Traffic Simulation using VISSIM Software: A Case Study of Ravet Stretch

Aavani Thampi[1], Sajan Lonare[2], Samadhan Pawar[2], Dhiraj Shinde[2], Rohit Shinde[2],

[1] *Professor, Civil Department, D.Y.P.I.E.M.R , Akurdi, Pune, India*
[2] *Students, Civil Department, D.Y.P.I.E.M.R , Akurdi, Pune, India*

ABSTRACT

In today's world due to Urbanization and Industrialization there is increase in traffic congestion. This is very important aspect in the development of the country. Heterogeneous traffic mixes are creating problems in developing countries because different types of vehicles with different characteristics use the same roadways. In addition, the phenomenal growth of vehicular traffic has resulted in low speeds, excess travel time, delays and other safety related traffic problems in the urban areas. To solve the traffic congestion problem, "Traffic Micro-Simulation Model" is the best solutions it can study models too complicated for analytical or numerical treatment. In this paper we studied actual traffic condition of three intersections and simulated them using VisSim Software. We removed the conflicts by optimizing signal timings.

Keyword : - *VISSIM Software, Ravet Stretch, Simulation.*

1. INTRODUCTION

Traffic simulation or the simulation of transportation systems is the mathematical modeling of transportation systems (e.g., freeway junctions, arterial routes, roundabouts, downtown grid systems, etc.) through the application of computer software to better help plan, design and operate transportation systems. Simulation of transportation systems is an important area of discipline in traffic engineering and transportation planning today. Various national and local transportation agencies, academic institutions and consulting firms use simulation to aid in their management of transportation networks. Simulation in transportation is important because, It can be used for experimental studies, can study detailed relations that might be lost in analytical or numerical treatment and can produce attractive visual demonstrations of present and future scenarios. It is very useful to reflect the dynamic nature of traffic in stochastic manner i.e. the traffic having continuous flow and different traffic volume. These models saves our time and cost. It's accuracy is far more than some classical methods. It is used to study both signalized and un-signalized intersections. To understand simulation, it is important to understand the concept of system state, which is a set of variables that contains enough information to describe the evolution of the system over time. System state can be either discrete or continuous. Traffic simulation models are classified according to discrete and continuous time, state, and space.

2. METHODOLOGY

2.1 Site Selection

Site selected includes the following three intersections in
Ravet:

1) Babasaheb Ambedkar Chowk: It is a four way road intersection (crossroad). It is highly congested intersection. The major traffic flow was from DY PATIL ROAD to RAVET VILLAGE and vice-versa. This is a signalized intersection.

2) Bhondve Corner: This is a three way road intersection. It is next to the Babasaheb Ambedkar Chowk. This is an un-signalized intersection. Major traffic flow is towards the Ravet. To control the traffic one roundabout is provided.

3) Bhondve Circle: This is a four way signalized intersection.

Fig.- 1 : Locations of intersection.

2.2 Data Collection from Traffic Survey

Traffic data was collected manually, among the group of twelve persons. Data were collected for each intersection for week days for two hours in morning and evening. The data were collected in the proforma which was given in IRC-SP19-2001.

Intersection	TW	Auto	CAR	Mini Bus	Bus	LCV	Truck
Babasaheb Ambedkar Chauk	4431	195	1689	2	30	20	7
Bhondve Corner	4743	151	1493	3	2	25	8
Bhondve Circle	7214	244	2489	13	4	64	8

Table - 1: Vehicle Count

The total PCU count are 5442, 2648 and 4169 at Babasaheb Ambedkar Chowk, Bhondve Corner, Bhondve Circle respectively.

3. MODELING AND ANALYSIS

3.1 Steps for analysis in VISSIM

The first step in the analysis of software was to add the links by selecting given route in the google map which was provided in the VISSIM. There were various forms of map for our convenience. After addition of the links they were divided into the lane of given width.

related your research work Introduction related your research work Introduction related your research work Introduction related your research work Introduction related your research work Introduction related your research work Introduction related your research work.

