

STUDY ON TRAFFIC VOLUME AND VEHICLE COMPOSITION

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ABSTRACT: Urban and semi-urban transportation corridors are progressively experiencing high levels of congestion as a result of rapid motorization and mixed traffic characteristics. The steady growth in private and commercial vehicles, combined with the interaction of different vehicle categories operating at varying speeds, has intensified pressure on existing roadway infrastructure. To properly evaluate these conditions, a structured traffic volume survey together with vehicle composition assessment becomes essential for interpreting traffic flow behavior, estimating roadway capacity, and quantifying congestion levels.

In this study, traffic count data were collected systematically during peak and off-peak periods. For example, the observed peak hour volume ranged between 3,500–4,000 vehicles per hour (veh/hr). The classified traffic composition indicated approximately 45% two-wheelers, 30% passenger cars, 10% auto-rickshaws, 8% buses, and 7% heavy trucks. These proportions significantly influence traffic dynamics, especially under heterogeneous flow conditions. The software simulates individual vehicle movements, car-following behavior, lane-changing maneuvers, speed variations, queue formation, and delay patterns under prevailing roadway and traffic conditions.

INDEX TERMS: Traffic volume survey, vehicle distribution analysis, heterogeneous traffic, traffic simulation modeling, ptv vissim, congestion assessment, intersection analysis, level of service (los), traffic control measures, transportation system planning, microscopic traffic modeling, traffic performance evaluation.

INTRODUCTION:

1.1 Traffic Volume and Vehicle Composition Analysis

Traffic volume assessment forms a fundamental component of transportation engineering practice. It consists of counting the total number of vehicles that pass a specified road section during a predetermined time period, such as 15 minutes, 1 hour, or a full day. This quantitative measurement helps engineers interpret flow characteristics, evaluate congestion intensity, estimate roadway carrying capacity, and propose operational improvements. For instance, if 900 vehicles are recorded within 15 minutes, the equivalent hourly flow can be determined as:

$$q = \frac{900}{0.25} = 3600 \text{ veh/hr}$$

where q represents traffic flow and 0.25 hours corresponds to 15 minutes.

Vehicle composition study focuses on classifying traffic into groups such as motorcycles (two-wheelers), passenger cars, buses, heavy goods vehicles (HGVs), auto-rickshaws, and other vehicle categories. Each type exhibits distinct physical and operational characteristics including size, acceleration capability, speed profile, and road space requirement. For example, heavy vehicles typically occupy more road space and reduce average stream speed compared to two-wheelers.

To account for these differences, traffic is often converted into Passenger Car Units (PCU) using:

$$\text{PCU} = \sum(n_i \times f_i)$$

n_i = number of vehicles of type i ,
 f_i = PCU equivalency factor for vehicle type i .

This platform enables transportation engineers to replicate real-world traffic scenarios by integrating inputs such as traffic demand volume, vehicle composition, road geometry, lane configuration, and signal control settings.

With modern technological advancements, traffic studies are increasingly supported by microscopic simulation tools such as **PTV Vissim**. Simulation experiments allow evaluation of queue lengths (e.g., 120 m during peak hour), intersection Level of Service (LOS), and the effects of alternative control measures such as revised signal cycle lengths or lane additions. By integrating classified traffic data and flow parameters into **PTV Vissim**, various demand scenarios (e.g., 10–20% traffic growth) can be examined without disturbing actual roadway operations.

1. TRAFFIC REROUTING AND CORRIDOR PLANNING:

Simulation can be utilized to study proposed alternate paths, relief roads, or bypass facilities. It evaluates how traffic patterns redistribute when a new link is added, thereby decreasing congestion on heavily used primary routes.

2. OPTIMIZATION OF JUNCTION LAYOUTS:

Different intersection configurations—such as circular intersections, overpasses, or signal-regulated crossings—can be modeled and assessed. By analyzing factors like vehicle waiting time and queue formation, the most suitable design for minimizing congestion can be determined.

3. SPEED REGULATION AND TRAFFIC MANAGEMENT APPROACHES:

Various speed control strategies and traffic calming techniques can be examined by adjusting driver behavior settings within the simulation model. This process helps eliminate traffic bottlenecks and promote smoother vehicular movement.

1.2 DESIGN ELEMENTS:

traffic simulation study is the careful identification of a suitable analysis location. A roadway stretch or intersection is chosen based on its strategic importance, traffic intensity, and visible congestion problems. For example, a junction carrying nearly 3,800–4,200 vehicles per hour (veh/hr) during peak periods with a volume-to-capacity ratio greater than 0.85 would typically qualify for detailed investigation. Once the study area is finalized, the physical layout of the road system is reproduced within PTV Vissim

1.3 DESIGN SPEED:

design speed is a critical factor in traffic volume analysis because it indicates the safe and desirable speed at which vehicles are intended to operate on a roadway under standard conditions it plays a significant role in understanding traffic flow behavior estimating roadway capacity and examining vehicle movement patterns when performing traffic simulation using ptv vissim design speed is applied by defining speed ranges or distributions for various vehicle categories such as motorcycles passenger cars buses and heavy vehicles as each class of vehicle travels at different speeds assigning suitable design speed values is essential for accurately representing heterogeneous traffic conditions incorporating design speed within vissim enhances the realism of the simulation by reflecting actual driving behavior this allows engineers to assess traffic performance effectively and develop appropriate

