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Roundabouts: A Solution to Mumbai's Congestion

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Abstract: Roundabout controlled traffic intersections have been in recent use in USA, UK and Germany for their special attribute to manage traffic and so there are many software models being made of intersection for analyzing them in heavy traffic condition. Mumbai being the most populated city after Delhi where every resident has either a two wheeler or four wheeler or both vehicles makes it bad for the traffic flow as everyone use their own vehicle and so during peak hours there are severe long traffic jams seen, also new startups like OLA and Uber are bringing more cars on road. As there are Metro constructions going on, there are many traffic jams seen on the intersections of the city of dreams. The Western Express Highway and the Eastern Express Highway being express roads gets to see many jams on the intersections of the service roads and station roads. Long Traffic Jams are seen at the Jogeshwari Vikroli Link Road (JVLR) even after constructing the East West Flyover so as there were severe traffic jams because of the vehicles which travelled from east to west of Jogeshwari. These jams are not only because of number vehicles but also due to Traffic Signals and the traffic management. As the people of this city are always in a hurry not everyone follows the traffic rules and signals, which leads to many accidents and so more traffic jams. Despite of increasing the number of public transport facilities, they do not meet the solution for transporting the citizens. The trains managed by Indian Railways are full during the peak office hours, same can be said about the Bus Services managed by Brihan Mumbai Electric Supply and Transport (BEST). To solve this traffic problem, roundabouts can be implemented on these intersections of the Station Road and the Highway Service Roads which are Signal Controlled, leading to traffic accumulation on each side of the traffic whereas if it is Roundabout controlled there can be a smooth flow of traffic as the roundabouts allow smooth flow of 1800 vehicles per hour as per practical experiment done in Detroit, USA [33]. As on the traffic signals the traffic accumulates on the either side of the signal there are basic and wear and tear happening due to stopping and vehicle collision and also the fuel is being wasted waiting for the signal to turn green. In this paper we shall discuss about the implementation of roundabouts on the intersections and the flow of traffic after the implementation.

Keywords: Roundabout-controlled, Intersection, Mumbai, Signals, smooth flow of traffic

I. INTRODUCTION

The ever increasing population need more and better facilities in every aspect, even in transport facilities but as every person dreams of owning a vehicle and brings it on the road, it gets difficult to manage the traffic. Since the last decade the people have either migrated or shifted to north Mumbai making it a developing hub and so the infrastructural demand has also increased. The population drives from North Mumbai to South using the famous Western Express Highway which expands from Bandra to Dahisar. The trains are totally packed and there's no space to place a foot in the trains. Even though the railways has increased the number of compartment in these trains and also increased the frequency. But as every day 2 lakh people migrate to Mumbai, these facilities are not able to fulfill the increasing demand. Next option being the Bus Services which are managed by BEST is the next cheap option to travel but as they also run on roads the time delay is equivalent to driving your vehicle rather driving your own vehicles makes you reach the destination faster, the bus services only run for 15 to 20 km after that you need to change the bus. Now, understanding this most Mumbaikars take their vehicle on road, the BMC has been trying to provide better roads for transport but has always been failed to do so as always seen during monsoons. The main problem here is not the roads rather it is the traffic control system, which are signaled. Every intersection in this city has a signal which controls the traffic flow and this makes traffic getting accumulated on either sides of the traffic. The most problems happen when the traffic from the west enters the WEH, this entrance causes most jams as vehicles just enter in a rush as the signals are set on the time counter. To reduce this jam and rush, we can just build a roundabout on every intersection as it allows the traffic to flow which any halt, all 4 sides of traffic can flow without hindering the path of other vehicle. It can observes from the king's circle in Matunga, The traffic is allowed to flow and signals are only used when there are either pedestrians crossing the road or when there is too much chaos seen during festivals.

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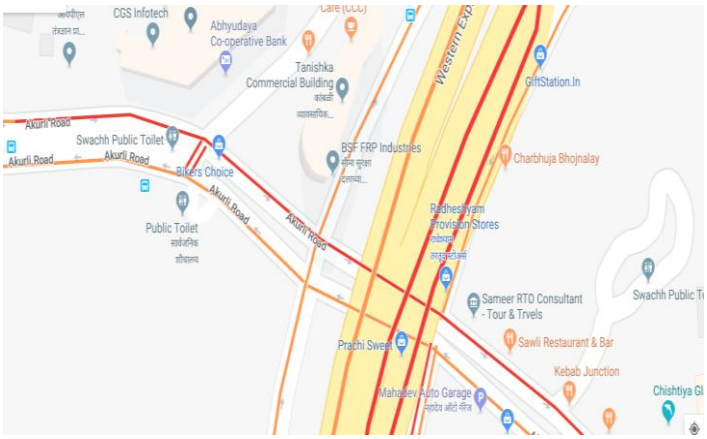

