

EPA SmartWay Truck Emissions
Test Protocol Workshop

Draft Test Protocol Methodology



Test Methodology - Technical Topics

Track Requirements

Track Test Procedure

Environmental Requirements

Chassis Dynamometer Requirements

Chassis Dynamometer Test Procedure

Coastdown Procedure and Other Methods to Measure Road Load

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Track Requirements

- Primary technical focus: Balance specifications to achieve comparative test results versus the number of tracks meeting requirements
 - Protocol: Specifies minimum track length of 1.5 miles, with >5 miles recommended
 - Comment: Allow 1 mile tracks
 - Protocol: Recommends oval, with figure eight or serpentine acceptable
 - Comment: Allow circular tracks
 - Protocol: Specifies testing on a track
 - Comment: Leave protocol open for on-road tests and wind tunnel testing
 - Comment: Aero improvements may require on-road testing to show impact due to traffic-induced airflow and cross-wind

Track Test Procedure

- Primary technical focus: Measurement methods for vehicle speed and fuel consumption
 - Vehicle speed measurement
 - Protocol: Allows ECM, speedometer, odometer, GPS, and stopwatch with track lane length
 - Comment: Remove stopwatch method due to accuracy
 - Comment: Add 5th wheel option
 - Fuel measurement method
 - Methods in protocol: Gravimetric/Portable fuel tanks (SAE J1321), PEMS (40 CFR Part 1065), lab emissions method (SAE J1094a)
 - Comment: Allow on-board fuel flow meter

Track Test Procedure (continued)

- Other comments
 - Protocol: Requires a coastdown test during track test procedure
 - Comment: Add maximum vehicle speed test and 0-100 km/h acceleration test which are currently required in Europe
 - Protocol: Does not specify HVAC settings
 - Comment: Add specifications regarding heat and air conditioning settings and window position

Track Test Procedure (continued)

- Other comments
 - Protocol: Specifies minimized trailer gap with 40” maximum
 - Comment: Specify trailer gap based on manufacturer’s recommendations
 - Protocol: Specifies standard trailer dimensions for line-haul trucks.
 - Comment: Consider expanding standard trailer to Regional Haul and Intermodal Drayage Trucks.
 - Comment: Consider creating a standard box body on a straight truck could be used for Local Pick Up and Delivery, Neighborhood Refuse Truck, and Utility Service Truck

Environmental Requirements

- Primary technical focus: Balance specifications to achieve comparative test results versus amount of available testing time
 - Protocol: Ambient condition requirements are 68-86°F, 35-75% humidity, wind less than 12 mph, no precipitation
 - Comment: Requirements are too restrictive – limits sites
 - Comment: Testing should reflect the environmental conditions that the fleets run in, including grade and altitude

Chassis Dynamometer Requirements

- Primary technical focus: Requirements for heavy duty chassis test facility
 - Protocol: Defines chassis dynamometer test is a test conducted indoors
 - Comment: Add Outdoor Chassis dynamometer option
 - Protocol: Prefers single-roll electric dynamometer, with option for twin roll
 - Comment: Would not include twin roll as an option

Chassis Dynamometer Test Procedure

- Procedure well developed due to use in regulatory programs
 - No comments received to date

Coastdown Procedure

- Primary technical focus: Accuracy and repeatability of coastdown testing of heavy duty trucks
 - Protocol: Specifies SAE standards for coastdown testing
 - Comment: Suggest wind tunnel testing

Vehicle Selection and Preparation Requirements

- Primary technical focus: Balance specifications for comparative testing versus application-specific flexibilities
 - Vehicle Preparation
 - Protocol: Specifies SAE J1321
 - Comment: Add requirements for engine and transmission calibrations to be representative of in-use
 - Fuel Measurement
 - Protocol: Requires exhaust routing to meet 40 CFR Part 1065 which includes crankcase ventilation gas in exhaust stream during PEMS testing
 - Comment: Leave crankcase routing as configured because has minimal effect on FE

Vehicle Selection and Preparation Requirements

(continued)

- DPF regeneration
 - Protocol: Requires manual regeneration prior to testing
 - Comment: There are concerns about accuracy of using the carbon balance technique due to presence of diesel particulate filters. Measuring before the DPF will not include fuel consumed in DPF regeneration for those that require post-injection events. Measuring after the DPF will present problems due to DPF collecting soot (carbon) and later releasing this carbon during a filter regeneration.
 - Comment: Results from short tests can be skewed by DPF regeneration, while longer tests will average out the statistical nature of regeneration. Recommend that the emissions measurement method continue to be developed.

Additional Requirements for Hybrid Vehicles

- Primary technical focus: Develop protocol to be technology-neutral and appropriately demonstrate the benefits of hybrid vehicles
 - Protocol: Specifies State of Charge, Energy Storage, Net Energy Charge
 - Comment: Recommend using HEV version of SAE J1321 currently being developed
 - Comment: Hybrid trucks should probably not be tested on a chassis dynamometer, with the exception of smaller vehicles if they can be tested on a 4WD dynamometer. The amount of energy available for regenerative braking can be dependent on powertrain design and the braking characteristics of the vehicle. Unless a 4WD dynamometer can be used, the dynamometer will not adequately simulate braking events.

Fuel Efficiency Calculation

- Primary technical focus: Fuel efficiency calculation will be completed after metrics are determined
 - Comment: The overall test method is similar to existing SAE fuel economy tests, where the emphasis is on the final MPG number. More use could be made of the J1939 data to gain a better understanding of exactly what variations occurred in addition to the bottom line MPG number.

Reporting and Documentation

- Procedure well developed due to use in regulatory programs
 - Comment: Use engine ECM and J1939 data to validate test accuracy. Suggest evaluating fuel consumption, distance, and throttle position comparisons for validation.

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