Residual Brake Drag Torque on a Commercial Vehicle

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ABSTRACT

Research and/or Engineering Questions/Objective:
Total cost of ownership (TCO) is a crucial argument for the purchase of a commercial vehicle. Fuel Economy is one of the most important parameters to influence the TCO calculation. The residual drag torque of disc brakes is considered a significant contribution for losses and fuel wasting. This paper provides a comparison between the static and dynamic residual drag torque of a heavy duty commercial vehicle disk brake with a floating caliper.

Methodology:
Measuring systems are created to record the drag torques externally in the workshop and integrated to the wheel end while running the vehicle. The device for static measurement contains a drive unit with integrated output torque sensor, intended to drive externally one wheel end of the vehicle. Bearing resistances are excluded by appropriate preparation instructions and differential torque measurement. The device for dynamic measurement is designed in the shape of the hat section of the brake disk, and is capable to exclude any superposition of motion resistances or vibration induced forces. It is equipped with an adapted friction ring, and integrated to the wheel end by replacing the standard brake rotor.

Results:
In opposition to the static drag torque, the dynamic drag torque depends on the floating behaviour of the caliper. The variability of the dynamic drag torque affected by different moving resistances of the caliper is analyzed and correlated to straight and circular driving and different road conditions.

Limitations of this study:
The findings only correlate to the analyzed brake system and the given axle. Different designs will lead to different, however comparable results. This study concerns residual brake drag torque investigations. An exact determination of the influence on the fuel consumption is not derived. It will require an appropriate information input regarding the representative road conditions, topography, vehicle weight, and driving behavior.

Conclusion:
Fuel consumption is increased by residual drag torque though its quantitative contribution can vary considerably between particular vocations. Thus, further activities should focus on eliminating the drag torque in principle, rather than increasing efforts to reduce its influence on fuel consumption.