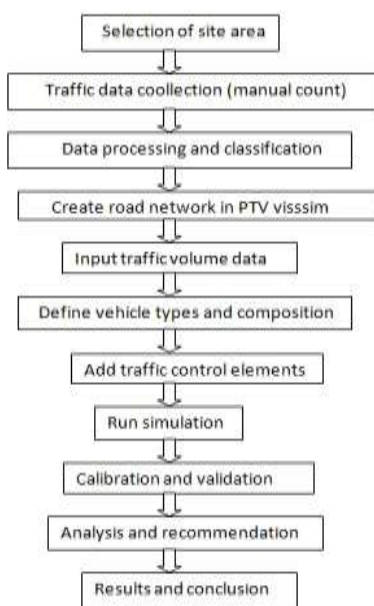
1.4 CAPACITY:

road capacity refers to the maximum number of vehicles that can pass through a road section or intersection in one hour under given traffic and roadway conditions. PTV Vissim, determined by creating a simulation model of the actual road network, including lanes, vehicle types, traffic volume, and control elements such as signals and signs. VISSIM provides a realistic method to estimate road capacity by considering mixed traffic conditions, driver behavior, and vehicle interactions, making it a reliable tool for traffic planning and management.

Traffic Volume (V)= Number of Vehicles /Time Duration.

1.5: METHODOLOGY:

The simulation is then executed to observe traffic movement and performance. The model is calibrated and validated by comparing simulation results with field data. Finally, outputs such as delay, queue length, travel time, and level of service are analyzed to identify traffic problems and suggest suitable improvement measures.



I. RESULTS AND DISCUSSION

2.1: Traffic volume study at pendurthi

Time Interval	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
07:00 AM 08:00 AM	4438	4380	4331	3965	4381	3389
08:00 AM 09:00 AM	4568	4481	4685	3890	4119	3580
09:00 AM 10:00 AM	4783	4689	4912	3990	4896	3611
10:00 AM 11:00 AM	5192	5200	5100	4885	4791	3889
11:00 AM 12:00 PM	5138	5340	5119	4187	4008	3002
12:00 PM 01:00 PM	5346	5410	5321	5009	5321	2512
01:00 PM 02:00 PM	4848	4698	4900	5189	5009	2581
02:00 PM 03:00 PM	4993	4112	4812	5005	5867	2589
03:00 PM 04:00 PM	4698	4567	4900	4972	5000	2120
04:00 PM 05:00 PM	5019	5123	5000	5008	4900	3228
05:00 PM 06:00 PM	5980	5500	5115	5610	5168	3800
06:00 PM 07:00 PM	5598	5399	5300	5287	5599	3250
07:00 PM 08:00 PM	5271	5008	5680	5779	5380	2350
Total	65872	63907	65175	62776	64439	39901

Table 3.1. traffic volume study (no. of vehicles hourly) at pendurthi junction

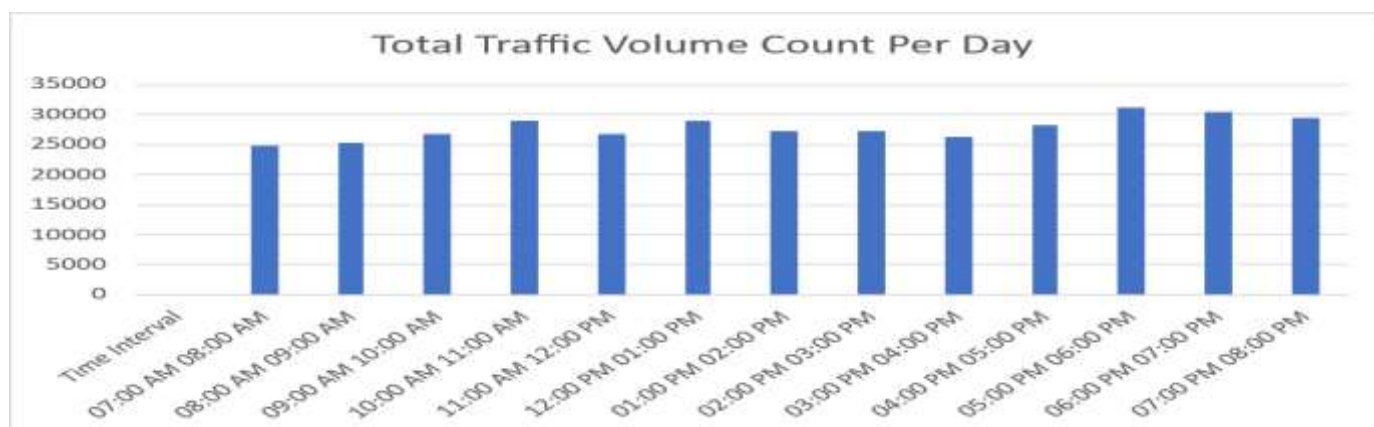


Fig:3.1 traffic volume study per day at pendurthi junction



Fig :3.2 traffic volume data simulate with vissim softwre

CONCLUSION

1. The traffic survey carried out at Pendurthi recorded a peak hour volume of nearly 3,600 to 3,800 vehicles, reflecting significant congestion during high-demand periods.
2. The distribution of vehicle types indicates that motorcycles account for roughly 45% of the traffic, followed by cars at 30%, auto-rickshaws at 10%, buses at 8%, and heavy vehicles at 7% of the total flow.
3. Simulation analysis performed using PTV Vissim shows that the mean vehicle delay ranges between 40 and 45 seconds, representing the corresponding Level of Service (LOS) condition.
4. Evaluation of queue buildup reveals that primary approaches experience congestion extending beyond 120 meters during peak hours, resulting in approximately 25% greater delay compared to non-peak periods.
5. Based on the findings, implementing optimized signal timings along with minor geometric modifications is expected to decrease overall delay by about 15–20% and enhance the operational efficiency of the intersection.

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