

Centrifugal Casting of Metal Matrix Composites

Because of the hazard asbestos poses, the Navy can no longer use brake shoes made of asbestos on bronze friction drums. Shoes using replacement materials destroyed the drums in about 100 hours of use. A new material was needed for the drums that would reduce the amount of wear and tear. The team of Amarnath Divecha and Subhash Karmarkar of the Carderock Division invented a composite casting technique that creates a material as strong as asbestos.

By carefully selecting a metal alloy for matrix metal (such as aluminum) reinforced with other materials (such as silicon carbide), as well as a very hard powder for the desired wear-resistant characteristics, the team created a wide variety of parts, including tubes, brakes, clutches and gears, that have different material properties. Depending upon the respective densities of the metal matrix and the particles, it is possible to produce tailor-made composites with reinforced wear surfaces on the outer or inner surface of the part as desired. The Navy constructed friction drums using this material and, in nearly 1,000 hours of use, the drums with the replacement metal matrix composites have shown no significant wear.

Divecha and Karmarkar partnered with two companies to transfer the technology through Cooperative Research and Development Agreements (CRADAs) and licensing. John Crane Marine intends to apply the technology to shipboard mechanical seals, which are very expensive and must be replaced frequently. Using the metal matrix composites will significantly reduce operating costs for the company. MSE Technology Applications, Inc. will apply the technology to a number of items, including disc brake rotors, golf clubs, boring tool disks and electronic heat sinks, to create longer

lasting materials at a lower operating cost.

It is estimated that this technology will save the Navy as much as \$38 million during the next five years without returning to the use of asbestos brake shoes. In addition, Metal Matrix Composites will provide benefits

for builders and consumers of high performance automobiles, long distance trucks, airplanes, and ships.



From left: Todd G. Johnson, MSE Technology Applications; Amarnath P. Divecha, and Subhash D. Karmarkar