PNNL wins four R&D 100 Awards

In a novel approach to controlling vehicle exhaust emissions, re-searchers at PNNL have success-fully reduced harmful oxides of nitrogen in a diesel engine by half.

Researchers at Pacific Northwest National Laboratory and their collaborators have been recognized by *R&D Magazine* for developing four of the 100 most technologically significant innovations of the year 2000. These technologies are reducing harmful exhaust emissions, significantly improving facility energy efficiency and lifecycle costs, improving the quality of glass and metal products, and helping to quickly locate, monitor and account for nearly anything from produce to people.

The magazine conducts the annual R&D 100 Award competition to honor the most promising new products, processes, materials or software developed throughout the world. Awards are based on a product's technical significance, uniqueness and usefulness. With these four awards, PNNL will have received 58 since the Lab began submitting entries in 1969, including 51 since 1988.

"I'm proud of the award-winning work done at PNNL," said Secretary of Energy Spencer Abraham. "These accomplishments demonstrate the value of government-funded research to our nation."

This year's winning teams and their research projects are:

- **Materials that convert harmful engine exhaust emissions into components of clean air** — Stephan Barlow, Suresh Baskaran, Darrell Herling, Alexander Panov and Russell Tonkyn (PNNL), Lou Balmer-Miller (former PNNL staff member), John Hoard (Ford Research Laboratory) and Galen Fisher (Delphi Research Labs).

Engine emissions include harmful oxides of nitrogen (NOx) and can pose a serious health risk. These emissions also threaten the environment by contributing to the formation of acid rain and are precursors to ozone, the major component of smog.

PNNL researchers, working with Ford Motor Company, General Motors and DaimlerChrysler through the USCAR Low Emissions Technologies Research and Development Partnership, have been developing a promising new plasma-catalysis technology that significantly reduces NOx from the exhaust of next-generation energy-efficient vehicles.

The R&D 100 Award is for the invention and further development of the catalyst materials used in a plasma-catalysis device, and was carried out by researchers at PNNL, Ford and the Delphi Energy and Chassis Division of Delphi Automotive Systems. The research performed at PNNL was funded by DOE's Office of Transportation Technologies.

Delphi, previously part of General Motors, is now funding separate research with PNNL to develop a complete, integrated non-thermal plasma-catalyst system. The commercial engine exhaust after-treatment system will be capable of reducing NOx and soot emissions from diesel-powered vehicles.

- **A suite of analysis procedures, software and hardware that can reduce lifecycle operations and maintenance costs by as much as 25 to 50 percent** — Darrel Hatley, Donald Jarrell, Richard Meador and Daniel Sisk (PNNL).

The cost of operations and maintenance can make or break a business — especially with rising capital equipment and energy costs. Researchers at PNNL have attacked this problem by developing a suite of

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PNNL wins four R&D 100 Awards, cont.

analysis procedures, software and hardware that has proven to reduce lifecycle operations and maintenance costs by as much as 25 to 50 percent. Decision Support for Operations and Maintenance, or DSOM, improves process efficiency, cuts maintenance costs, extends equipment life and reduces energy consumption and harmful emissions.

Based on the concept of condition-based management, DSOM focuses on finding the balance between high production rates and the resulting machine stresses and failures. DSOM allows online condition monitoring of equipment and provides early warning signs of degraded performance.

After an initial assessment, baseline data are used to identify improvement opportunities. Some problems can be addressed easily with the DSOM software; others may require changes in organization and infrastructure. PNNL then creates a customized database and interface matrix that is tailored to the specific needs of each user group.

- **Long-Range Semi-Passive Radio Frequency Identification System** — Gordon Anderson and Kerry Steele (PNNL), and Curt Carrender, Jeff Cole, Ron Gilbert, Norman Hansen and Jeff Scott (Wave ID).

The long-range semi-passive radio frequency identification, or RFID, system was developed at PNNL and commercialized and marketed by the newly formed Wave ID company. These unique semi-passive radio frequency tags can identify, locate and even determine the condition of any tagged item. In an inventory application, this system significantly reduces the time required to count, locate, monitor and control distribution of resources ranging from clothing, blood plasma and perishable foods to military equipment and personnel.

Inventories of items in large warehouses or stores can be completed in minutes instead of days, and the locations of specific items can be found within the warehouse at a moment's notice.

- **A high-temperature viscosity measurement technology for process monitoring of hot molten materials such as those in glass manufacturing and metals refining** — S.K. Sundaram (PNNL), Gene Daniels (Savannah River Technology Center) and Paul Woskov (MIT).

The MilliWave Viscometer is a high-temperature viscosity measurement technology for process monitoring of hot molten materials such as in glass manufacturing and metals refining. The technology fills a need for a high-temperature, on-line viscosity sensor that makes possible real-time process control.

The MilliWave Viscometer is the only viscosity measurement technology that uses millimeter-wave electromagnetic radiation to probe the movement of liquids. The MilliWave Viscometer uses a hollow ceramic waveguide that can withstand the hot and chemical environment inside a melter. One end of the waveguide is immersed in the molten material, and the other end is sealed outside the melter with a window. The viscosity is determined by the rate of fluid flow in response to a waveguide pressure change.

The principal application for the MilliWave Viscometer is on-line monitoring of molten glass in melters, including those associated with glassifying radioactive wastes. The MilliWave Viscometer will allow active feedback control.

The MilliWave Viscometer was funded by the Department of Energy to improve the multi-billion-dollar effort to vitrify radioactive wastes. ✦