The next step was to inter join these lane for suitable flow of the traffic. If map was not updated than we have to create the lane as per our convenience. After the creation of the links the next step was the input of the vehicles. The vehicle input must be given in the PCU per hour or as per the selected in the VISSIM. Vehicle input should be given at right point.

After this run the simulation and see whether the input data which were entered was right. If the simulation was correct than proceed further and if it was not than check the input data. Further we had to give the vehicle route for each lane in each direction according to the PCUs in that route. Analysis of the conflict areas should be done at the point where traffic congestion was occurring. Run the VISSIM and see whether the simulation was according to the data given.

The next step was fixing signal timing at suitable intersections according to the traffic flow. For this we had to make the signal group at each intersection. After creating the signal group we created one signal program for various

signal groups. In this we had to decide the cycle time of the signal. For checking we can entered the timing in the actual signal if it is installed on intersection. Check whether the given timing for signal were suitable for congestion

4. RESULT AND DISCUSSION

After entering the timing of signal which was installed on the intersection we found that the cycle which was given to the signal group was not adjusted according to the traffic flow. There was formation of big queue. Since the ratio of red to green signal high, the queue formed due to the red signal was not cleared by red signal in the direction for major traffic flow. So the main task was to adjust the signal timing and lower the ratio of red to green signal at the intersections. Also at intersection of Bhondve Corner there was roundabout and there was not signal installed. So there was problem of conflict areas and congestion. Therefore it was necessary to install the signal at intersection with suitable time cycle to avoid congestion. Following were the Signal time at intersection.

4.1 Babasaheb Ambedkar Chowk

There were four signal groups at this intersection which were as follows:

Group	Red Signal Time	Green Signal Time	Total Cycle Time
Ravet Village to DY PATIL College	77	53	135
DY PATIL HOSTEL to PRATHAMESH WINES	108	22	135
PRATHAMESH WINES to DY PATIL HOSTEL	108	22	135
Ravet Village to DY PATIL College	77	53	135

Table - 2: Signal Timing For Ambedkar Chowk

The ratio of red signal time to green signal time was not correct. So there was less time for the vehicle to pass the signal and therefore there was queue formation.

Group	Red Signal Time	Green Signal Time	Total Cycle Time
Ravet Village to DY PATIL College	75	45	125
DY PATIL HOSTEL to PRATHAMESH WINES	108	12	125
PRATHAMESH WINES to DY PATIL HOSTEL	108	12	125
Ravet Village to DY PATIL College	89	31	125

Table - 3: Adjusted Signal Timing

To avoid this we to modify the time cycle of signal and also their red and green signal timing. So the new time was given as per above table.

To solve the problem of congestion, co-ordination among the signal groups were necessary. The signal program which was installed was creating the problem of congestion and queue formation. To avoid this we had created the new the signal program by co-coordinating the signal groups. The signal program which was installed is shown in following figure.

