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# Analyzing Efficiency and Applications of Providing a Roundabout: A Literature Review

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**ABSTRACT**: The modern roundabout, first introduced widely in the UK around 1960s, is becoming an increasingly popular alternative to traditional roadway intersections among traffic engineers and planners in the U.S. and other parts of world. This paper reviews relevant literature on this subject to see the implications of the roundabout on traffic safety and flow, moreover because the safety and pleasure of other road users, including bicyclists and pedestrians.

In reviewing literature relevant to the subject of roundabouts, this paper asks the subsequent questions:

1. Does the introduction of a roundabout reduce automobile accidents and fatalities at a specific intersection and to what extent?

2. Does the introduction of a roundabout at a specific location in addition as regionally have an impression on traffic flow?

**KEYWORDS**: Traffic, roundabout, rotary capacity, design, rotary intersection

## I. INTRODUCTION

Although roundabouts have recently acquired popularity in several urban locations around the world, most people are still unfamiliar with them. As a result, many people have misconceptions regarding roundabouts, which are sometimes confused with older traffic circles and rotaries. Many traffic circles, including roundabouts, were built for high-speed driving and have a huge radius and vehicle capacity. The result of the design and rules for key routes from rotaries and traffic circles, and it is critical to understand the history and evolution of the roundabout in order to illustrate these distinctions. With the creation of Columbus Circle in New York City in 1905, the traffic circle was first introduced in the United States. Following that, similar traffic circles were created in a number of cities around the world. High collision rates and congested traffic were the result of these traffic circles.

## II. ROUNDABOUT DEFINED

According to IRC 65-1976, “A traffic rotary is a specialised form of at-grade intersection where vehicle from converging arms are forced to move around an island in one direction in an orderly and regimented manner and weave out of the rotary movement into their desired directions.”

Roundabouts, unlike rotaries or traffic circles, have a significantly lower perimeter. Roundabouts have substantially lower operating speeds than other circular junctions due to their smaller circumferences and curving entries. A roundabout is typically intended for operating speeds of around 15 mph, although a rotary or traffic circle may be designed for speeds of roughly 25 to 40 mph.

## III. OBJECTIVES

A) To compile available information regarding capacity analysis of roundabouts through literature review

B) To know the efficiency of roundabouts which are already been provided in different parts of the world through literature review

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C) To analyse the public opinion about providing a roundabout at busy intersections.

D) To analyse the pros and cons of providing a roundabout over signals.

## IV. LITERATURE REVIEW

Ishanya p **et al**.[1] presented research paper on "A study on rotary intersection at Mangluru".The behaviour of traffic at the Nanthur crossroads in Mangaluru is investigated in his work. They used a video camera to count traffic volume and determine peak traffic flow. Due to the high level of traffic, an attempt was made to construct traffic signals according to IRC guidelines, which failed due to the high volume of traffic. The current traffic rotary was then successfully redesigned, with a modified roundabout design feature suggested.

S. vasanthakumar et al. [2] presented a paper on "Design of a rotary for an uncontrolled multileg intersection in Chennai".They conducted a video graphic survey for eight hours during the day to determine the traffic volume at the intersection and the capacity of the intersection. The rotary's practical capacity was found to be 3020 pcu, which was significantly higher than the reported traffic flow of 2665 pcu.

Rakesh kumarchhalotre, ,Dr. Y. P. Joshi**.** [3] presented paper on "An evolution of Rotary intersection on Prabhat Square Bhopal". They personally counted traffic volume on that square for seven days and collected peak hour traffic statistics. They discovered the rotary's capacity and offered design specifications. The capacity calculated from the traffic volume analysis was more than the rotary's operational capability. As a result, a signalized intersection was included to keep the volume at the crossing under control.

Ms. Sonalikamaurya, Mr. Ajeet Singh**.**[4] presented a paper on "Efficiency of rotary intersection at authority chowk greater Noida". They manually counted and gathered traffic volume at the study intersection. They discovered that the roundabout's capacity had been exceeded due to the current traffic load, thus they proposed a signalized intersection to regulate the traffic entering the circle.

Dayananda H. S. **t al.**[5] presented paper on "capacity evaluation of rotary intersection at K. R. Hospital Junction Mysore" and suggested redesigned parameter for rotary. They measured traffic volume over seven days using a video camera mounted on a building near the intersection. They calculated the capacity of the rotary by adjusting dimension with the same weaving ration as the previous capacity after calculating all traffic volume data.

