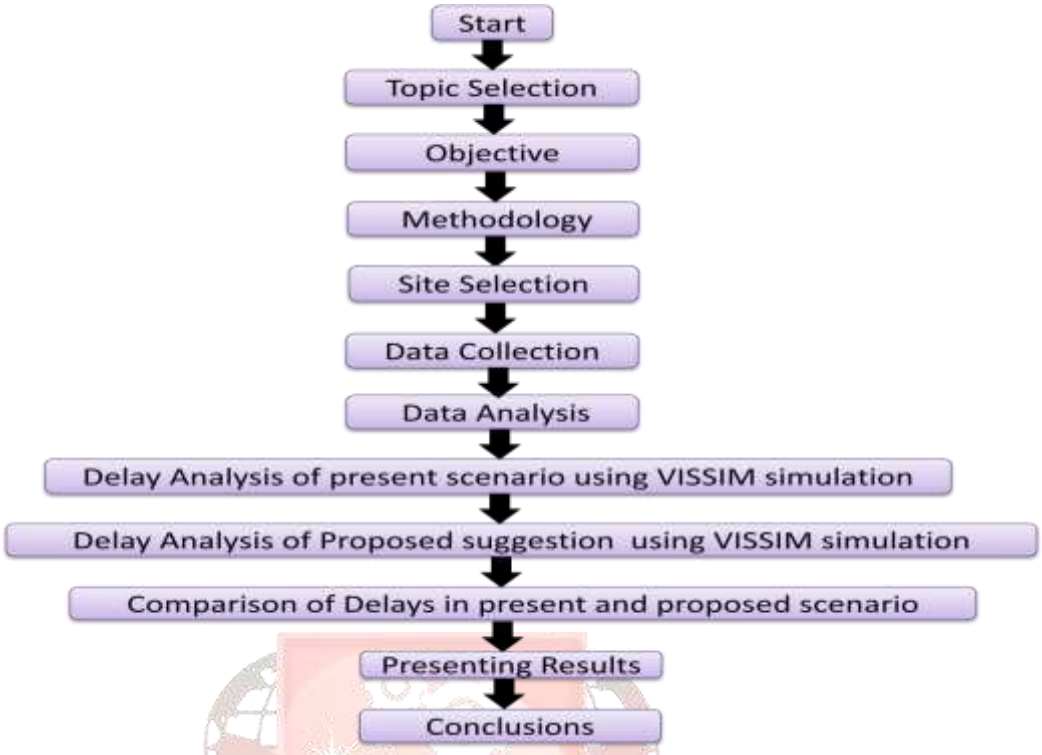
1. To observe Real time scenario of traffic at selected intersection/corridor.
2. To find out causes of delays at signalized intersection/corridor.
3. To analyze delays with appropriate Delay model.
4. To redesign Intersection with signal cycle so as to enhance the utility of corridor and reduce delay.

LITERATURE SURVEY

Delays in Traffic is one of the growing problem in India. Delays represent the effectively and efficiency of the road system and Transportation management systems. Thus, the analysis of delays is become necessity in study related to traffic management, level of service, utility improvement of road intersections. Delays can be studied and analyzed with different methods and models but as Indian traffic is of heterogeneous nature, traditional delay models are not that accurate and effective, thus literature review of previous studies done by researchers shows the scope for using modern methods or models so as to give results close to reality and minimizing the errors in analysis to give more appropriate results for analyzing the utility of signalized,