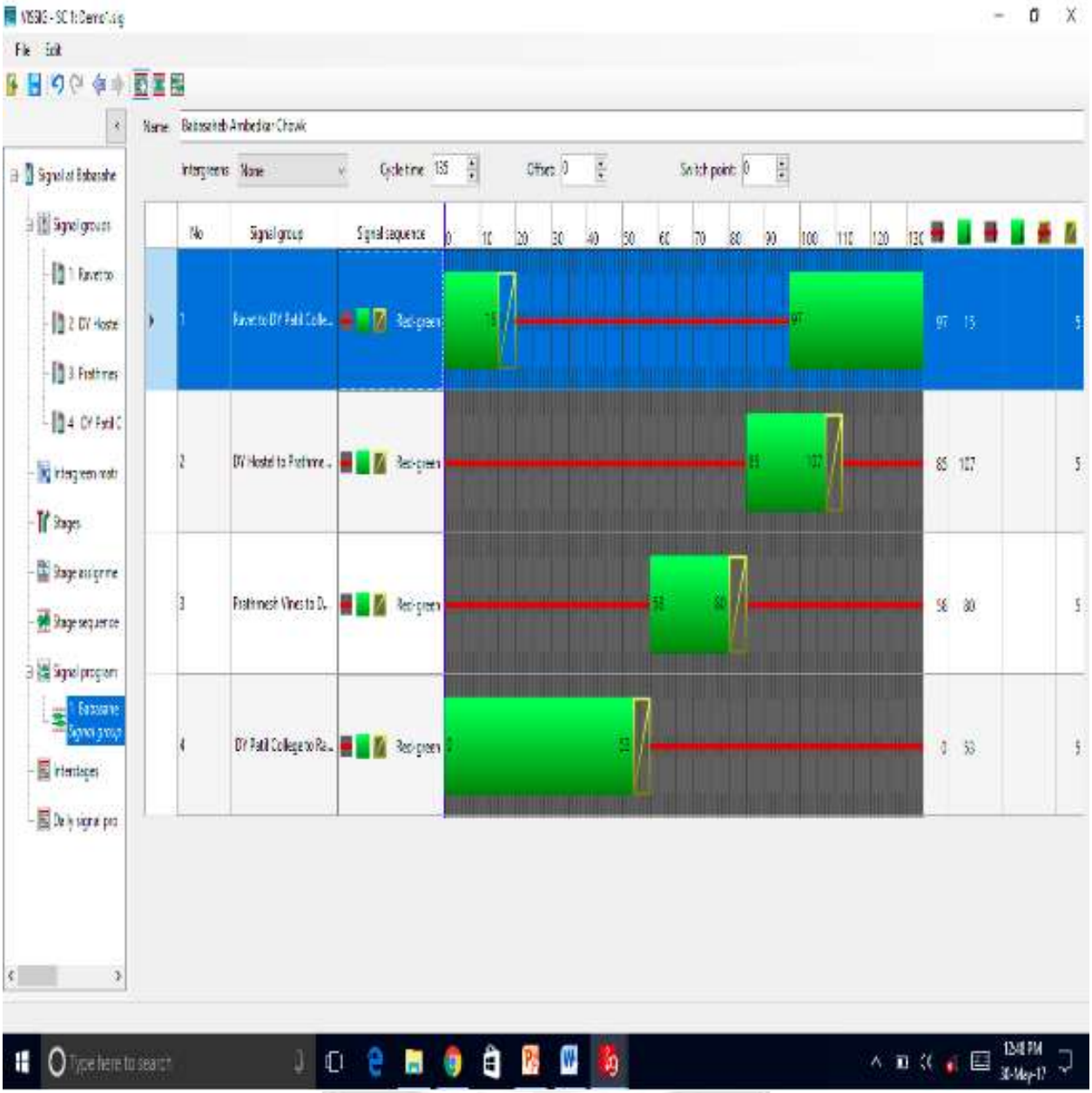

Fig.- 2 : Signal program which was installed.

We can clearly see that the timing of signal for group 1 and group 4 were overlapping, so these was giving rise to problem of congestion and conflict areas. Also the Group 1 and Group 2 were overlapping. To solve this problem we had created the new signal program by trial and error method. The new signal program was as follows. From this we can see that there was no overlapping of any signal group and also no problem of congestion.

