IEA Implementing Agreement for R&D on Advanced Materials for Transportation

Heavy Vehicle Propulsion System Materials

Transportation

FOR THE 21ST CENTURY

U.S. DEPARTMENT OF ENERGY

ENERGY EFFICIENCY AND RENEWABLE ENERGY PROGRAM

OAK RIDGE NATIONAL LABORATORY

UT-BATTELLE

Background

New materials technologies have been identified as key enablers for the development of clean, fuel efficient diesel engines. The commercialization of new materials technologies is dependent on having standard testing and characterization methods that are accepted by industry. Materials testing standards in the United States are primarily voluntary consensus standards by the American Society for Testing and Materials (ASTM). ASTM standards are coordinated with international standards activities by the International Standards Organization (ISO).

The Technology

To promote pre-competitive standard testing and characterization methods for diesel engine materials, DOE is proposing an international collaborative effort under the umbrella of the International Energy Agency. This effort will be in the form of two new annexes conducted under an existing Implementing Agreement on Advanced Materials for Transportation Applications. The proposed new annexes are described below. ORNL will be responsible for the work conducted in the United States and will provide technical expertise and support to the Executive Committee Chairman, Dr. Sidney Diamond of the DOE FreedomCAR and Vehicle Technologies Program.

Annex III: Contact Damage. This annex will focus on the development of test methods for the assessment of reliability of ceramic components in diesel engines and other heavy vehicle propulsion systems. Reliability and cost-effectiveness are critical issues in implementing ceramics in the valve train of diesel engines. Ceramic valve train components are subjected to high contact loads, elevated temperatures, and corrosive environments. To ensure a reliable service life, standard test methods are needed to evaluate the performance of potential ceramics in highly loaded rolling and sliding contacts.

Annex IV: Technology Assessment. This annex will focus on the rapid assessment of new technologies. The approach will involve the formation of a team of experts from academia, government, and industry to identify promising new technologies and develop strategies for quickly assessing the utility of these technologies. Two such technologies under consideration are laser shock peening (LSP) and micro-dimpling. LSP has shown potential to introduce an extensive zone of residual stress in certain metals. This residual stress tends to close surface cracks, making the material less susceptible to stress-corrosion cracking and fatigue. Micro-dimpling involves the use of a laser to introduce periodic arrays of small dimples in the surface of a material. These dimples can be 2 to 20 microns in depth, 50 to 150 microns in diameter, and can comprise surface coverage ranging from 5 to 50%.

Benefits

- Provides a mechanism for rapidly addressing new technologies
- Utilizes expertise available internationally
- Reduces duplication of effort

Executive Committee of the Implementing Agreement for R&D on Advanced Materials For Transportation Applications

For more information on how ORNL is helping America remain competitive in the 21st century, please contact:

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Success Story

November 2002