

asbestos-based linings, the brake system engineer would have two choices. First, the drum brake could be redesigned and redeveloped for acceptable performance with non-asbestos linings. Second, the designer could wait for a lining formulation to be developed that can be used directly in existing drum brake designs. This is a critical decision. Redesign of a brake assembly is costly, time consuming, and probably unrealistic. However, waiting for the development of a suitable universal non-asbestos replacement friction material--that has yet to be made--involves the risk of not having acceptable aftermarket components if asbestos-based brake linings are banned.

2.5 Influence of Brake Lining-Brake Drum Pressure Distribution on Brake Effectiveness

For drum brakes of the same design, the use of different materials exhibiting similar friction coefficients is not sufficient to ensure consistent and even braking throughout the life of the material. The use of a material that exhibits different wear or thermal properties can be sufficient to change the effectiveness of the brake system. Figure 4 shows the variation in effectiveness for the same brake design but for different brake lining pressure distributions. Note that large changes of brake effectiveness are possible for the same value of friction coefficient due to the effect of lining pressure distribution.

Several factors can lead to uneven and inconsistent brake lining-brake drum pressure distribution, but the most significant are wear and thermal distortion. Wear tends to shift the center of pressure location. Thus, substitute friction materials with different wear rates from the original asbestos materials may also influence stability by changing the center of pressure. A reduction in brake effectiveness, or an increase in brake effectiveness leading to wheel lock-up, could be possible consequences of improper friction material selection.

The profiles of the brake linings also are affected by thermal distortion. Brake lining expansion through the friction material thickness is often much greater for non-asbestos brake linings, and these friction materials also tend to be much stiffer. Therefore, the contact geometry and pressure distributions will be different, which can affect the friction