SURFACE VEHICLE RECOMMENDED PRACTICE

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Chassis Dynamometer Simulation of Road Load Using Coastdown Techniques

RATIONALE

This procedure has been revised to include a new fixed-run test option, provisions for four-wheel drive dynamometer and 20°F testing, and updates to definitions and nomenclature aimed at harmonizing these quantities across related SAE documents.

FOREWORD

Electric chassis roll dynamometers provide the means for rapid, accurate, automatic adjustment of dynamometer loading to simulate vehicle road load over the entire speed range through which the vehicle is tested. Precise calibration of chassis roll torque measurement and speed instrumentation, accurate measurement of base inertia, and controls employing valid algorithms have resulted in accurate dynamometer load coefficient measurements using coastdown techniques without requiring onerous computation and data manipulation by users. Variability of each dynamometer and between dynamometers is low, permitting load coefficients obtained on one dynamometer to be used on other similar dynamometers. To achieve this interchangeability of loading coefficients, operational factors are specified with the objective of keeping test variability at the low levels of the dynamometer.

This procedure was originally developed in conjunction with the introduction of the 1.219 m (48 in) diameter single-roll electric dynamometer for vehicle emissions and fuel economy testing, however, the methodology is generic to any dynamometer capable of carrying out the road load derivation described, regardless of roll size, geometry, or roll surface roughness and is intended to provide a standard of best practice for all vehicle testing requiring accurate road load simulation.

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1. SCOPE

This procedure covers vehicle operation and electric dynamometer load coefficient adjustment to simulate track road load within dynamometer inertia and road load simulation capabilities.

1.1 Purpose

To provide a uniform procedure for adjusting an electric chassis roll dynamometer to provide accurate simulation of the resistance which must be overcome by the vehicle powertrain to maintain steady speed on a flat road, as determined by track coastdown tests on that vehicle.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 HWFET Publication

Available from the Superintendent of Documents, U.S. Government Printing Office, Mail Stop: SSOP, Washington, DC 20402-9320.

HWFET, Highway Fuel Economy Test, 40 CFR Part 600, Subpart B and Appendix I

2.1.2 Other Publications

Dynamometer Performance Evaluation and Quality Assurance Procedures (AMA) for a 48 inch Single Roll, Electric Light Duty Chassis Dynamometer

2.2 Related Publications

The following publications are provided for information purposes only and are not a required part of this SAE Technical Report.

2.2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

SAE J1263 Road Load Measurement and Dynamometer Simulation Using Coastdown Techniques

SAE Paper 780257 DeRaad, L., "The Influence of Road Surface Texture on Tire Rolling Resistance," SAE Technical Paper 780257, 1978, doi:10.4271/780257.

SAE Paper 810166 Oswald, A. and Browne, L., "The Airflow Field Around An Operating Tire and Its Effect on Tire Power Loss," SAE Technical Paper 810166, 1981, doi:10.4271/810166.

SAE Paper 900760 Metz, L., Akouris, C., Agney, C., and Clark, M., "Moments of Inertia of Mounted and Unmounted Passenger Car and Motorcycle Tires," SAE Technical Paper 900760, 1990, doi:10.4271/900760.

SAE Paper 930391 D'Angelo, S., Mears, W., and Brownell, C., "Large-Roll Chassis Dynamometer with AC Flux-Vector PEU and Friction-Compensated Bearings," SAE Technical Paper 930391, 1993, doi:10.4271/930391.

SAE Paper 930392 Mears, W., D'Angelo, S., and Paulsell, C., "Performance Tests of a Large-Roll Chassis Dynamometer with AC Flux-Vector PEU and Friction-Compensated Bearings," SAE Technical Paper 930392, 1993, doi:10.4271/930392.

SAE Paper 940486 Brownell, C., Brownell, C., D'Angelo, S., Fagerman, T. et al., "Simulation of 8.65″ Uncoupled Twin-Roll Hydrokinetic Dynamometer Operation on a 48″ Single-Roll Electric Dynamometer," SAE Technical Paper 940486, 1994, doi:10.4271/940486.

2.2.2 Other Publications

Differential and Integral Calculus, C. E. Love, Macmillan Co., 1948