# Comparative Study of Signalized Intersection and Rotary for Effective Traffic Management

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# Abstract

The comparative study and analysis of signalized intersection and rotary intersection by taking into consideration various parameters such as journey time, delay time, reduction in the distance covered has been done in this study. We studied about the places in the city where there is an intersection of five roads and selected Shankar Nagar Square for our study. We collected the traffic data on the peak hours of the day by video graphic survey method and we counted classified and categorized the vehicles into different classes. As the vehicles are accessing towards the Rotary they are forced to reduce their speed but won't stop as in the case of signalized intersection. This may reduce the extra time spent by the vehicles at the intersections. The initial construction cost of the Rotary is the only cost as the maintenance cost is negligible. For design purpose we use the simulation software PTV VISSIM. This software has helped us to design Signalized Intersection and rotary at Shankar nagar intersection. By drawing the links, connectors, showing the reduced speed area, inserting the nodes, set proper cycle length like this by following proper design steps design the signalized intersection and rotary. The journey time and delay time is calculated on the signal. The same data of vehicles is inserted on the rotary and the same parameters are calculated for the Rotary intersection. On comparing we can conclude that Rotary is much more preferable as compared to the signalized intersection.

Keywords: Intersection, Signalized intersection, Traffic, VISSIM, Rotary

# **1. Introduction**

### 1.1General

From the last decade the traffic in India has increased dramatically. Congestion is increasing as a result of increase in the number of vehicles and the space is getting narrow. As a result there is a delay in reaching the destination. The total delay can be categorized into declaration delay, stop delay and acceleration delay. Traffic signals generally play an important role for functioning of urban Street traffic system. Effective signal helps in improving the mobility of road and reducing the congestion in the rural and urban area. Nagpur is now one of the third largest city in Maharashtra. Nagpur city is facing traffic congestion in different Road intersection due to Rapid and uncontrolled development in traffic. Transportation network which result in environmental degradation as well as delay in traffic and loss of fuel. When the vehicle are waiting for their turn to pass the intersection the driver normally cannot off the engineand unnecessarily blow or hoot the horn, as a result delay the vehicle, cause loss of fuel, noise pollution at all the signalized intersection.

Comparative study on signalized intersection and rotary is basically a case study project where the traffic situation in Nagpur city is evaluated at specific place where the roads have 5 intersections. Then the study is carried out by vehicle volume count on the square by means of videography method. Then the recording data is analyzed and the number of two wheelers, three wheelers, four wheelers and heavy vehicles are calculated at peak hours of the day. Then by using vissim software the delay is calculated on signalized intersection and is compared with that of the rotary.

#### 1.2 Need of study

- 1. To ensure continuous flow of traffic without any signal so that delay will not occur and time in reaching to destination will be less so it is suggested to provide rotary at Particular Square.
- 2. To reduce the chances of collision between vehicle at traffic signal by providing rotary. And keeping in view about the safety of person.
- 3. To utilize the full space which is available at Particular Square by providing roundabout.
- 4. No extra fund required to construction and maintenance of traffic island by substitute of rotary.

### 1.3 Objectives

- 1. To reduce delay at signalized intersection as difference in the departure time and arrival time of vehicle.
- 2. Reduce extra time spent by vehicle at intersection.
- 3. To channelize the smooth flow of traffic.
- 4. To provide continuous flow of traffic without any obstruction.
- 5. To improve the aesthetic appearance of intersection.
- 6. To reduce frequency and severity of crashes.
- 7. To ensure safety of drivers.
- 8. To ensure smooth and steady flow of platoon of vehicle.

# 2. Literature Review

Eshaniya et al. (2017) made an attempt to study the behavior of traffic platoon at nanthur area intersection at manguluru city. With the help of videographic survey method to collect traffic volume. To determine peak traffic flow they studied the IRC guide line. They conducted three experimental program which are vehicle volume count, traffic signal design, rotary or round about intersection. But the attempt to made the signal was failed due to high traffic volume and suggested to provide rotary. [1]

Marian tracez et al. (2012) studied designs, advantages and some drawbacks of various layouts of roundabout with traffic signals, used in urban araters they reconstruct grzegorzeckic roundabout and analyse the number of accidents and collisions before and after reconstruction. [2]

HAO Yanxi and Yang Xiaoguang(2013) they studied traffic and found that largest number of conflicts are caused at intersections due to left turn off vehicles and the ones approaching from opposite end. They analyse the conditions to set left turn waiting area under special left turn face.[3]

S.k. Mahajan et al. (2013) they studied on new concept of traffic rotary design and Road intersection their main focus was on right turn moments in addition the Rotary capacity can be determined by using empirical formula they also discuss about Rotary design design, speed, entry exit Island radius and shape of Central Island.[4]

Peezadamosir shah et al. (2016) they studied on three parameters such as volume speed and capacity due to this parameters have high impact on traffic regulations they also collect collected data to calculate Road stretch and level of service traffic and speed data was calculated at mid-block of six lane Road of Jalandhar - Phagwara Road.[5]

