CMV Brake Wear and Performance Test

Background

Little is known about the brake performance of commercial motor vehicles (CMV) within the United States. However, brake life and wear are of great interest to the transportation community due to the fact that 41.2% of vehicles placed out of service from vehicle safety inspections were due to brake defects. Additionally, brake maintenance and repair present a significant cost to CMV fleets. This project seeks to investigate brake performance and wear quantitatively, in contrast with the current method of visual inspection.

Motor coach entering the PBBT at the Greene County Inspection Station, Bulls Gap, Tennessee.

Research Plan

To facilitate this research, the Federal Motor Carrier Safety Administration, in partnership with the Oak Ridge National Laboratory and the Tennessee Department of Safety, has installed a performance-based brake tester (PBBT) at the Greene County Inspection Station on I-81 in Bulls Gap, Tennessee. This PBBT will be used to assess brake efficiency (performance) in various commercial motor vehicle vocations. These vocations include tankers, dry -box vans, dump trucks, and motor coaches. Brake wear will be assessed by actual measurement of brake lining thickness and brake drum diameter over the life of the brake components. Each vehicle will be tested on the PBBT at regular intervals to monitor brake performance over the life of the linings. This research is being conducted as part of an 18-month Field Operational Test.

Brake shoes and brake drum.

Parameters Being Measured

The PBBT machine uses in-ground roller dynamometers to objectively evaluate braking force (Bf) of each wheel end. Since brake efficiency

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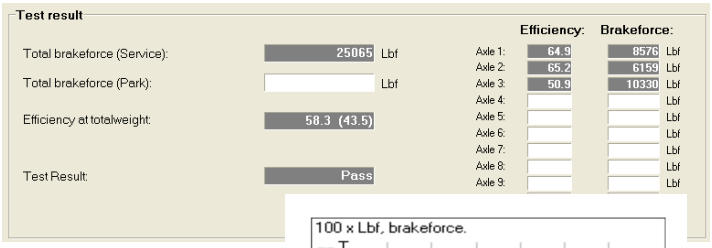
Roller based PBBT.

Brake lining measurement.

(Be) is proportional to vehicle weight (Wt) as (Be = Bf/Wt), artificial axle loading can be utilized to bring a lightly loaded vehicle to within 80% of the gross axle weight rating through a hydraulically operated hook and strap system attached to the vehicle's axle. This allows determination of BE at the most demanding axle loads. Brake force is also dependent upon air brake pressure. A transducers will be used to measure the vehicle's service brake air pressure during PBBT testing. To determine performance as a function of wear, the thickness of brake pads will also be measured along with ovality and eccentricity of the brake drums.

Results and Data Analysis

Results from the PBBT will be analyzed to provide a performance curve over the life of the



Results for PBBT test.

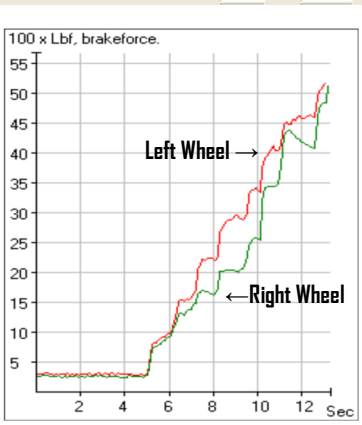


Chart displaying brake force vs. time.

brake. As displayed in the test result screen shown at the right, a ratio of brake force to gross vehicle weight is computed as an index of brake performance. The graph depicts brake force versus time for each wheel end on a given axle of the truck. The variations indicate ovality and eccentricity, which have an unknown effect on brake performance. This experiment will lay groundwork for future studies in which the PBBT may be utilized as a diagnostic tool for faulty brakes.

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