OAK RIDGE NATIONAL LABORATORY 2013 R&D 100 AWARDS

■ ClimateMaster Trilogy 40 Q-Mode Geothermal Heat Pump, developed by ClimateMaster and ORNL through a cooperative research and development agreement. The ORNL team consisted of Ed Vineyard, Moonis Ally, Jeffrey Munk, Bo Shen, Keith Rice and Anthony Gehl.

This water-to-air packaged heat pump provides significantly lower energy costs, reduces peak demand for electricity and provides environmental benefits, especially through reductions in greenhouse gases and pollutants. Using the earth as its heat source and sink (absorber) rather than outdoor air, homeowners and small businesses can reduce energy costs by up to 65 percent compared to conventional systems.

The Trilogy 40 Q-Mode is a product of several years of research and development conducted by ClimateMaster and ORNL. It is a significant advance, considering that the Trilogy 40 Q-Mode is designed to provide not only space conditioning but also provides all the water heating needs of a typical residence.

The project was funded by the Department of Energy's Office of Energy Efficiency and Renewable Energy, Building Technologies Office.

■ Distribute The Highest Selected Textual Recommendation, developed by ORNL's Robert Patton, Thomas Potok, Chad Steed and Jim Treadwell.

This patent pending technology automates the discovery of selected information from massive dynamic streams of text, which can aid in the discovery of threats and help law enforcement agencies safeguard the nation. Distribute The Highest Selected Textual Recommendation provides a personalized humanly manageable list of documents from a significantly larger unmanageable set of documents without the user performing keyword searches. The technology utilizes advanced analytic technology and a low computing footprint that allows for analysis of very large and dynamic text data with unprecedented speed and accuracy to help users find documents related to their interest regardless of the application domain. For example, DTHSTR is ideally suited for matching resumes from job applicants to job openings.

This research was funded by the Office of Naval Research.

■ V-shaped External Cavity Laser Diode Array, developed by ORNL's Bo Liu, Yun Liu and Yehuda Braiman.

By using a V-shaped external Talbot cavity and strategically placed micro-prism mirrors, ORNL researchers have created an efficient method to extract a high-quality laser beam from a broad-area laser array. The V-shaped external cavity laser diode array provides a coherent light source with impressive beam quality, narrow spectral bandwidth, high power, low cost and scalability to larger arrays. The result is a laser source with high brightness and wavelength tunability that has applications in spectroscopy, laser radar, material surface processing and optical communications, sensing and metrology.

■ SYMMETRIX HPX-F Nanocomposite Separator for Improved Lithium Ion Battery was jointly developed by Porous Power Technologies LLC and ORNL. ORNL's participants were David Wood III, Claus Daniel, Wallace Porter, Amit Shyam, Cristian Contescu, Rosa Trejo, Edgar Lara-Curzio, Jane Howe, Harry Meyer III, Jianlin Li, Ralph Dinwiddie, Curt Maxey, Hsin Wang and Beth Armstrong. SYMMETRIX HPX-F addresses market demands by lowering lithium ion battery costs and improving safety through the replacement of polymer separators. The implementation of lower-cost ceramics and mineral fillers in these internal separators can improve a battery's thermomechanical properties, making it less likely to overheat or ignite due to shorting. This breakthrough membrane technology could affect electric vehicles, grid storage applications, portable electronic applications, filters, barrier fabrics, transdermal drug delivery and toxic chemical absorption.

■ Adaptable I/O System for Big Data, or ADIOS, was developed by ORNL, G eorgia Institute of Technology, Rutgers University, and North Carolina State University. The ORNL team consisted of Scott Klasky, Qing Liu, Norbert Podhorszki, Hasan Abbasi, Jeremy Logan, Roselyne Tchoua, Jong Youl Choi and Yuan Tian.

ADIOS is a portable, scalable, easy-to-use software framework conceived to solve "big data" problems. As compared to other products, ADIOS significantly reduces the input or output complexities encountered by scientists running on high performance computers, along with reducing their time to solution, which allows researchers to spend more time achieving scientific insight and less time managing data. The software streamlines workflows and lays the foundation for exascale supercomputers to be able to run multiple tasks simultaneously.

■ Da Vinci Fuel-in-Oil, or DAFIOTM, Measurement System, developed and jointly submitted by Da Vinci Emissions Services Ltd., Cummins Inc. and an ORNL team that includes James Parks, William Partridge and David Sims.

The DAFIOTM system uses a fiber optic probe to obtain real-time measurements of oil in an operating engine to quantify the fuel dissolved in the lubricant oil. During advanced combustion techniques for improved fuel efficiency and emissions control, fuel can enter the lubricating oil, which is a concern for engine durability. The DAFIOTM technology enables combustion engineers to rapidly assess any issues related to fuel dilution of oil during development of efficient, clean and reliable engines.