Figure 1:Traffic Flow at Akurli Road on 19th Feb,2018,6:15 pm
Source: Google Maps

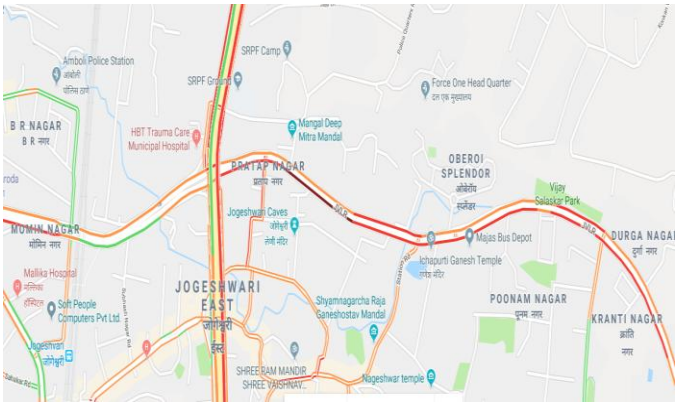

Figure 2: Traffic Flow at JVLR on 19th Feb, 2018, 10:00 am
Source: Google Maps

II. TYPES OF ROUND ABOUTS

Types of circular intersections:

- Gyratory system / Standard Roundabouts
- Smaller, small or mini- roundabouts
- Mini-roundabouts
- Raindrop roundabouts
- Balcony roundabout
- Turbo roundabouts

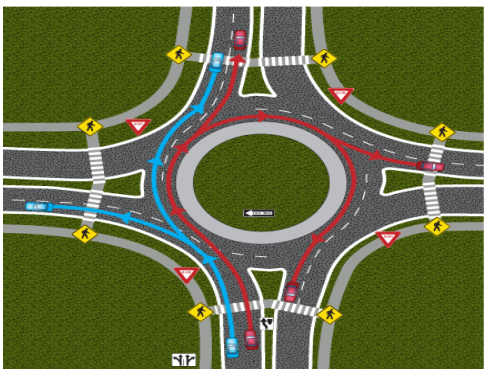

Figure 3: Standard Roundabout
Source: https://www.dot.state.mn.us/roundabouts/navigating.html

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- Motorways
- Access-controlled roundabouts
- "Magic" roundabouts/ring junctions
- Trams
- Railways
- Hamburger roundabout/through about/cut-through
- Bicycle-pedestrian roundabouts
- Traffic circles

For a city like Mumbai, the only possible roundabout that can be implemented is the Standard Roundabouts as it requires less and allows free traffic flow. Explaining the rest is of no use as there are no possible implementations on the ground zero due to space constraints.

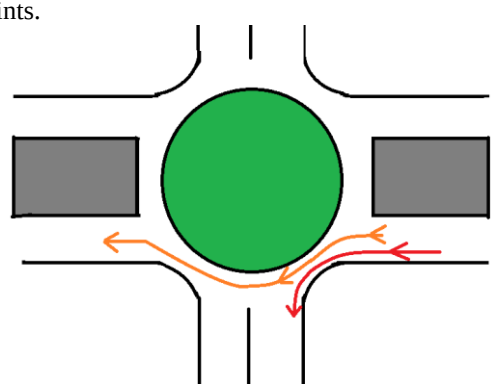

Figure.4: Representation of Roundabout at Mumbai's Intersection

In Figure 4, the gray solid portion represents the column or pillars of the flyovers, the green part shows the roundabout where there can be a small garden built and it will provide some recreational area for the citizens. Having the roundabout in the center allows the traffic to flow smoothly without the halt for the signal. For road crossing we can either build skywalks or subways allowing ease to the pedestrians.

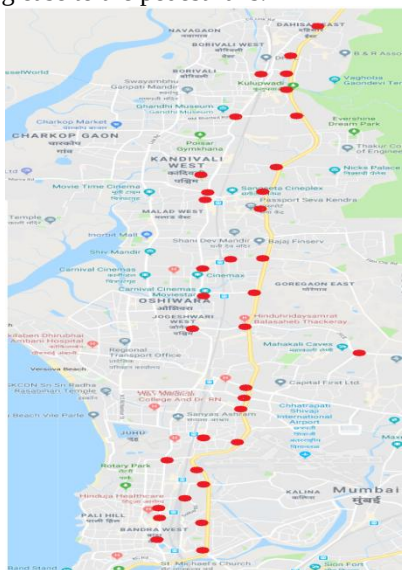

Figure.5: Intersections near the stations causing slow traffic flow

Figure 5 the shows the intersections near the stations and Western Express Highway where there is a very slow traffic flow, the data has been collected by observation of the traffic flow on Google maps from 4th Feb, 2018 to 18th Feb, 2018 during peak office hours.

