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Traffic Volume and Congestion analysis By Calculating PCU Value at Khurram Nagar Rotary

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Abstract - Traffic congestion is a major problem in a fast growing Smart city, which creates major conflicts on roads and results into time and fuel losses. This study analyzes the current condition of traffic congestion at Khurram Nagar rotary. Number of vehicles are increasing as the population is increasing and more number of vehicles are coming on the road which creates conflict and congestion. This study analyzes the traffic capacity and traffic volume of the rotary and questionnaire with vehicle drivers for creating relationship between practical and theoretical design parameters. Number of vehicles are counted and converted in PCU with the help of video recording camera on rotary followed by field visits and according to rotary dimension the capacity and volume is calculated. Various tools and technique are used for verifying the collected data and for creating relationship. To reduce the problems of traffic at Khurram Nagar is to apply the traffic signs with signals and regulation of traffic with the help of trained traffic manpower.

Key Words: **Congestion, Traffic Capacity, PCU (Passenger Car Unit), Traffic Volume, Questionnaires, Design Parameters, AADT (Annual Average Daily Traffic)**

INTRODUCTION

In a developing country where the population density is more with respect to their population area distribution, show frequent traffic congestion during working time. Lucknow is a smart city of Uttar Pradesh and this has more no. of registered vehicle than any other city. During morning and evening time huge number of vehicle movement occurs around a rotary with addition of pedestrian and costermonger. So the flow of traffic, pattern of movement, traffic volume and capacity of road changes drastically during morning (8.30-10 am) and evening (5-7 pm) time at Khurram Nagar rotary. The main reason of the congestion is due to large number of vehicle (public, private) movement in a sudden and small time period and narrow width of road. Rotary covers residential buildings, showrooms, hospitals and educational institutions. So during morning and evening time the movement of traffic suddenly increases which creates conflicts. Some places also lacking the traffic signals and less experienced traffic police. In order to reduce the traffic congestion around the rotary necessary and effective steps should be taken.

OBJECTIVE OF THE STUDY- The main aim of this study is to find out the cause of traffic congestion at rotary by finding out the PCU values. Following objectives are formulated-

1- To study the current situation of traffic at Khurram Nagar rotary by calculating PCU.
2- To identify the responsible factors for traffic congestion.
3- Calculation of vehicle per hour (Vph).

LITERATURE REVIEW

IRC-65 suggest that maximum volume of traffic that a rotary can efficiently handle is 3000 vehicle per hour and minimum is 500 vehicles per hour entering from all the legs of intersection. Rotaries are most adaptable where the volume entering the different intersection legs are approximately equal.

A rotary is preferable if there are other junctions so near that there would be insufficient space for the formation of queues. A traffic rotary is a specialised form of at-grade intersection where vehicles from the converging arms are forced to move round an island in one direction in an orderly and regimented manner and weave out of the rotary movement into their desired directions.

Circumstances where rotaries are an appropriate method of inter- section control are largely dependent on the layout of the site, proportion of right turning traffic and the traffic characteristics of the routes. Rotaries are not generally warranted for inter- sections carrying very light traffic. These could be a good choice though for moderately

busy intersections in urban and suburban areas, and also sometimes rural areas, where otherwise the alter- native may be to go in for a complicated channelised layout or traffic signals. Normally the lowest traffic volume for which rotary treatment should be considered is about 500 vehicles per hour, of course, there could be exceptions from this rule depending on factors peculiar to the individual sites.

Methodology

In this study, PCU value calculation is used to know the flow of vehicle at specific time period at Khurram Nagar rotary which is located on ring road. Traffic volume study is used to know the number of vehicle crossing at different cross-section of Khurram Nagar junction. These data are used to know the situation of traffic during peak and non-peak hours. The details are explained below:

Passenger Car Unit- The counted vehicle on rotary is converted in PCU because of weightage on the basis of different parameters as per Indian Roads Congress (IRC-SP41). PCU values are used to make homogeneity of traffic because of heterogenous composition of vehicle on road.