VeethikaGomatsa**et al**[6] presented paper on "Design and analysis of an intersection for improve traffic flow at Bhopal". At Jyoti Talkies Square and VallabhBhawan, an attempt was made to recommend measures for improving and easing traffic flow. On consecutive days of the week, they conducted traffic volume surveys at two-hour intervals throughout the day. Signal timing at Jyoti talkies square has been changed to accommodate afternoon peak traffic. It was suggested that the road be widened. The capacity of Rotary was calculated at another crossroads called VallabhBhavan, and it was found to be greater than its capacity. As a result of this, Roundabout was able to give.

Siteshkumarsingh, Karan Prabhakar**.**[7] published a paper on "statistical analysis of rotary intersection on Dogra chowk Jammu. They looked examined traffic volume on existing roundabouts and gathered data on the roundabout's geometric features and operational status. They discovered that the capacity of the existing roundabout had reached its limit. They made recommendations for geometric features to boost the capacity of the roundabout based on the results of the rotary junction study and improvement.

Parth M. Pande, Srinath Karli**.**[8] presented paper on "Design of Rotary Intersection as an alternative to four arm signalize intersection of urban area". A traffic volume survey was conducted, and the capacity of the rotary was determined. The current traffic flow at a signalized intersection was greater than the intersection's capacity. As proposed and design parameters were supplied for the reduction of delay and increase in capacity of intersection rotary.

Tom v. Mathew **et al.**[9] published a paper on traffic rotaries in which they provided all the theoretical knowledge about rotaries includes guidelines for selection of rotaries, traffic operation in rotaries, design elements , capacity of rotary etc.

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## V. EFFICIENCY

Many studies have shown that roundabouts increase the efficiency of intersectionsin the following ways:

- Reduced delays
- Lower operating costs
- Reduced environmental impact

The Project for Public Spaces compiled information from a variety of transportation organizations across the country on the impact of roundabouts on reducing traffic delays. At three roundabouts studied, the Insurance Institute for Highway Safety (IIHS) reported a 13 percent to 36 percent reduction in delays. At the roundabouts tested, the National Cooperative Highway Research Program observed a 75 percent reduction in peak hour delays. After the implementation of roundabouts at Vassar College in Poughkeepsie, the New York Department of Transportation (NYDOT) recorded a 54 percent reduction in delays and a 70 percent reduction in ravel times along Route 67 in Malta, New York.
According to the IIHS, a study of 11 Kansas junctions indicated a 65 percent reduction in delays and a 52 percent decrease in vehicle stops. According to a 2005 IIHS research, installing roundabouts at ten urban intersections deemed suitable for roundabout construction might have resulted in a 62 percent to 74 percent reduction in delays. 20 It should be emphasized that roundabouts are not suited for all intersections, according to the IIHS and others. Roundabouts are not recommended by the IIHS for intersections with uneven traffic flow or locations where site constraints prevent the building of a well-planned roundabout. The reduction in delays that occurs as a result of proper roundabout installation has a knock-on effect on car emissions and fuel consumption. Carbon monoxide emissions are expected to be reduced by 21% to 42%, according to several IIHS assessments. The IIHS also predicts a 30 percent reduction in fuel usage. A NYSDOT intern utilized SIDRA software to anticipate the environmental benefits of roundabouts in a study titled "Quantitatively Determining the Emissions Reduction Benefits of the Replacement of a Signalized Intersection with a Roundabout." In comparison to the traffic signal, this analysis expected a "6.36 percent reduction in nitrous oxide and a 26.05 percent reduction in hydrocarbons."

## VI. CONCLUSION

In recent decades, roundabouts have become increasingly popular in North America, Asia, Europe, and other parts of the world. The primary reason for this is that roundabouts have been shown to improve traffic flow and safety at specific intersections. Studies have been done by the Federal Highway Administration, the Insurance Institute for Highway Safety, the Transportation Research Board, and others to examine the potential impacts of a roundabout on a junction. These findings were released by the FHA and the TRB, along with recommendations and guidelines for roundabout placement and design.

Roundabouts have been found to have significant positive benefits on both automotive safety and traffic delay, as well as pedestrian safety. However, research on the benefits of roundabouts on bike safety is scarce, and some studies reveal unfavourable results. More research is needed in this area, especially on how roundabout design might increase the safety of bicyclists. Roundabouts minimize traffic congestion, cut fatalities and delays, and are, in my opinion, more aesthetically pleasing than many standard intersections.

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