III. SAFETY

Experimental Studies have shown that roundabouts are safer than the traditional signal- controlled system [38]
Roundabouts have reduced to about 75% injury crashes, According to the studies the reduced rate it due to the continuous flow and as there is a curve the driver has to naturally reduce the speed. The studies show:

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- A 37 % decline in overall collisions.
- A 75 % decline in injury collisions.
- A 90 % decline in fatality collisions.
- A 40% decline in pedestrian collisions.

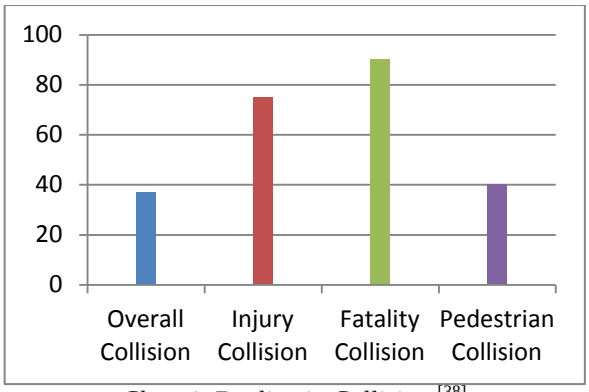

Chart 1: Decline in Collision [38]

There are several reasons why roundabouts help reduce the likelihood and severity of collisions: [38]

- Low travel speeds

Drivers must slow down and yield to traffic before entering a roundabout. Speeds in the roundabout are typically between 20 and 30 Kilometers per hour. The few collisions that occur in roundabouts are typically minor since they occur at such low speeds.

- No light to beat

Roundabouts are designed to promote a continuous, circular flow of traffic. Drivers need only yield to traffic before entering a roundabout; if there is no traffic in the roundabout; drivers are not required to stop. Because traffic is constantly flowing through the intersection, drivers don't have the incentive to speed up to try and "beat the light," like they might at a traditional intersection.

- One-way travel

Roads entering a roundabout are gently curved to direct drivers into the intersection and help them travel counterclockwise around the roundabout. The curved roads and one-way travel around the roundabout eliminate the possibility for T-bone and head-on collisions.

IV. IMPLEMENTATION

Implementing the roundabout on any intersection is not very difficult as only minor structural changes are to be done like the dividers are to be adjusted and the corners are to be curved so as to give way to the roundabout. The central area has to be dug and a circle has to be built in. The central area can have a small play ground or a garden fenced from all sides throughout the circumference.

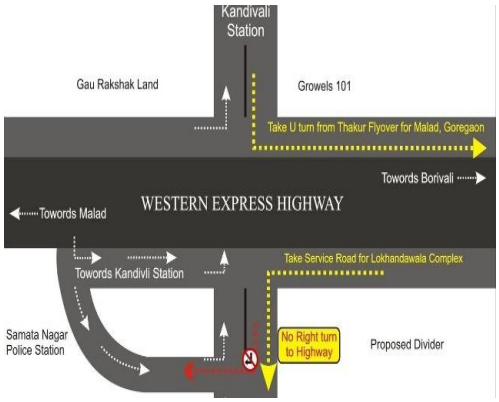

Figure 6: Representation of the traffic flow from Kandivali Station

Source: http://www.dnaindia.com/india/report-mumbai-250-kandivali-residents-spread-awareness-to-divert-traffic-2267292

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Good revenue can be generated by ticketing the general public in these gardens. For example the Intersection at Thakur Marg, where there are metro constructions going and so long traffic jams are seen. If a roundabout is introduced, then the vehicles entering the roundabout can flow smoothly as most traffic is seen from the station road side. Let's assume as traffic count of a day is 2000 enters the intersection from station road and 1000 enters from borivali side, the roundabout would allow a count of 1800 to pass through per hour. The traffic accumulation won't happen and so no traffic jam will be observed.

V. CONCLUSION

To manage the traffic flow in Mumbai, the intersections at Highway Service Roads and Station Road should have roundabout at the intersection so as to keep the traffic flowing and no stagnation happens, which leads to empty roads and so as the vehicles will enter these roads from the highway using the service road, the traffic will be clear and no jams are seen on the highway. The Roundabout controlled system is being in use by UK, USA, Germany, France and so on. These nations have understood that the roundabout allow steady flow without hindering the traffic flow and so maintenance cost also decreases as the traffic lights need regular maintenance and the garden on the roundabout will keep a steady income coming throughout. It will also contribute to the aesthetics of the city and encourage green Mumbai initiative. This will allow the citizens to reach their destination on time and there will be no race against the green light.

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