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A Breakthrough in Mechanical Friction Reduction and Part Restoration

Ceramic Nanotechnology Applied to Metal Restoration to Create Fuel-Savings & Reduced Repair Costs

The value of ceramic as a thermal barrier and for protection against corrosion has been proven in thousands of applications over the last five decades in the electronics industry, and in other products. Ceramic coatings, achieved through a physiochemical process, can create a ceramic-metal structure that reduces friction in metal-to-metal environments. Increasing fuel economy through friction reduction is the most common objective. The problem has been the cumbersome and labor intensive task of treating metal surfaces in an existing engine, transmission or other in-service equipment, since it typically necessitates disassembly, reassembly and retuning.

Cermet Lab Company (Southfield, Michigan) is manufacturing and distributing a patented nano-particle ceramic conditioner that is the first product of its kind formulated for cost-effective ceramic treatment of engines and other mechanisms, without engine disassembly or related downtime. The nanotechnology product, called CerMet, utilizes oil or other lubricants for delivery to the friction zone. Initial applications have focused on diesel engines. Numerous tests in heavy trucks and power generators have resulted in fuel savings of between 5% and 15%, prompting decisions to treat entire fleets of vehicles. Fuel economy benefits of the treatment last for approximately 60,000 miles of operation.

“Given the impact of fuel and repair costs in all industries, large diesel engines were a natural place to begin applying this nanotechnology,” said Dean Rose, CEO of CerMet Lab. “But the market potential extends to marine applications, rail, military, both large and small fleets, power generators in the energy industry, industrial equipment, various power transmission environments...and of course, consumer automotive.”

The “servo vitae” film formation created by CerMet has a restorative effect and reduces surface reduction, a result that has been confirmed by Scanning Electron Microscope (SEM) investigations, as well as by microhardness measurements and by X-ray fluorescent analysis of the surface layers composition. The new process is based on nano-particles (average size of the particles is approximately 168 Angstrom ($1 \text{ \AA} = 1\text{E-}10\text{m} = 0.1\text{nm}$) that are activated by heat generated in the friction pair during operation of the mechanism.

It was initially believed that the friction-reduction benefit would be difficult to prove with standard lab tests since it takes time to grow the ceramic-metal layer and complete the restructuring of the metal. Several lab and field tests, however, were helpful in confirming the positive change in surface topography, and the ability of the process to rebuild worn metal surfaces and lower the friction coefficient. Tribology Testing Lab Co. (Saginaw, Michigan) conducted an ASTM 5706 Coefficient of Friction – Step Load Test, recognized by the automotive industry as the standard test emulating engine conditions. Additionally, Falex Corp (Sugar Grove, Illinois) performed an ASTM G77 test (“Ranking Resistance of Materials to Sliding Wear using Ring on the Block Test Machine”).

Controlled field tests have also been successful. An SAE J1321 Type II fuel consumption test, performed by independent testing company Claude Travis & Associates, has verified the ability of the CerMet product to increase fuel economy in a freight-hauling, heavy-duty truck.

The Department of Energy states that ceramics have been proven to dramatically improve performance, energy efficiency, power density, and in the case of diesel engines – lower exhaust emissions. Additionally, Michael Anderson, Director of Engine Development, General Motors, stated at the recent SAE 2008 World Congress that friction reduction could help improve a vehicle's fuel economy by 13% to 16%.¹

U.S. Patent No. 7,304,020 BI was issued for the CerMet product on December 4, 2007. Visit www.cermetlab.com for more data. Sales contact Richard Edwartoski at CerMet (800.372.7580, X107), rje@cermetlab.com.

¹as reported in the SAE (Society of Automotive Engineers) 2008 World Congress Daily, Tuesday, April 15, 2008.

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