Table 1**:** Types of vehicle on road

Vehicle Class	**PCU Values**
Motorcycle	0.5
Car	1
Auto Rickshaw	1
LCV	1.5
Bus	3
Truck	4.5

Shape of Rotary- Shape of rotary depends on how the roads and number of vehicles are approaching towards the intersection and the number of vehicles are coming towards the rotary. In accordance to importance of road the design is taken into account and given as-

Table 2**:** Rotary shape details

Type	**Shape**
Circular	Equal importance to all road
Square	Suitable for straight ahead flows
Elliptical, Ovel or Elongated	To provide longer weaving length
Irregular	Suitable for large number of approaches

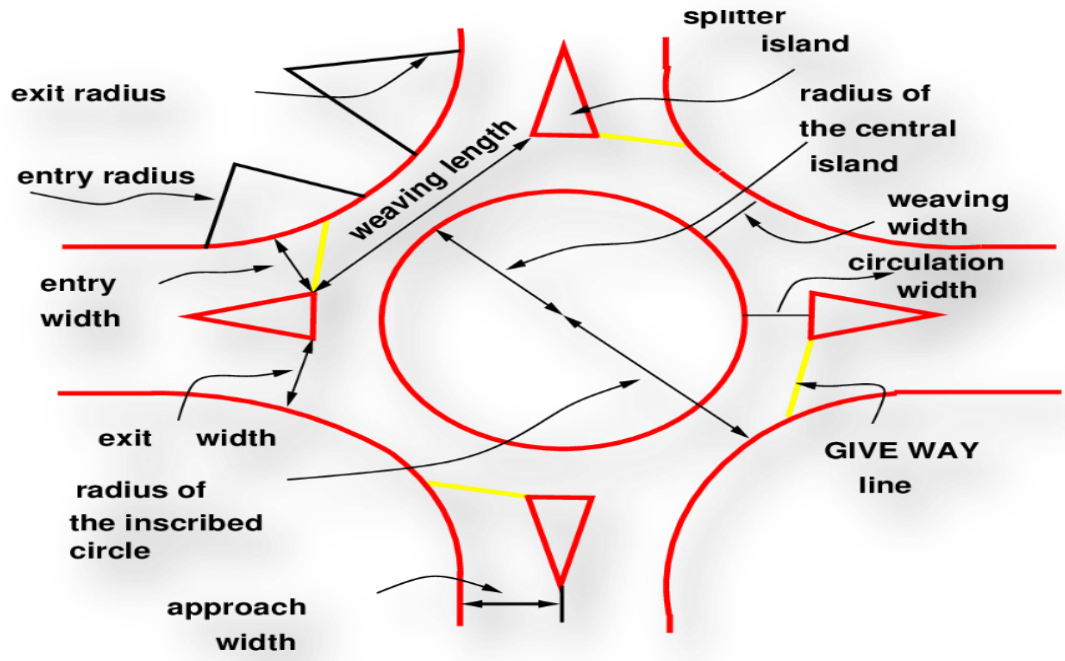

Fig-1: Design Elements of Rotary

Details of Khurram Nagar Intersection: The Shape of Rotary is Ovel/Elliptical. This indicates that the one road has more importance than other in terms of traffic volume.

