

OPTIMIZATION OF TRAFFIC CONDITIONS IN VIJAYAWADA USING INTELLIGENT TRANSPORTATION SYSTEM

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Abstract – Intelligent transport system (I.T.S) is a board term that refers to application of advanced technologies to improve the safety & efficiency of transportation systems. The goal of “I.T.S” is to improve the transportation system in case of cities by controlling traffic congestion & regulating the traffic flow. This project mainly stresses on studying the Vijayawada city’s traffic pattern, critical junctions, Signal management, IPT, Parking and Toll collection system. It also focuses on how application of I.T.S technology helps in optimizing the traffic conditions in the city. The main aim of this project is to improve the traffic conditions in Vijayawada by introducing desired components of intelligent transportation system, reduction of accident rate and promote fuel efficiency.

Introduction

Intelligent Transportation System in case of cities is controlling traffic congestion, regulating the traffic flow, Toll collection and Parking studies. Traffic congestion and its associated problems is a Global Phenomenon. Congestion reduces efficiency of transportation infrastructure; increases travel time, air pollution, fuel consumption. Building new transportation infrastructure is expensive, can be detrimental to the environment and cannot practically catch up with the increasing transportation demand. Intelligent Transport Systems and Services (ITS) refers to the integration of information and communication technologies with transport infrastructure to improve economic performance, safety, mobility and environmental sustainability for the benefit of all citizens. It comprise several combinations of communication, computer and control technology which are applied to vehicles (including trains, aircraft and ships), transport infrastructure and users to improve system performance, transport safety, efficiency, productivity and level of service, environmental

impacts, energy consumption, and mobility. ITS represent the next step in the evolution of the entire transportation system.

PCU TABLE

TYPE OF VEHICLE	PCU VALUE
CAR	1.0
AUTO RICKSHAW	1.0
MOTOR BIKE	0.5
BUS	3.0
TRUCK/LORRY	4.0
NMV	0.3

Analysis of Data at Benz Circle Area

- Total vehicular flow from MG Road is 39717 veh/day
- Total Pcu value from MG road is 33022 pcu/day
- Total vehicular flow from Varadhi Road is 34521/day
- Total Pcu value from Varadhi road is 45375/day
- Total vehicular flow from AutoNagar Road is 45960veh/day
- Total Pcu value from AutoNagar road is 49809 pcu/day
- Total vehicular flow from Ring Road is 23406 veh/day
- Total Pcu value from Ring road is 30534 pcu/day
- Total vehicular flow from All directions is 143604veh/day
- Total Pcu value from All directions is 158745 pcu/ day
- Average annual traffic is 57941925 pcu/year.

Peak Hour traffic is observed during 7pm to 8pm

Analysis of Ibrahimpatnam Traffic Flow

- Total Vehicular Flow from Hyderabad Route is 16374veh/day
- Total PCU Value from Hyderabad Route is 23166pcu/day
- Total Vehicular Flow from Vijayawada Route is 20394veh/day
- Total PCU Value from Vijayawada Route is 32967pcu/day
- Total Vehicular Flow from Kondapalli Route is

16671veh/day

- Total PCU Value from Kondapalli Route is 20157pcu/day
- Total Vehicular Flow from Ferry Route is 10134veh/day
- Total PCU Value from Ferry Route is 6501pcu/day
- Average daily Traffic at IBM is 82794pcu/day
- Average annual Traffic at IBM is 30219810pcu/year
- Peak Hour Traffic flow is observed during 6:15pm to 7:15pm.

Analysis of data collected at Ring Road

- Total Vehicular Flow from Karl Marx Road is 18507veh/day
- Total PCU value from Karl Marx Road is 19581pcu/day
- Total Vehicular Flow from Gannavaram Road is 21012veh/day
- Total PCU value from Gannavaram Road is 24753pcu/day
- Total Vehicular Flow from Benz circle Ring Road is 18096veh/day
- Total PCU value from Benz Circle Road is 22404pcu/day
- Average daily Traffic flow is 66744 pcu/day
- Average annual traffic flow is 24361560 pcu/year.