METHODOLOGY

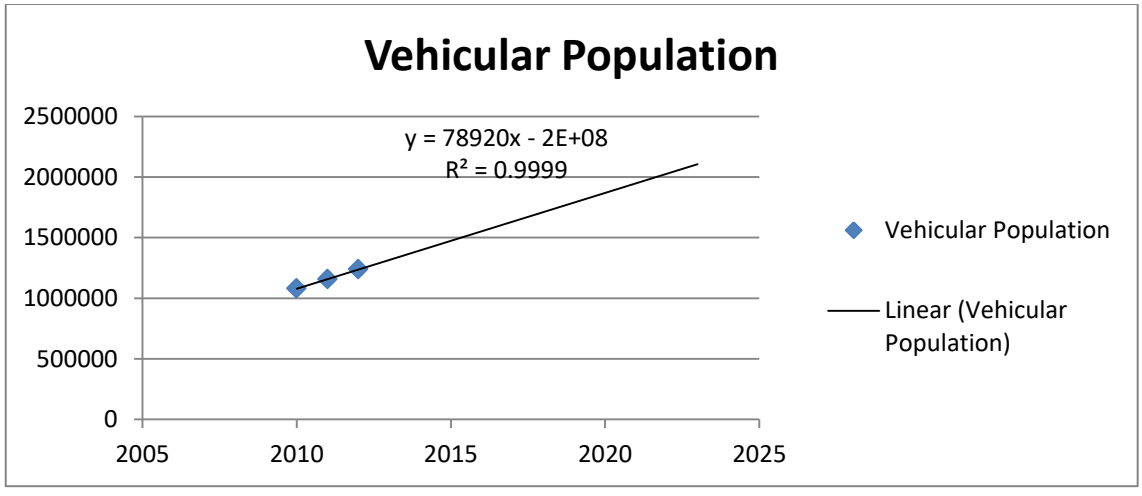
3.1.1 ***Study Area Characteristics***



- Corridor selected: Amravati to Paratwada Urban Highway
- Total length of selected corridor = 3.9 km
- Latitude/Longitude: 21^0 09'08.47" N 79^0 00'11.42"E
- Elevation/Altitude: 349m
- Intersections In Corridor: (From Amravati towards Paratwada)

I. Panchvati Square
II. Shegaon Naka
III. Kathora Naka

DATA COLLECTION AND ANALYSIS



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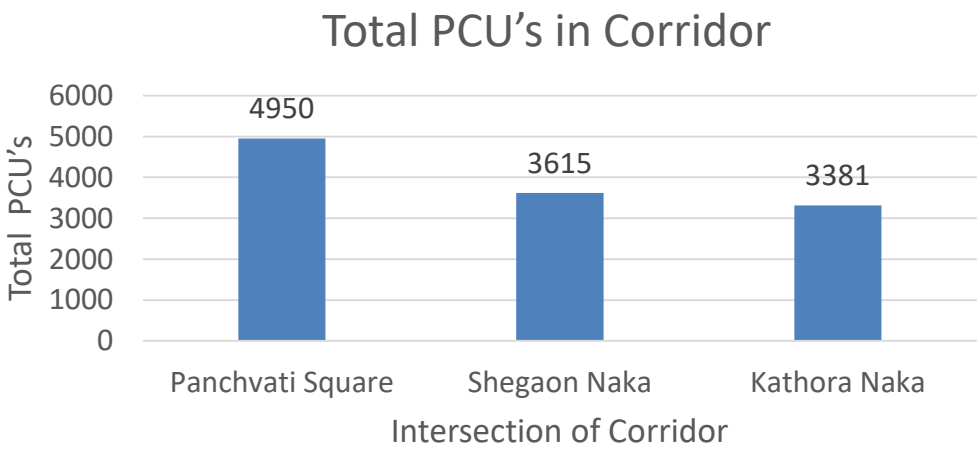
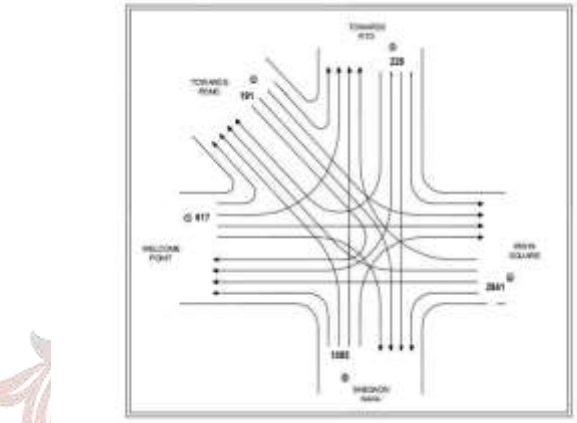
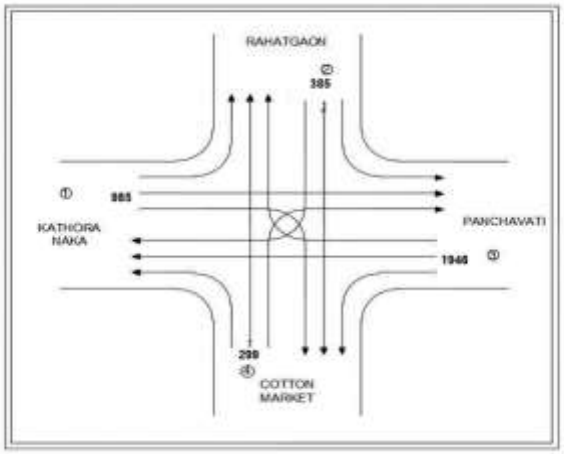