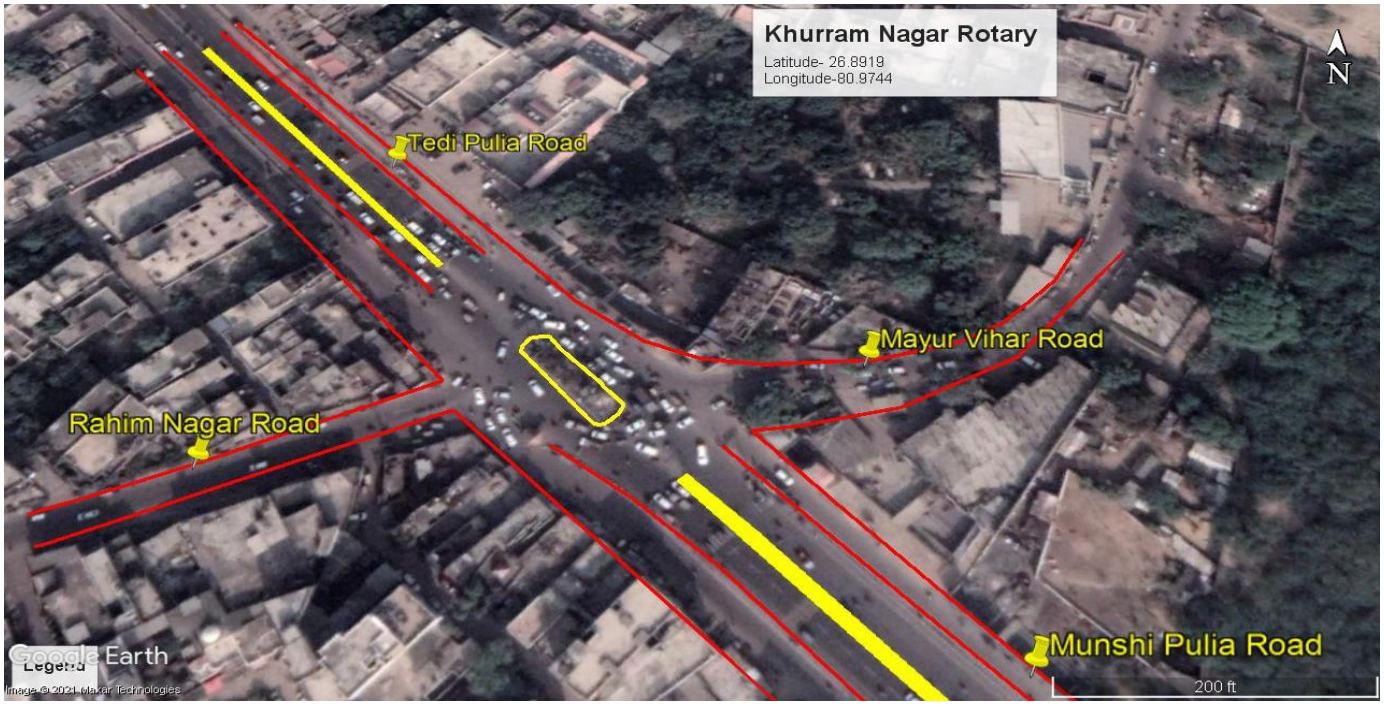

Fig-2: Satellite view of Khurram Nagar Rotary

The empirical formula for determining the practical capacity of rotary is

$$Qw = 280w([1+e/w][1-p/3]) / [1+w/1]$$

Where,

e is the average entry and exit width, i.e. (e1+e2) /2

w is the weaving width

l is the weaving length

p is the proportion of weaving traffic to the total traffic

And p= (b+c)/(a+b+c+d)

Where a = Left turning traffic moving along left extreme lane

b= Crossing or weaving traffic turning towards right while entering the rotary

c= Crossing or weaving traffic turning towards left while leaving the rotary

d= Right turning traffic moving along right extreme lane

Table 3: Counting of traffic volume

Capacity of rotary calculated value	3258.6 vehicle per hour

Direction:

1-Tedi Pulia lane

2- Rahim Nagar lane

3-Munshi Pulia lane

4-Mayur Vihar Lane

Morning Time Data

Table 4 : Details of intersection

Approaches	**Number of lanes**	**Availability of Signal (Yes/No)**	**Working of Signal Timing (Yes/No)**	**Traffic Volume (Qw) PCU values in vehicle/hr**
Tedi Pulia Lane	2	Yes	No	1150
Rahim Nagar Lane	1	No	No	500
Munshi Pulia Lane	2	Yes	No	1200
Mayur Vihar Lane	1	No	No	450

