Once the friction material has been cured, the asbestos fibers are locked into the matrix. During brake operation, the high temperatures generated at the interface convert more than 99.7 percent of the asbestos to non-fibrous residues (primarily olivine) in the wear debris,[2] and less than 0.02 percent asbestos becomes airborne.[3,4]

The conventional organic formulations and the processes by which they are made have been dependent upon and tailored to the physical and chemical properties of asbestos. Two courses of action are open for elimination of asbestos from automotive friction materials:

1. Develop a new generation of friction materials, designed from the start without asbestos in mind.

2. Attempt to substitute an alternative fiber system for the asbestos in conventional formulations, with subsequent modification of composition and process techniques.

Bendix is aggressively pursuing both courses of action. As Mr. William Agee, our Chairman and Chief Executive Officer, has stated, Bendix is committed to being asbestos-free at the earliest possible date within this decade.

SEMIMETALLIC DISC PADS

Properties

In the 1960s, a new generation of friction materials, called semimetallic, was developed to meet severe braking requirements which organics could not meet. Class A organics (typical U.S. materials), which perform well in low and moderate temperature duty, are prone to fade and exhibit compressibility and poor wear resistance at high temperatures. Class B organics (typical European and Japanese materials) provide good high-temperature wear and friction levels, but have poor low-temperature wear resistance, produce rotor scoring and/or wear, and are prone to being noisy. Semimetallics were initially develed for these extreme, high-temperature applications.[5]

Semimetallics rely on steel fiber and powder metallurgy techniques for reinforcement. Various property modifiers are added to enhance performance to desired levels, with a resin binder holding the materials in a uniform solid mass. Semimetallics may contain metallic powder, sponge iron particles, ceramic powder, steel fiber, rubber particles, graphite powder, and phenolic resin.[6,7] Some manufacturers utilize a backing layer of a different composition which can contain asbestos.

Problems Overcome

Inherent in the uniqueness of the semimetallic formulations and their performance properties were a number of significant problems which required resolution. Concentrated development effort was required to resolve both processing and performance related issues. Processing issues included: the uniformity of the raw materials mixtures, the ability to form and handle the in-process material, and the ability to manufacture high-quality parts consistently.