



Evaluating The Effects of Signal Control Applications on Roundabout's LOS Performance Using VISSIM Microsimulation Model

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Abstract: The existence of unbalanced and high traffic flows at roundabout have resulted in poor performance and safety concerns. Past research has shown that applications of signal control at problematic roundabouts had significantly improved its Level of Service (LOS) performance. This study investigates the effects of different signal phasing plans on the roundabout's LOS performance using VISSIM microsimulation model. The findings revealed that both Approach-Signal-Control Roundabout ACSR and Two-Stop-Line Control Signalized Roundabout TSLSR signal phasing methods did not significantly improve the roundabout's entry capacities. Partial signal control applications, however, have resulted in a significant reduction in vehicle delays and higher entry capacities. The results of this study provide a good overview to local traffic practitioners on how to evaluate and implement the signal control strategy at problematic roundabouts.

Keywords: Roundabout, unbalanced flow, signalized roundabout, VISSIM microsimulation

1. Introduction

The conflict between the entry and exit flows has always occurred at roundabouts due to high traffic flow demands and the existence of unbalanced flow conditions. Oftentimes, such a phenomenon has caused massive delays and spills back to the upstream intersections. Therefore, applications of traffic signal control have been used to improve the roundabout's capacity performance. According to Al-Omari et al. [1], some safety benefits and a significant reduction in overall delays could be achieved by applying signal controls at problematic roundabouts.

Generally, the maximum capacity of a normal roundabout is approximately 6000 veh/hr (total hourly volumes from all entry approaches), while signalized intersections could handle total hourly traffic flows up to 8000 veh/hr [2]. Converting a problematic roundabout to an interchange will significantly increase its capacities. Due to cost factors, many roundabouts in Malaysia, particularly in Sarawak have been replaced with a crossed-signalized intersection that requires major geometric modifications. It is not known why signalized roundabout which does not require major reconstruction and traffic disruptions has not been considered by the local road management agencies.

As the application of signalized roundabouts has shown significant benefits in capacity improvement with lower costs, this research aimed to evaluate the effects of different signal control applications on the LOS performance of a problematic roundabout.

2. Literature Review

A roundabout is a circular intersection with the introduction of a few key features such as channelized approaches and proper geometry curvature to make sure the travel speed across the circulating lane is less than 50 km/h [3]. The