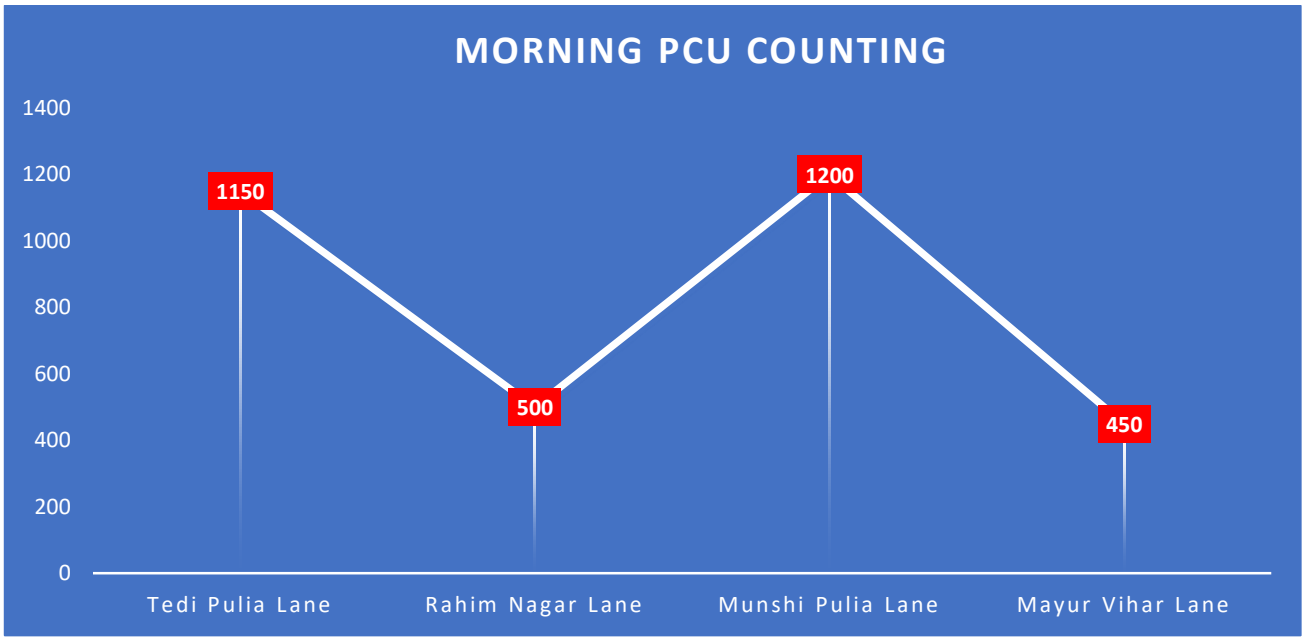

Fig-3: Morning PCU values in vehicle/hr

Evening Time Data

Table 5 : Details of intersection

Approaches	Number of lanes	Availability of Signal (Yes/No)	Working of Signal Timing (Yes/No)	Traffic Volume (Qw) PCU values in vehicle/hr
Tedi Pulia Lane	2	Yes	No	1350
Rahim Nagar Lane	1	No	No	600
Munshi Pulia Lane	2	Yes	No	1300
Mayur Vihar Lane	1	No	No	540

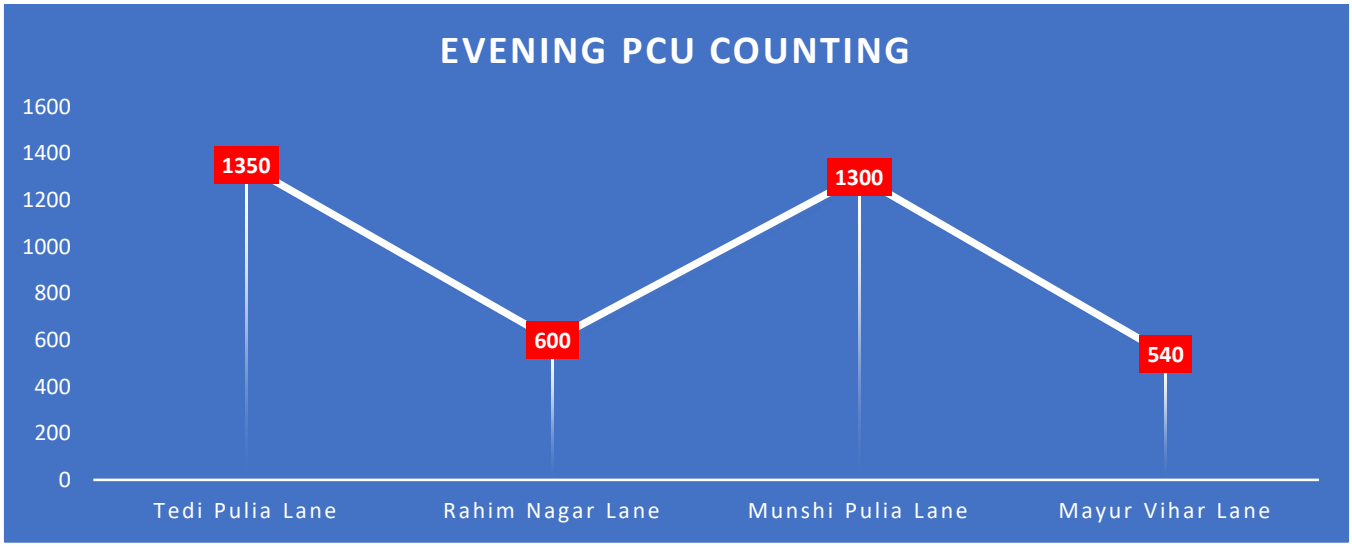

Fig-4: Evening PCU values in vehicle/hr

Conclusion-Based on the study, the condition of traffic and location of rotary, these findings are obtained-

1- The PCU values crossed its saturation during morning and evening times frequently.
2- Mandatory, informatory and warning signals are not present.
3- Intersecting and weaving traffic has more influence than straight moving traffic.
4- The width of roads joining the rotary are very narrow.
5- Improper functioning of traffic police.
6- Lack of knowledge about handling of traffic during peak hour.
7- Less knowledge of peak timing of traffic.
8- Lack of infrastructure of traffic study equipment.
9- No proper place to pickup and drop off for public transport.

Suggestion- For overcoming the problems following suggested things should be followed-

1- The width of all approach road should be increased.
2- The width of shoulder of all roads should be increased.
3- The signal timing of heavy traffic road should be more.
4- During peak hour the number of traffic police should be increased.
5- Straight moving traffic should be handled with more efficiency.
6- Level of service of roads should be increased.
7- There is need of 4 lanes over bridge for segregation of straight moving and turning traffic vehicle.
8- Proper placing for Bus and auto stop.

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