

Emission Estimation at Multilane Roundabouts in Corridors

Paulo Fernandes, Jorge Bandeira, Margarida C. Coelho

Research Group on Transportation Technology of the Centre for Mechanical Technology and Automation
(TEMA) / Department of Mechanical Engineering
University of Aveiro
{paulo.fernandes, jorgebandeira, margarida.coelho}@ua.pt

Katayoun Salamati, Nagui Roupail, H.C. Christopher Frey

N.C. State University
Raleigh, USA
{Katy_Salamati_rouphail_frey@ncsu.edu}

Ana Bastos Silva

Department of Civil Engineering – Faculty of Science and Technology
University of Coimbra
abastos@dec.uc.pt

PhD research + Research project

The goal of this research is focused on a comparison between different roundabouts corridors with respect to traffic performance and emissions. To achieve the proposed objectives, several Portuguese roundabouts will be analyzed using traffic and emission models. Using multi-objective analysis, this research will expect to optimize traffic system both in terms of emissions and congestion.

As a first step, between March and July 2012 the effect of multilane roundabouts located on urban corridors on traffic performance and pollutant emissions generated from vehicles was explored. Data measurements were gathered in several roundabouts in Aveiro, Portugal. It further compared the emission of vehicles moving through the roundabout as they use either the entry left or right lanes.

The methodology described in this research can be generalized to measure the emissions of any multilane roundabouts. The research identified a representative speed profile for each speed trajectory type, no stop (I), one stop (II) and multiple stops (III), from field data collection. Then, the "Vehicle Specific Power" (VSP) emission methodology is employed to estimate the second-by-second emissions generated from a vehicle during different acceleration-deceleration cycles. This research tests the hypotheses that differences in: a) the characteristics of speed profiles in each lane (left vs. right lane); b) conflicting flows for left and right lane; c) lane flow; and d) overall congestion level effects the emission amounts generated from vehicles in each lane.

This methodology will be applied and refined in 2013-2014 under the FCT Project AROUND (PTDC/SEN-TRA/122114/2010), which involves a partnership between the University of Coimbra, University of Aveiro and Polytechnical Institute of Viseu.

KEYWORDS: Emissions, Roundabouts, Traffic, VSP

March 2012 – October 2014