Aaron Loiselle

Thesis

The effect of driving conditions and ambient temperature on energy flow and gaseous emissions from light-duty gasoline-electric hybrid vehicles

Abstract

The effects of five transient drive cycles (LA4, LA92, US06, HWFET, NYCC), and two steady speeds (40 and 80 km/hr), at two ambient temperatures, on emissions of CO, NMOG, NO_x, CO_2, CH_4 and N_2O were analyzed for four gasoline-electric hybrid vehicles and one spark-ignition vehicle operated on chassis dynamometers. Battery and braking energy values, the cumulative time the engine was off during a drive cycle, and the number of engine restarts per drive cycle were also estimated. Pollutant emissions were below detection limits in many cases and elevated but below regulated limits during coldstart and aggressive cycles. Testing at -18°C increased pollutant emissions by up to 65 times and greenhouse gas emissions by up to 23 times relative to 20°C tests. Hybrid vehicle engine off time was proportional to pollutant emission rates of CO, HC and NO_x. The effects of augmented braking and battery net energy change are also discussed.

Degree

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Supervisors

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