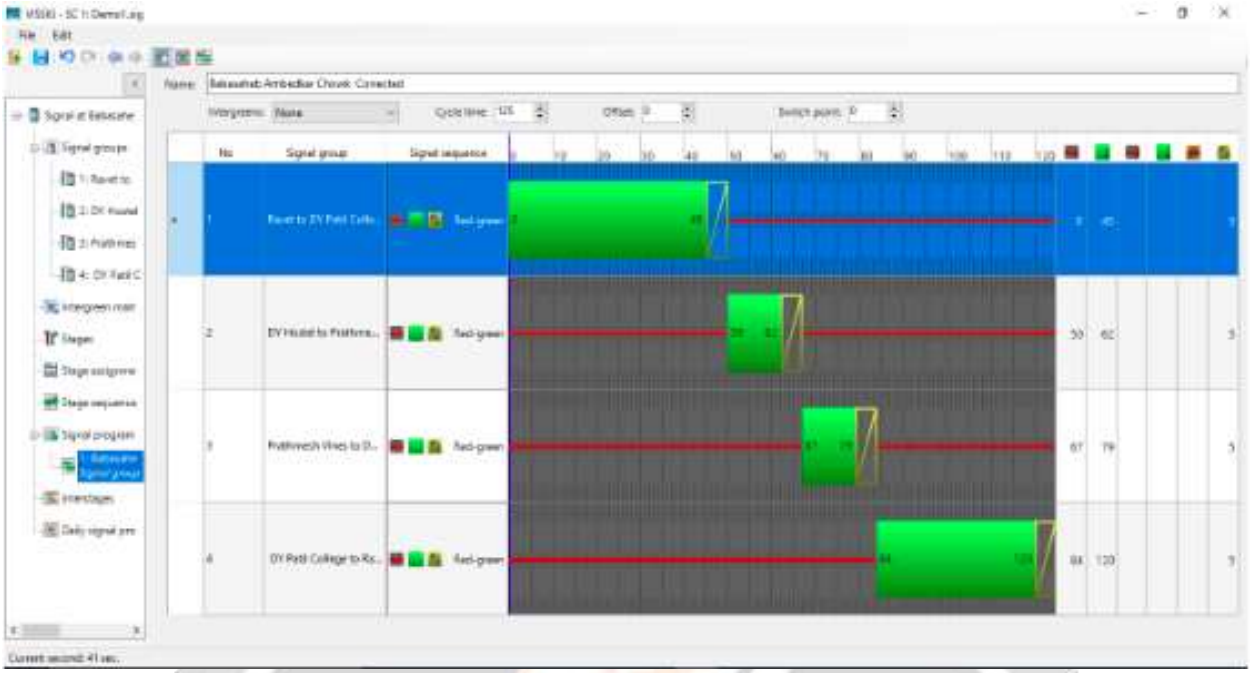

Fig.- 3 : Corrected Signal Program.

4.2 Bhondve Circle

This was the third intersection in the route and this was next to the Bhondve Chowk. This was three road intersection. There were three signal groups at this intersection which were as follows:

Group	Red Signal Time	Green Signal Time	Total Cycle Time
Highway to DYP	92	38	135
DYP to Highway	86	44	135
From Golden Gate Bridge	68	62	135

Table - 4: Signal Timing For Bhondve Circle

Group	Red Signal Time	Green Signal Time	Total Cycle Time
Highway to DYP	93	27	125
DYP to Highway	76	44	125
From Golden Gate Bridge	81	39	125

Table - 5: Adjusted Signal Timing For Bhondve Circle

To solve the problem of congestion, co-ordination among the signal groups were necessary. The signal program which was installed was creating the problem of congestion and queue formation. To avoid this we had created the new the signal program by co-coordinating the signal groups. The signal program which was installed is shown.

