

West Virginia University (WVU) In-Use Emissions and Performance Testing of Propane-Fueled Engines

West Virginia University performed a research program for PERC to establish exhaust emissions and performance characteristics of propane-fueled vehicles/engines through in-use testing methods in comparison to vehicles/engines fueled with other common transportation fuels. WVU used portable emissions measurement systems (PEMS) on each vehicle to collect the data (CO, CO₂, NO_x, and total hydrocarbon emissions) as they drove predetermined test routes using hot and cold starts. The Morgantown route consisted of city and highway driving, while the Stop and Go route simulated low speed operation and passenger pick up. The table below shows the specifications of the tested school buses.

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| Fuel | Propane (LPG) | Ultra-Low Sulfur Diesel |
| Vehicle | Blue Bird School Bus (6.8L, 10 Cylinder) | Blue Bird School Bus (6.7L, 6 Cylinder) |
| Model Year | 2015 | 2014 |
| Exhaust Aftertreatment | Three-Way Catalyst | Diesel Oxidation Catalyst, Diesel Particulate Filter, Selective Catalytic Reduction System |

Pros: The approach to collect real-world data on specific propane-fueled vehicles/engines was robust and accurate. NO_x results are very favorable for propane.

Cons: The results are specific to the conditions of the test environment and differ from the requirements (e.g., temperature) for engine certification testing.

Noteworthy Results

- 96% NO_x reduction: Propane school bus vs. diesel school bus (stop-and-go route)
- >95% NO_x reduction: Propane school bus vs. diesel school bus (Morgantown route, cold start)
- >93% NO_x reduction: Propane school bus vs. diesel school bus (Morgantown route, hot start)
- >13% CO₂ reduction: Propane school bus vs. diesel school bus (stop-and-go route)

The findings from the WVU in-use tests of high NO_x emissions for heavy-duty vehicles are supported by other tests in literature. See “Real-World Emissions from Modern Heavy-Duty Diesel, Natural Gas, and Hybrid Diesel Trucks Operating Along Major California Freight Corridors” ([link](#)) and “Emission rates of regulated pollutants from current technology heavy-duty diesel and natural gas goods movement vehicles” ([link](#)).