

What You Don't Know Can Be Deadly

By Daniel Judson

Part Three in a series of articles on Brake Adjustment

The common saying, “what you don’t know won’t hurt you”, might be true in some instances, but when it has to do with the inspection and maintenance of brake adjustment, ‘what you don’t know’ can be deadly. The recent NTSB report of a truck crash that killed two and injured others was the result of simply not knowing the facts about the safety problems caused by manually adjusting automatic slack adjusters—an all too common practice that can be found in just about every fleet operation and, in large measure, helps to explain why brakes out-of-adjustment remains trucking’s costliest, deadliest and most frequently cited defect.

As we’ve seen in parts one and two of this series, ineffective/improper brake inspection and maintenance practices are the result of faulty assumptions and the ignorance that perpetuates them. For this reason, a basic understanding of brake adjustment and the factors affecting automatic slack adjuster function is essential.

It must be remembered that the airbrake system exists for one simple reason—to supply a volume of air to the brake chambers where the energy of compressed air can be converted into a mechanical force at the chamber pushrod. Since brakes out-of-adjustment is a mechanical defect, the first thing to note is that pushrod stroke is physically limited and will only stroke so far before it “bottoms out” in the chamber and can no longer produce any force on the brakes. For example, a typical “Type 30” brake chamber has a maximum available stroke of 2-1/2 inches, and a maximum effective/legal stroke limit of 2 inches. Of the 2 inches, a half inch is needed for ‘free stroke’, leaving only 1-1/2 inches to accomplish effective braking.

As brake linings wear and the drum expands, the clearance between the brake shoe and the drum increases.

And as the clearance increases, pushrod stroke must also increase. If adjustment is not made to reduce the clearance, the pushrod will run out of stroke. Thus, to prevent braking loss, pushrod stroke must never exceed its effective stroke limits.

As the link between pushrod and brakes, the slack adjuster performs two critical functions: (1) it provides a means to adjust the brakes and, (2) it acts as a lever to convert pushrod stroke into a rotational force, or torque, at the S-cam. However, since there’s a limited range of pushrod travel, it’s important to notice how this affects the relationship of pushrod stroke to brake shoe movement. While the slack adjuster functions as a lever to gain a mechanical advantage, it must do so at the expense of pushrod stroke. It takes an inch of pushrod stroke to move the brake shoes (.040”) forty thousandths of an inch.

Unlike manual slack adjusters, Automatic Slack Adjusters (ASAs) are designed to maintain brake adjustment without the need for manual adjustments. However, this does not mean that ASAs can be neglected or that brakes will not go out of adjustment. When a brake equipped with an ASA is out of adjustment, there is a cause, and manually readjusting the brake will not correct the problem.

Unfortunately, widespread ignorance and confusion regarding the proper inspection and maintenance of ASAs exists at many levels throughout the industry and is perpetuated in the policies and procedures of many fleet operations using a system that’s been carried over from the days of manual slack adjusters. The fact is, not only is the common practice of performing manual adjustments on ASAs costly and ineffective, it is dangerous and should not be done because, by giving the temporary appearance of maintenance correction, this practice actually conceals existing defects, returns defective units to service, places drivers and

the public at risk and defeats the very purpose of PM inspections.

For an ASA to maintain adjustment within effective stroke limits, it must do so in a proper environment, that is, it will not compensate for other deficiencies or factors in the braking system. While not exhaustive, the following is a list of factors that can hinder or prevent the self-adjusting function of the ASA.

- Improper installation/indexing of the ASA
- Lost motion caused by worn S-cams, S-cam bushings, cam splines, clevis pins, clevis pin bushings, etc.
- Inadequate/incorrect lubrication
- Installation of brake chambers without trimming pushrod to precise template setting
- Brakes not releasing completely caused by weak or broken brake chamber return spring, binding at clevis pin, broken emergency brake spring, misalignment, etc.

In short, anything that affects brake stroke will affect the function of the ASA.

Brake adjustment is all about brake stroke. Since a mere fraction of an inch can make the difference between safe and unsafe braking, the ONLY WAY to know if brakes are within the effective stroke limits is to measure pushrod stroke. Whether it has to do with drivers or technicians, checking the ‘applied stroke’ is the first and most important step in any inspection or maintenance procedure.

Editor’s Note: *Daniel Judson is the inventor and technical director of BRAKESENTRY, the visual brake stroke indicator. He has more than 25 years of industry experience as an ASE certified master truck technician, fleet maintenance manager and technical school instructor. For more information call Judson at 828-285-0708 or visit the website at www.brakesentry.com.*