Accident Studies

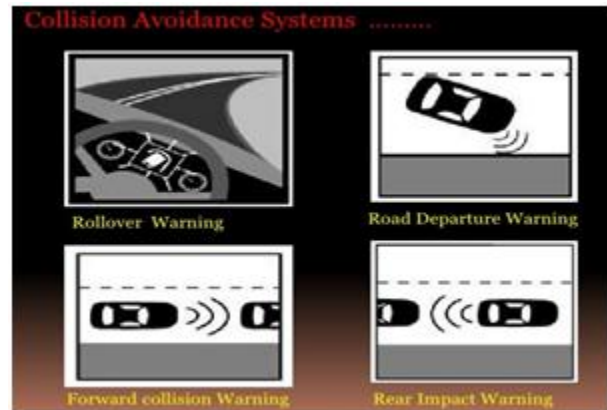
Over 10 pedestrians killed each month on Vijayawada’s roads. Vijayawada has the dubious distinction of being among the top three cities in the country reporting a large number of pedestrian deaths. With 130 such fatalities in 2014, it ranks third after Bengaluru (255) and Kolkata (203), as per stats released by the National Crime Records Bureau (NCRB).

How application of I.T.S can reduce the Accident Rates..?

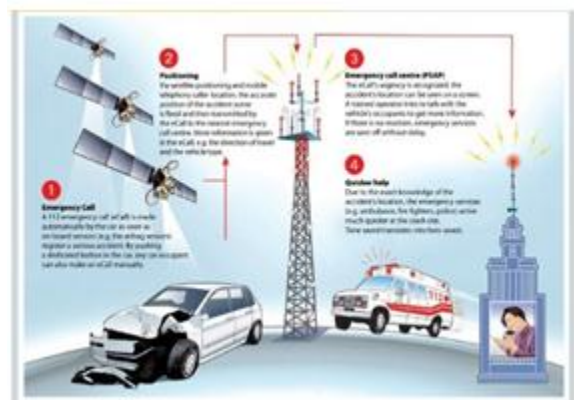
- Collision avoidance systems use radar, sonar, or other sensors to detect nearby vehicles and potential roadway hazards and alert drivers so they can take corrective action. Some systems also take proactive measures to avoid or mitigate the severity of a collision, including providing automated braking assistance and engaging vehicle stability control systems.
- Lane departure warning systems use cameras to detect lane markings and alert the driver when the vehicle begins to drift from its lane without use of the turn signal.
- Drowsy driver warning systems use video technology to monitor eye movements and detect when a driver is showing signs of fatigue, providing alerts when necessary to help reduce dangerous driving situations.

Incident and Emergency Response

Technology exists today to help identify and respond quickly to crashes, which can be especially critical in rural areas. Receiving appropriate care within the first hour after traumatic injury can greatly increase a crash victim’s chance of survival. Examples include



- Automatic crash notification systems use on-board sensors to detect evidence of a collision. When the vehicle’s sensors detect a crash, the vehicle automatically communicates with a call centre and transmits information on the vehicle’s location.
- Emergency vehicle pre-emption technology provides the right-of-way to emergency vehicles at traffic lights so they can respond more quickly to traffic incidents.



- Real-time data sharing between emergency responders, police, and traffic managers is now possible through coordinated traffic management and emergency operation centres equipped with cameras, sensors, and other technology.

. B.R.T.S

Bus rapid transit (BRT, BRTS, busway, transitway) is a bus-based public transport system designed to improve capacity and reliability relative to a conventional bus system. Typically, a BRT system includes roadway that is dedicated to

buses, and gives priority to buses at intersections where buses may interact with other traffic; alongside design features to reduce delays caused by passengers boarding or leaving buses, or purchasing fares.

