

larger, more expensive components.

Brakes - The recent adoption of disc brakes by the automotive industry makes material substitution more plausible. Disc brakes are capable of greater energy dissipation than similar sized drum brakes because the design results in considerably lower heating rates. This is due to the fact that at any one time the friction pad contacts only a section of the disc surface. The lower operating temperatures permit the use of friction materials which do not contain asbestos. Another feature of disc brake design which has reduced the need of asbestos materials is the lower strength requirement of the friction material.

Clutches - The substitution of other material for asbestos in clutch facings of traditional design could only be done by changes in size and design. Two changes in clutch design which have reduced the requirement for asbestos-containing friction materials are the advent of the automatic transmission and the redesign of manual clutch friction surface.

The clutch surface of the automatic transmission is immersed in an oil bath which virtually eliminates airborne pollutants. Further, the cooling affect of the oil bath reduces the requirement for high-temperature capability materials. Automatic transmission clutch facings may be made from either sintered metals or fibrous cellulose materials.

Many manual clutches have redesigned friction surfaces which consist of numerous small circular pads or discs attached to the clutch face as opposed to the standard annular ring friction surface. These small pads act in the same manner as the disc brakes friction pad. Thus, lower stresses and operating temperatures associated with the new design reduce the need for asbestos-containing friction materials.