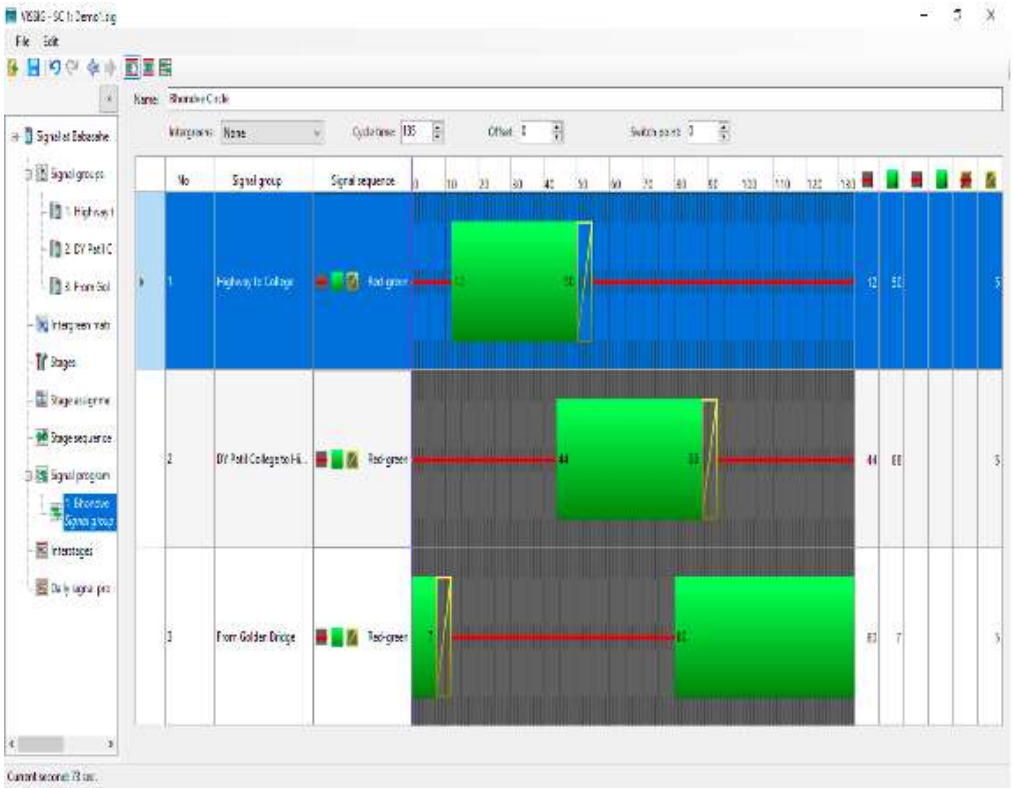

Fig.- 4 : Signal Program Installed At Bhondve Circle.

From the above figure we can see that there was overlapping of signal timing. The group1 timing was overlapped with the group2 timing. The group 2 timing was overlapped with group 3 timing. To overcome this we adjusted the group timing according to the traffic data. To solve this problem we had created the new signal program by trial and error method. The new signal program was as follows. From this we can see that there was no overlapping of any signal group and also no problem of congestion.