Vijayawada Bus Rapid Transit System

Six BRTS corridors were proposed under JNNURM at a cost of ₹ 450 crore (US\$70 million). They are:

S.No.	Corridors	Route	Length in km.
1	Green (Loop Road)	Bus terminal – Ramavarappadu Ring Road Junction – Benz Circle – City Bus Terminal	15.50 km (9.63 mi)
2	Red (Eluru Road)	Bus terminal - S.R.R. College – Padavala Revu	4.60 km (2.86 mi)
3	Blue (G.S.Raju Road)	Bus terminal – Government Press – Nunna	12.00 km (7.46 mi)
4	Orange	Bus terminal – Benz Circle – Auto Nagar Junction – Tadigadapa – Poranki – Kanuru	4.50 km (2.80 mi)
5	Yellow (Route No.5 Road)	Bus terminal – Srama Palace Hotel Junction – Besant Road – Madhu Kala Mandapam – Executive Club – Gurusank Colony Junction – Auto Nagar	6.15 km (3.82 mi)
6	Brown (Loop Road)	Bus terminal – Kalakshetram – Low Bridge – Municipal Corporation Office – Rajiv Gandhi Park – City Bus Complex	2.62 km (1.63 mi)

Why BRTS in Vijayawada...?

- Vijayawada is fast growing city and has recently got metropolitan status
- As of 2011 census, the city had a population of 1,048,240, making it the second largest city in the state in terms of population and it had an urban agglomeration population of 1,491,202.
- It has become difficult for the Government to meet the demands of the public and moreover public transportation such as city buses were in bad condition.
- As BRTS uses separate roads and accommodate more passengers, public transportation travel can become very handy.
- These buses are not impacted by the general traffic and travel at good speeds.
- Most of these buses run on Compressed Natural gas, which is environmental friendly and effective as well.
- B.R.T.S bus shelters are special attraction to the passengers as they provide information regarding the Bus routes, fares and location of the bus while travelling.
- G.P.S and passenger information system helps in providing better travel information to the passengers and promote good

economy to the APSRTC.

Intermediate Public Transportation

Intermediate public transport systems like autorickshaws and private buses which provide transport services where city bus and other mass transit systems cannot meet the dynamic demands of urban residents. Integrating these intermediate systems with various mass transit systems is essential to meet urban India's transport challenges.

Two main types of IPT services:

- Door to door or “contract carriage”: cycle / auto rickshaw or taxi
- Informal public transport or “fixed route”: share-cabs or autos, mini- buses.

Ipt in Vijayawada

Auto-rickshaws (CNG & 3-wheelers included) and mini trucks such as TATA Magic vehicles constitute majority of intermediate public transportation in Vijayawada. Other modes include cycle rickshaws, taxi service and mini buses on special occasions. Almost all Auto-rickshaws within Vijayawada are registered under auto unions and are operated within their city limits. These unions are located at Benz circle area, charlapalli banglow, Gollapudi, ibrahimpatnam, Ramavarappadu etc... Most of these auto stands were not allotted any sort of parking area and they utilise sections of the road. The main demand routes include PN Bustand-benz circle, bus stand to ramavarapadu, railway station to Benz circle, Benz circle to gvt.Hospital, Ramavarapadu- Benz circle. Vijayawada is the first city in country to introduce SHE AUTO service. Under this scheme DWACRA women were provided with subsidy and loans to run autos in the city. It is introduced to promote women empowerment and gender neutrality.

Issues of Ipt

- 1. Overlapping routes:** Formal Bus services and ipt compete among themselves
- 2. Vehicle overcrowding:** vehicles are overcrowded to accommodate more passengers. it causes severe inconvenience and also dangerous.
- 3. Parking:** Ipt vehicles do not have designated parking areas. Most of them are parked alongside road and cause congestion problems.
- 4. Pricing:** As they are not run by government, drivers tend to

increase the travel price whenever possible.

Signal Management

Intelligent Transportation Systems (ITS) applications for traffic signals – including communications systems, adaptive control systems, traffic responsive, real-time data collection and analysis, and maintenance management systems – enable signal control systems to operate with greater efficiency. Sharing traffic signal and operations data with other systems will improve overall transportation system performance in freeway management, incident and special event management, and maintenance/failure response times.

Vijayawada Traffic signalling system

Traffic signals at nearly 30 junctions in the city are not on par with the requirements of the fastest growing capital city. Bharat Electronics Limited (BEL) conducted a survey at 63 junctions in Vijayawada, in November 2015, for the implementation of integrated and intelligent traffic management system and estimated ₹40 crore to execute the project. According to the traffic police, signals were installed at 30 junctions in Vijayawada in 2008. According to BEL survey reports, there are 6,78,000 non-transport vehicles and 94,937 transport vehicles in Vijayawada. There is a severe traffic congestion causing problems to high VIP movement. BEL reports stated that the capital city is in need of 63 junctions, which has to be automated and centrally controlled with vehicle actuated technology in two phases. Most of the traffic signals in the city are situated near intersections. They include Benz circle, Ramavarapadu ring road, Ramesh Hospital, Nirmala convent junction, Police Control Room, Chuttagunta centre, Vijay Talkies, Sitarampuram junction, Brts road etc.. All the Signalling equipment and maintenance within the city is under the control of the software company called EFFTRONICS.

