



## Emission and Fuel Economy Measurements of Motorcycle on Real Roads of Taichung

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### Abstract.

The purpose of this study is to analyze the pollutants generated and the fuel consumed of scooter riding on real roads of Taichung city. Three routes were selected in this study. One is from the campus of the Nation Chung Hsing University to the Taichung Railway Station, which represents the urban route, the second one is from the campus to the Wuquan Railway Station, which represents the short urban route, and the third one is from the campus to the Taichung High Speed Railway Station, which is a typical suburbs route. The routes include different proportions of acceleration, constant speed, deceleration, and idling. These riding modes represent the types of engine running conditions, including throttle opening, fixed throttles, throttle closing, and closed throttle.

We recorded velocity and acceleration variations per second with GPS in the routes, and then reproduce the same variations on a chassis dynamometer. The scooter we used for test is Kymco V2, which is a four stroke engine produced in 2011. We installed the scooter on the chassis dynamometer, and collected the exhaust flow with a sampling tube which is part of the sampling device. The sampling device contains a differential manometer, orifice flowmeter, exhaust gas analyzer, and NO<sub>x</sub> sensor.

After we recorded the data, the emission is calculated with the flow rate as well as the concentration variations of the exhaust gas. Then we obtained the amount of pollution generated per second.

Finally, we integrated the rates of pollutants generated per second to obtain the amount of pollutants per km. The pollutants generated by riding in the urban route are CO 3.46 g/km, HC 0.20 g/km, NO<sub>x</sub> 0.22 g/km, CO<sub>2</sub> 72.09 g/km, and fuel consumption 32.8 ml/km. The short urban route produces CO 4.06 g/km, HC 0.32 g/km, NO<sub>x</sub> 0.25 g/km, CO<sub>2</sub> 77.21 g/km, and fuel consumption 35.5 ml/km. The suburbs route produces CO 5.21 g/km, CO<sub>2</sub> 91.60 g/km, HC 0.21g/km, NO<sub>x</sub> 0.24g/km, and fuel consumption 42.1ml/km.

**Keywords:** Driving cycle, Motorcycle, Pollutant.