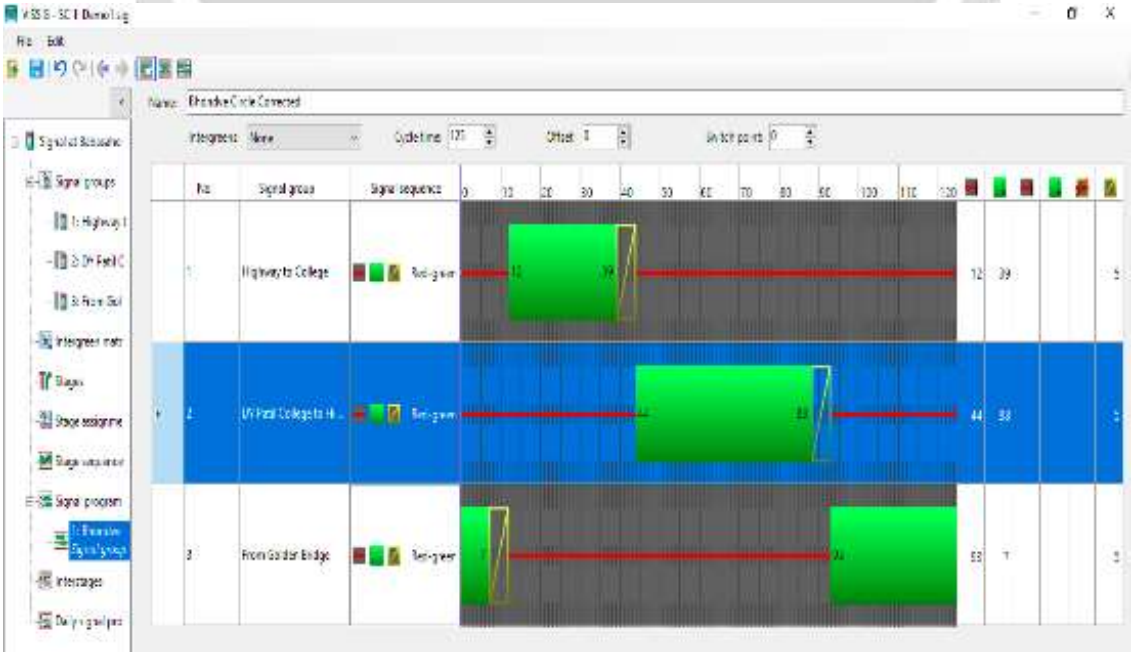

Fig.- 5 : Corrected Signal Program Installed At Bhondve Circle

4.2 Bhondve Circle

This was the un-signalized intersection but it had roundabout to control the flow of traffic. But if there is a roundabout between two signalized intersection then it will cause more delay at signals. The situation was same as stated above so to avoid delay at signalized intersection, we installed new signal at Bhondve Corner. The timing for the signal which was given is as follows. There were three groups of signals. First group was for Ravet village to DY Patil College. Second was for DY Patil College to Ravet Village and the last was for Walhekarwadi.

Group	Red Signal Time	Green Signal Time	Total Cycle Time
Highway to DYP	68	52	125
DYP to Highway	78	42	125
From Golden Gate Bridge	104	16	125

Table – 6 : Adjusted Signal Timing For Bhondve Corner

To coordinate all the groups we created a signal program. The co-ordination among the groups are shown as below.

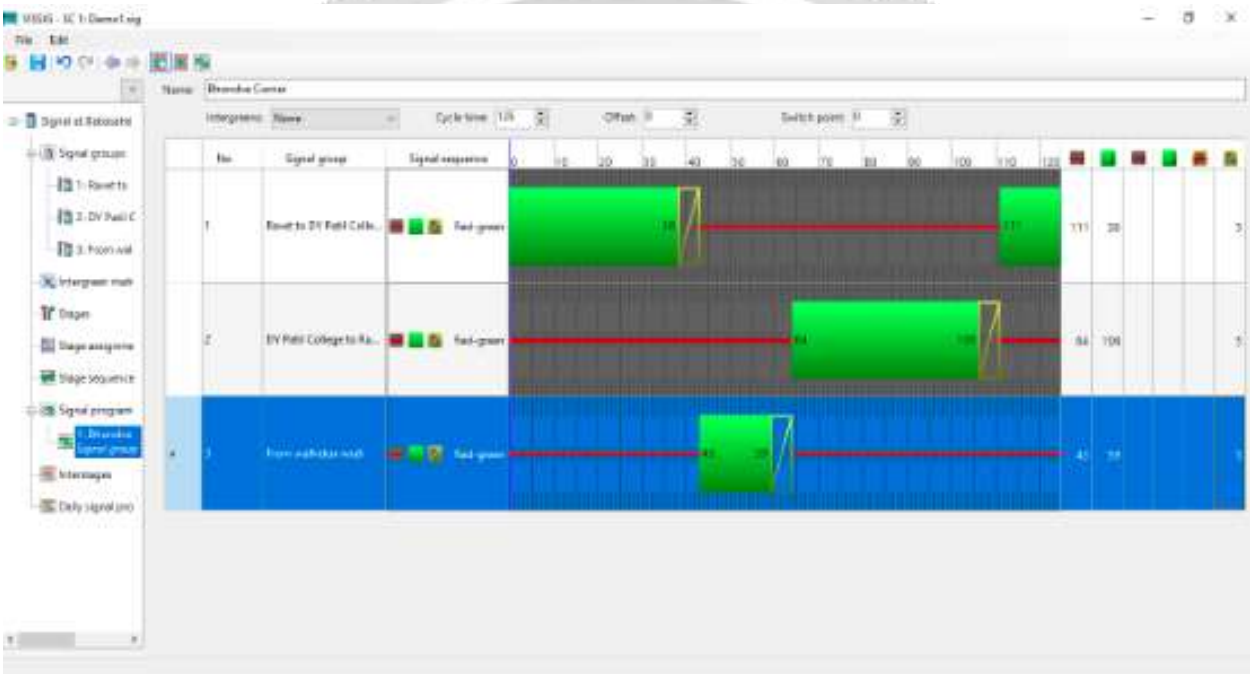

Fig.- 6 : Signal program at Bhondve Corner.