How ITS helps in smart Signalling...?

- The smart signal system will be monitored and gets instructions from command and control centre through synchronisation. Also, such signal system will fix the timing for red and green lights depending on the flow of vehicles.
- Inductive loop technology helps in determining the vehicle presence and sends information to the command centre by estimating the floating data. Signal timings are then adjusted

accordingly to facilitate the free flow of traffic.

Toll collection in Vijayawada

Vijayawada city is surrounded by three toll plazas. They are

- 1.POTTIPADU TOLL PLAZA (NH-16)
- 2.KAZA TOLL PLAZA (NH-16)
- 3.KEESARA TOLL PLAZA (NH-65)

There also a proposal for new toll plaza along Vijayawada-Machilipatnam route. All these toll plazas are less efficient and are operated manually. Due this process traffic gets accumulated and increases the travel time. Increasing the efficiency of toll collection by Application of ITS. Electronic Toll Collection (ETC) system in uses passive radio frequency identification technology (RFID) .

- RFID tag called FASTag is mounted on the vehicle's windscreen.
- As the vehicle reaches the toll plaza, a unique identification number that is embedded on the tag is read by road side RFID reader.
- This unique number is sent to a central computer.
- Applicable toll amount is deducted from a prepaid account that is linked to that particular FASTag.

There are dedicated ETC lanes on toll plazas to aid faster traffic flow of vehicles using FASTag. Vehicles can do toll transaction without stopping thus making the process faster and more efficient. This has many more advantages like reducing congestion at plazas, saving fuel, reducing travel time and so on. Ministry of Road Transport and Highways has aimed to make all toll-plazas on national highways across India ETC enabled. This will greatly enhance user experience and enable fuel saving worth Rs 86,000 crore (Electronic toll collection to enable fuel savings worth Rs 86,000 crore: Gadkari.)

CONCLUSION

- 1.Traffic Volume study is conducted at critical areas in the city, results show that the actual traffic flow is way more than the designed traffic. Therefore, road extensions and new diversions must be made to control the traffic efficiently during peak hours.
2. Most of the roads and intersections in Vijayawada were designed based on the statistics of the past. The city is undergoing lot of urbanization process after declaration of the

capital area. Today most of these roads and intersections were outdated and providing poor service to the road users.

3. Signal systems were outdated as most of them were installed in the year 2008.

4. Peak hour traffic is not efficiently handled by the signalling system as a result, there is lot of accumulation of traffic along the main city centres such as Ramavarappadu ring Road, Ramesh hospital junction and Benz Circle area.

5. Traffic police in the previous year operated peak hours traffic with help of hand held remote controllers. But they were of no use as the person cannot oversee the accumulated traffic along the lanes.

6. Intelligent Transportation technologies such as inductive loops help in recognising the presence of vehicles, radar technology helps in calculating speeds and count of the vehicles,

7. Toll collection must be made automatic to save time and fuel. It also increases the efficiency and saves expenditure.

8. Smart cards help in saving time during Toll collections and parking usage.

9. Parking system in the city is intolerable due lack of space within the city. Locations like Beasant road face severe congestion problems due to lack of parking spaces. Traffic authorities must implement multi-storied parking lots and roof-top parking to utilise the minimum available space and reduce the congestion problems.

10. Intermediate public transport vehicle such as autos must be allotted parking space as they occupy most of the width of the road.

11. Though B.R.T.S service is in loss in Vijayawada, further expansion can help in promoting efficient public transportation and reduce the individual vehicle users.

12. Passenger information system and diversion routes are to be implemented along the city to provide efficient journey to the road users.

13. Accident and incident management includes various technologies of ITS, promoting them helps in prevention of accidents and if so provides quick treatment to the accident victims.

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