Rakesh Kumar Chhalotre et al.(2016)they study the traffic condition in Prabhat square Bhopal an attempt was made to solve the problem of traffic congestion and unusual delay to the traffic movement by suggesting the design of Fixed time signal in place of Rotary intersection first day conducted a traffic survey and data collection then converted the value into PCU 7 days data was collected in a week of different time interval from morning to evening peak hour from their analysis they conducted that the traffic approaching at the intersection is very high 3000 PCU per hour.[6]

# 3. Study Area and Field Data Collection

To provide rotary we have selected such a site where there is a Junction of 5 roads. There are many such intersections in our city from which we have selected 'Shankar Nagar Square'. We obtained the permission for collection of traffic data on peak hours of the day.

### 3.1 Study area

Place: - Nagpur Area: - Shankar nagar square Latitude and longitude: - 21\*08\*09\* N, 79\*03\*38\* E Figure1. Shankar nagar



# 3.2 Data Collection and Analysis by using Videogrphic Survey

The video camera was installed over high rise building near the square which recorded the traffic of the complete square. From five roads one was considered as approach road from where the vehicles passed on to other four roads. Different category of vehicles passed over the roads which are analyzed as:-For sample example we consideredAmbazari road as an approach road and fromAmbazari road vehicles moved from this road toBurdi-Bajaj nagar-Dharampeth-Ram nagar.Like this we collected the data(Day 1 morning and Evening, Day 2 morning and Evening)



Ambazari to Burdi











#### Table 1. Day 1 Morning ( From Ambazari to ... )

	Bardi	Bajaj nagar	Dharampeth	Ram nagar
Two wheeler	670	112	89	120
Three wheeler	146	17	11	6
Four wheeler	130	47	29	18
Heavy vehicle	38	2	-	6

Table 2. Day Evening (From Ambazari to...)

	Bardi	Bajaj nagar	Dharampeth	Ram nagar
Two wheeler	876	201	192	11
Three wheeler	240	38	24	4
Four wheeler	252	164	143	6
Heavy vehicle	44	2	2	0

#### Table 3. Day 2 Morning( From Ambazari to...)

	Bardi	Bajaj nagar	Dharampeth	Ram nagar
Two wheeler	1201	196	184	445
Three wheeler	242	22	10	34
Four wheeler	192	63	61	104
Heavy vehicle	83	1	3	4

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	Bardi	Bajaj nagar	Dharampeth	Ram nagar	
Two wheeler	1129	349	168	18	
Three wheeler	119	44	4	4	
Four wheeler	305	98	65	13	
Heavy vehicle	-	1	-	-	

Table 4. Day 2 evening (From Ambazari to...)

# 4. Methodology



# 5. Modelling In Vissim

PTV VISSIM is microscopic multi-modal traffic flow simulation software developed by PTV Karlsruhe, Germany. VISSIM is use for making simulation model of road network. PTV VISSIM is use for signal optimization, transportation planning and urban planning. Multi modal simulation is use to simulate more than one type of traffic.









# 6. Results and Discussion

#### Table5: Day 1 morning (Signalized intersection) From Ambazari to...

	Bardi	Bajaj nagar	Dharampeth	Ram nagar
Q- Length	99.03	99.03	99.03	99.03
Vehicle Delay	160.11	183.27	166.03	148.04

Table6: Day 1 morning (Rotary) From Ambazari to...

	Bardi	Bajaj nagar	Dharampeth	Ram nagar
Q- Length	97.11	97.11	97.11	97.11
Vehicle Delay	99.54	168.43	82.25	82.12

Table7: Day 1 evening (Signalized intersection) From Ambazari to...

	Bardi	Bajaj nagar	Dharampeth	Ram nagar		
Q- Length	96	96	96	96		
Vehicle Delay	150.39	160.81	164.42	159.97		

Table8: Day 1 evening (Rotary) From Ambazari to...

	Bardi	Bajaj nagar	Dharampeth	Ram nagar
Q- Length	81.85	81.85	81.85	81.85
Vehicle Delay	82.54	50.25	72.15	28.02

Table9: Day 2 morning (Signalized intersection) From Ambazari to...

	Bardi	Bajaj nagar	Dharampeth	Ram nagar
Q- Length	89.1	89.1	89.1	89.1
Vehicle Delay	140.64	160.62	143.68	173.33

#### Table10: Day 2 morning (Rotary) From Ambazari to...

	Bardi	Bajaj nagar	Dharampeth	Ram nagar
Q- Length	61.0	61.0	61.0	61.0
Vehicle Delay	95.65	65.57	56.35	135.93

# 7. Conclusions

The present study is conducted for the wide range of control delay and fuel consumption which maintains a high degree of accuracy to be applicable for traffic flow with wider traffic volume from each intersection of the square. A new geometric concept is discussed to design rotaries at intersection of roads. It finds wide application in road work planning and design. The study is conducted on important parameters which control delay as well as collisions.

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