5. SIGNAL COORDINATION

In urban areas, if individual signals are provided, it may handle the traffic at that particular intersection, but if the signals are not coordinated with respect to each other, it leads to queue formations and delay. Signals should be properly optimized and coordinated so that driver, who has to stop at one intersection due to red signal, will not have any stoppages at succeeding intersections. The signal timings of all three intersections are adjusted so that signals are coordinated and driver who stopped at one intersection, will have a clear route ahead without stoppage and over speeding of vehicles will be reduced. The optimized signal timings at all three intersections are as shown in following figure:

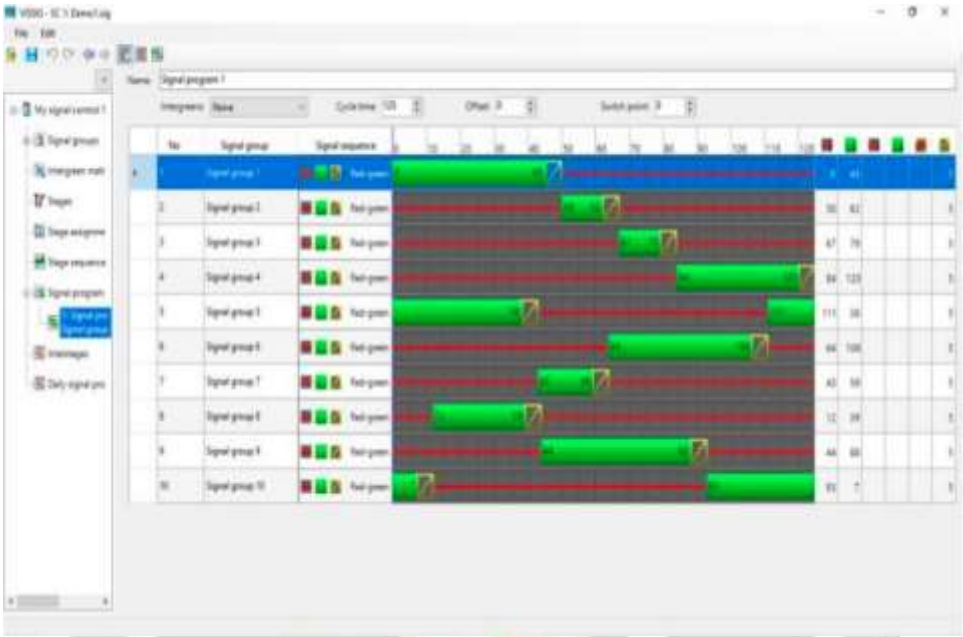

Fig.- 7 : Optimized Signal

6. CONCLUSION

Traditional signal timing provided causes conflicts and unnecessarily long queues. Providing a signalized intersection on the roundabout and optimizing signal timing removes the conflict and shortens the queues. Therefore adding signals at the roundabout and using optimized signal timings are very helpful to society and environment.

7. REFRNCES

[1] Byungkyu (Brian) Park and J.D Scheenberger,"Microscopic Simulation Model Calibration and validation", Transportation Reserch Record 1856, 03-2531,page 185-192.
[2] Pruthvi Manjunatha, Peter Vortish, tom V Mathew,"Mathedology for the calibration of VISSIM in Mixed Traffic", TRB 2013 Annual Meeting [
3] Vipul N. Prajapati and P.J. Gundaliya ,"Use of VISSIM in Heterogenous Traffic Modelling-A Review ",Paripex, Indian Journal of research, May 2015, ISSN 2250-1991, Volume 4, page 453-454.