Real World On Road Emissions Of In Use Vehicles For Different Types Of Fuels

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Urban transport plays an important role in city development and is one of the major sources of environmental pollution. In developing countries, rapid urbanization, an increasing number of vehicles and congestion has resulted in environmental stress on urban centres causing air pollution, health hazards, and increased GHG emissions. Motor vehicles possess the principal polluting potential in deteriorating since the urban air quality. However, the link (relationship) between tailpipe emissions invariably falls short of explaining the resultant air quality. The shortcoming may be at two levels; mass emission factors, and predictive modelling tools. The vehicle - specific (category/type) mass emission factors derived from simulated laboratory tests (driving cycle), and expert judgment criteria are used for estimation of vehicular air pollution load calculations and as an input parameter for predictive modelling. However, the actual driving conditions vary significantly from the standard testing protocol and result in variation in emission estimates. It has been established that the emissions are higher during actual traffic conditions. Recent developments in measurements of in use vehicle emissions under real-world condition in contrast to laboratory tests during on-road operation enables data collection under real-world condition at any location travelled by the vehicle and under any weather conditions. Delhi, which is one of the most polluted cities in the world, steady growth in vehicular population has resulted in frequent traffic bottlenecks, queuing of vehicles, delay at intersections, and increased vehicle emissions. **To understand the relationship between the vehicle emissions under dynamic traffic conditions and impact of different fuel types commonly used such as petrol/gasoline, diesel and CNG,** this research work was undertaken. Real-world on-road data collection of emissions under dynamic urban traffic conditions was done at a selected road corridor in Delhi. Vehicle emissions were evaluated during acceleration, deceleration, cruising, and idling. Then the relationship between vehicle emissions and a commonly used traffic measure,

control delay, was also investigated. **This type of study is being carried out for the first time in India, using simultaneous second-by-second vehicle emissions data collection along with engine parameters in the real world on road conditions. In this research study, novel method has been used for first time in India for evaluation of motor vehicle emissions. Actual on-road emissions measurements were utilized in contrast to the laboratory-based dynamometer tests.** Exploratory analysis of these data revealed that emissions are different under varying vehicle operation conditions.

This research study is focused on real-world vehicle activity, emission data collection, and application of real-world data to different problems in vehicle emission field. This research work features novel methodological contributions regarding on-board vehicle activity and emissions measurements in Indian context.

The influences of instantaneous vehicle speed on emissions and fuel consumption were studied. It was observed that low driving speed contributed to a significant portion of the total emissions over a trip. Furthermore, the analysis of four standard driving modes are acceleration, cruising, deceleration, and idling showed that the transient driving modes (i.e., acceleration and deceleration) were more polluting than the steady-speed driving modes (i.e., cruising and idling) in terms of g/sec. These results indicated that the on-road emission measurement is feasible in deriving vehicle emissions and fuel consumption factors in urban driving conditions.

Results of modal analysis performed for petrol and a diesel driven vehicle using the advanced portable emission monitoring system, OEM-2100 showed that the cruise mode accounts for the majority of the time but the acceleration mode contributes most to the total emissions as compared to the time spend in that mode for all pollutants for both petrol and diesel vehicles. The implication of this study is that the medium and long-term emission control strategies should be focused on the mode of vehicle operation such as reducing number of accelerations which can lead to decreased vehicle emissions.

For future work it is recommended to undertake further scientific studies to establish city specific real world driving cycles and the corresponding real world emission factors for different vehicle types that are in use. It is also to be noted that the driving cycles need to be updated from time to time as the traffic operating conditions undergo change with growing traffic on roads.