Brush Wellman Inc.'s Toughmet® Alloy Poised For Success

CLEVELAND -- December 17, 2003 -- After several years of intensive work by Brush Wellman Inc. engineers and success in the field, a copper-nickel-tin alloy the company trademarked ToughMet® may be on the verge of becoming a new standard in the bearing and bushing market.

Evidence of growing interest in the product is building from a variety of sources. For example, while the economy is still in the early stages of a recovery, orders are coming from an increasingly wider range of end-use markets, from giant mining equipment to high-speed race cars. In the past year, ToughMet® has made its way onto at least one aircraft at nearly all the major producers in the world. Aircraft use includes both new and retrofit applications, and the alloy recently won influential specification approvals from authorities at Aerospace Material Specification (AMS4596) and Airbus Industries Material Specification (AIMS 02-04-002).

The most recent evidence of ToughMet®'s acceptance came in October when a maintenance panel for the National Association of Corrosion Engineers (NACE International) approved ToughMet® for unrestricted application in corrosive, or so-called "sour" oil and gas well service described in Section 4 (Paragraph 4.20) of NACE standard MRO-175/ISO 15156.

Interest in the material stems from an uncommon combination of properties that makes it ideal in tough bearing and bushing applications - the material has both excellent lubricity and wear resistance.

"There are generally two schools of thought about plain bearing materials," says Dave Krus, product and market manager for ToughMet® at Brush Wellman. "Engineers have typically used either bronze or steel bushings. Steel bushings have good wear resistance but high friction; bronze bushings have low friction but tend to wear rapidly in severe service. What those engineers are now beginning to learn is that there is something between those two traditional choices.

"ToughMet® combines the best properties of the two principal options," continues Krus. "It has a much higher hardness than bronze, but its hardness and stiffness are still low enough to protect steel mating parts. It has very high yield strength like steel, which means it takes a lot of force to cause permanent deformation. Yet it has a low elastic modulus and a coefficient of friction similar to leaded bronze, which has the best lubricity in the bronze alloy family. ToughMet® can be a drop-in replacement for either material."

Krus says ToughMet® derives its unique characteristics from a hardening mechanism called spinodal decomposition. Achieved by a proprietary heat treatment process, spinodal decomposition creates a fine, homogeneous microstructure with ultra-microscopic strengthening, which is a key aspect of advanced bearing technology. Brush Wellman found a way to make large billets of the alloy using a patented EquaCast™ process. Before the company developed a broad commercial offering, the on available versions of the alloy were made with a powdered metal process and only in a limited size and property range.

"The first aerospace applications with Brush Wellman material were developed to solve especially tough problems on aircraft already in service," says Bill Nielsen, market manager for industrial components at Brush Wellman. "Now with the general specifications in place, new designs are multiplying rapidly within aircraft builders around the world, and aircraft operators are discovering that the ToughMet® alloy has the ability to replace numerous alloys without sacrificing performance.

In addition to aircraft applications, ToughMet® has proved itself in a variety of other tough situations:

- Kingpin bushings in the steering mechanism of off-road dump trucks that carry payloads of more than 300 tons, resulting in less downtime for maintenance
- Wear plates for a 5,500-ton extrusion press that hold up longer and maintain the press's close tolerances
- Racing car engine bearings that last longer and limit power loss in the engine

"If you want to go to a new level of performance, such as a more powerful, more efficient automobile engine, or you want smaller and lighter airplane bearings that keep things turning smoothly, or components that you really never need to lubricate again, ToughMet® presents a value-added solution," says Nielsen.

Nielsen says the years of hard work behind the material's rapid success are not unusual.

"It takes some time to prove that a material works the way we say it will, and to get real field experience, because that's the best attribute of all when you are talking about airplanes, deep sub-sea oil and gas wells or other demanding applications," he explains. "You really need experience above all else, so that people know they can count on it. And we've been able to do that."

Krus and Nielsen say the technology and processes used to develop ToughMet® are key ingredients in Brush Wellman's strategy for revenue growth. "The company is using its heritage, experience and technical capabilities in special alloys to develop and market new materials with performance-enabling benefits," says Krus.

"ToughMet® demonstrates the company's ability to take the know-how that we have had for decades and creatively apply it to uses that no one had thought of before, or for different product forms," adds Nielsen. "We have very high-performance materials that are now cost competitive. This is allowing Brush to work in markets where it hasn't participated before."

Brush Wellman Inc. is a wholly-owned subsidiary of Brush Engineered Materials Inc. (NYSE: BW). Through its subsidiaries, Brush Engineered Materials supplies worldwide markets with beryllium products, alloy products, electronic products, precious metal products, and engineered material systems. Around the world, the company's engineered materials can be found in technically demanding end-use products with the telecommunications and computer, automotive electronics, industrial components, optical media, aerospace and defense, and appliance markets.

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