Fig Traffic Distribution at Corridors





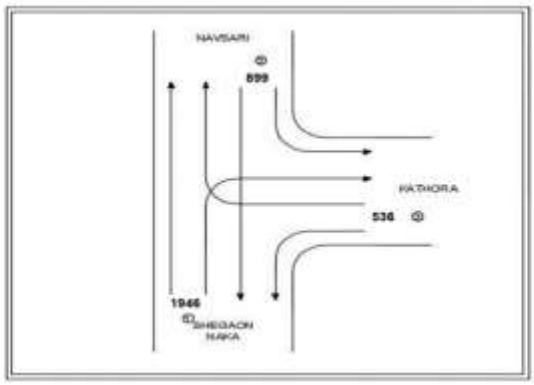


Table 4.4.3 a) Proposed Signal Cycle at Panchvati Intersection

Panchavati Intersection			
Phase	Green	Red	Amber
I	46sec	91sec	3sec
II	40sec	97sec	3sec
III	45sec	92sec	3sec
IV	45sec	92sec	00sec
V	140sec	00sec	00sec

Table 4.4.3 b) Proposed Signal Cycle at Shegaon Naka

Shegaon Naka Intersection			
Phase	Green	Red	Amber
I	30sec	39sec	3sec
II	21sec	48sec	3sec
III	21sec	48sec	3sec
IV	72sec	00sec	00sec

Table 4.4.3 c) Proposed Signal Cycle at Kathora Naka

Kathora Naka Intersection			
Phase	Green	Red	Amber
I	30sec	27sec	3sec
II	11sec	46sec	3sec
III	10sec	47sec	3sec
IV	60sec	00sec	00sec

RESULTS AND DISCUSSION

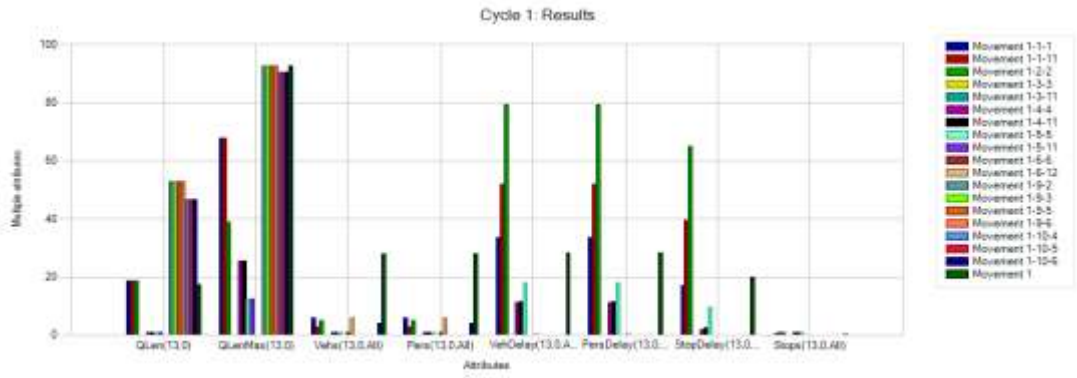


Fig 4.5.1 Delay analysis of present scenario in vissim simulation

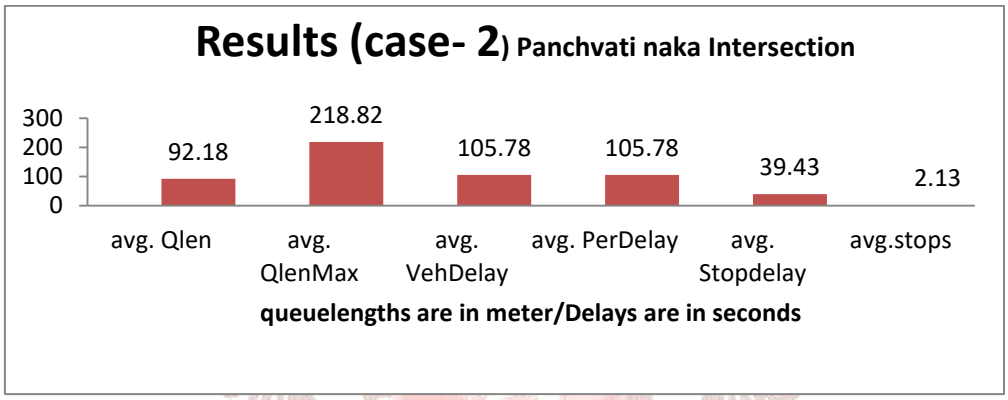


Fig. 4.5.3 Analysis of proposed corridor in vissim simulation

Delay analysis of present and proposed corridor scenarios in vissim simulation showed that the proposed changes in signal cycle and phase system which allows straight going vehicles from Amravati- Paratwada and Paratwada-Amravati for signalized intersection at Panchvati Square to flow freely in a single phase reduced the average delay of total corridor by 50.82% and application of signal system at Shegaon naka and Kathora Naka intersections respectively helped to reduce delays. average delay due to vehicles stoppages was reduced up to 11.54%. average vehicle stops was reduced by 1.58 percentages due to proper signal system and restricted flow movement of the vehicles throughout the corridor.

Table. 5.1 Average of result of case-1 and case-2

Delay parameter	Present scenario	proposed scenario
avg. VehDelay	160.32	78.86
avg. Stopdelay	40.54	35.78
avg.stops	1.26	1.24

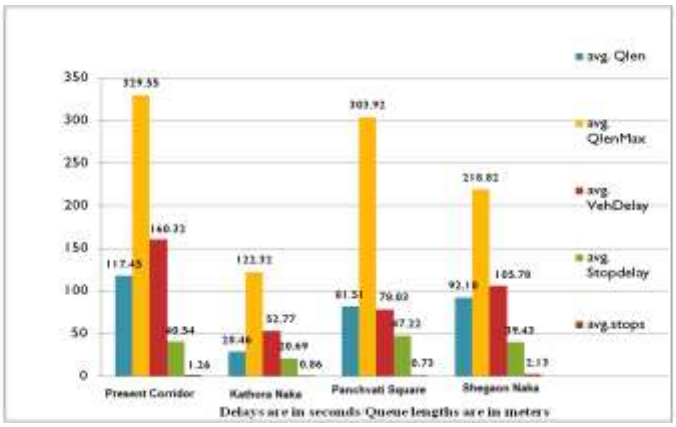


Fig. 5.1.2 Comparison of present and proposed corridor's Utility

CONCLUSION

- With the results occurred after Delay analysis through VISSIM simulation, it is cleared that there is a need of several changes in present Traffic management system.
- HGV traffic running on urban Highways is causing more delay to other vehicles.
- Selected corridor needs a restructuring of signal cycles, phases at a present Signalized Intersection and a provision of Signal system at remaining two Intersections.
- Amravati-Paratwada road carries majority of traffic travelling through the corridor, suggested Signal phase would bring down the Delays and queue lengths to a satisfactory results, without major changes in the geometry of Intersections.

FUTURE SCOPE

The projected methodology is good and mostly practical, very useful and more feasible in terms of economy, serviceable, and reclaimable for associate, particularly for an influential person in the very first stage of the strategic plan and goal study with a view of enhancing sustainability and utility of the present scenario at most of the signalized intersections.Though research study showed that delays were reduced to the good level but changing signal cycles and phases are not permanent measures for the rapidly growing vehicular population on roads. If these constituent elements could be quantified and further integrated with indistinguishable yield aspects the projected methodology with more precise and detailed observations in assessing the sustainability and utility of signal systems or LOS of road systems. Provision of separate lanes, same as that of rapid bus transit for straight going traffic in the selected corridor would be more effective for more period of time but provision of grade separators can solve this problems to the large extent and would be effective for long time period.

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