Science & Technology HIGHLIGHTS

Published by Oak Ridge National Laboratory's EERE and OE Programs

No. 2 2007

ORNL Research Results in Industrial-size Energy Savings

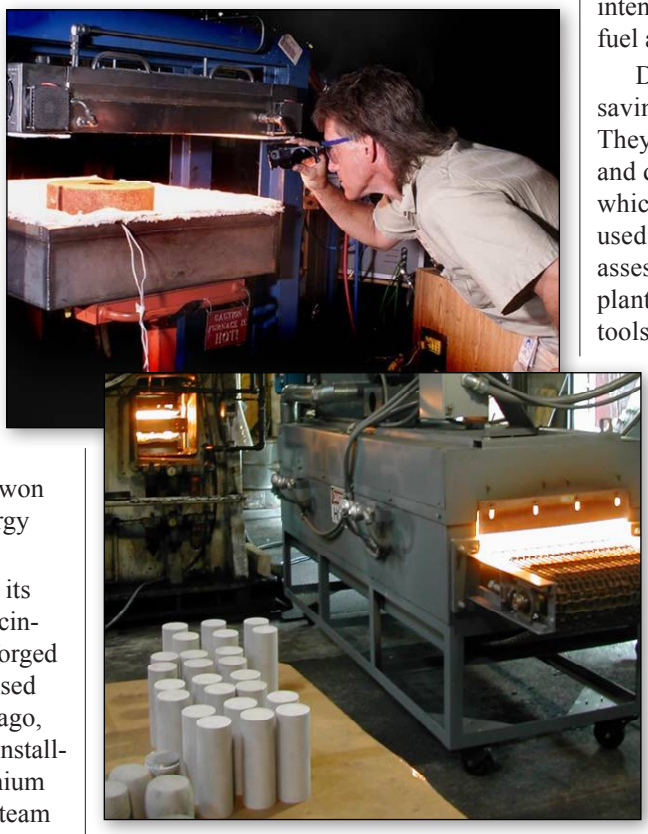
Because industry consumes a third of the energy used in the United States, researchers at ORNL are developing novel materials and technologies to reduce industry's consumption of oil, natural gas, and electricity.

For example, an ORNL team led by Vinod Sikka, along with industrial partners, developed an aluminum-bronze copper alloy to replace carbon steel in water-cooled components such as the "skirt" portion of large furnaces used to make steel. Whereas a carbon steel skirt might require up to 50 maintenance shutdowns over 20 months, a skirt made of the new alloy required none in a trial at the Republic Engineered Products plant in Lorain, Ohio. The alloy is expected to increase the lifetime of a skirt by six times.

Reduced maintenance has saved Republic 5.3 billion Btu per year, valued at $39,750. Republic expects to save another 4 billion Btu per year after installing other components made from the new alloy. The production increase from fewer shutdowns is expected to generate an additional $12 million in revenue annually. This work won the Ohio Governor's Award for Energy Efficiency in 2006.

With assistance from ORNL and its partners, Queen City Forging in Cincinnati is now producing high-quality forged aluminum rotors for turbochargers used in truck diesel engines. Three years ago, U.S. diesel engine companies were installing turbochargers using heavier titanium rotors purchased abroad. An ORNL team headed by Craig Blue developed a new hybrid infrared heating system for Queen City that rapidly and uniformly heats aluminum alloy billets before forging. Compared with conventional gas-fired convection and induction furnaces, rapid infrared heating is more than three times as energy-efficient, reduces preheating time by an order of magnitude, and produces finer-grained forgings with superior mechanical properties. The increased throughput and improved consistency of the product's mechanical properties reduced the cost by 40 to 50%.

ORNL and its partners on that project (Northeastern University, Queen City Forging Co., Komtek, Forging Industry Association, and Infrared Heating Technologies) were presented the Ohio Governor's Emerging Technology Award in 2005. The group also received an R&D 100 award for the technology in 2004.



Infrared furnaces and ovens are faster, use less energy, and produce a more durable product.

Conserving Btus

When Energy Secretary Samuel Bodman established the "Save Energy Now" initiative in autumn 2005, DOE's Industrial Technologies Program called on ORNL's BestPractices Support Team for help. ORNL was asked to send efficiency experts to 200 of America's most energy-intensive factories to advise on conserving fuel and using energy efficiently.

DOE's teams conducted 200 energy savings assessments by the end of 2006. They focused on industrial steam systems and direct-fired process heating systems, which consume about 75% of the energy used in large industrial plants. In each assessment, a specialist worked with plant leaders over 3 days. DOE software tools were used to quantify energy savings opportunities in targeted areas such as improving insulation; modifying steam turbine operation; recovering and reusing flue gas heat; and installing an integrated cooling, heating, and power system to capture and use waste heat.

The value of the potential plant energy savings identified by the assessments was $494 million annually, an average of $2.4 million for each plant assessed. Potential natural gas savings identified amounted to 52 trillion Btu per year—equivalent to the natural gas used by 725,000 typical U.S. homes.

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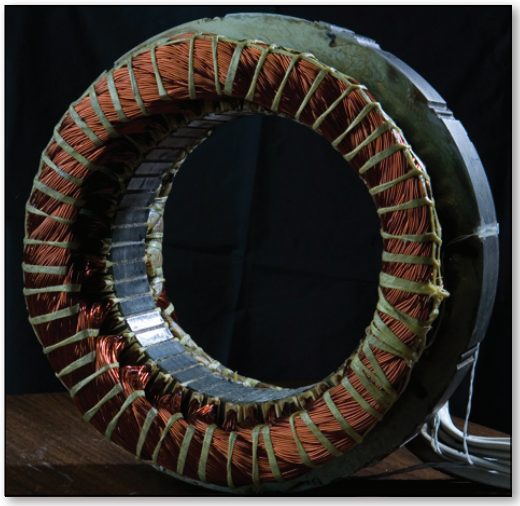
ORNL Is Key Player in Power Electronics Research Grants

ORNL is a partner on two of five grants awarded by DOE recently for next-generation vehicle research to support hybrid, plug-in hybrid, and fuel cell vehicles. ORNL's Power Electronics and Electric Machinery Research Center (PEEMRC) will conduct the research.

The five 3-year projects will support advanced electronics and motor technologies to help bring hybrid electric vehicle (HEV), plug-in HEV (PHEV), and fuel cell vehicle applications to market. They are a part of President Bush's "Twenty in Ten" plan for developing alternative and renewable energy sources to reduce U.S. gasoline consumption by 20% within a decade. DOE funding for the five winning bids will be up to $19 million. The industry cost share will bring the total funding for the effort to $33.8 million for FYs 2007–2010.



Technologies developed at ORNL's PEEMRC, such as this motor stator, support R&D to bring hybrid and fuel cell vehicles to market.

ORNL will team with Delphi and other partners for research on high-temperature 3-phase inverters to control and regulate the speed of electric motors. ORNL's contribution will be modeling and simulation of silicon carbide–based inverters, SiC device testing and characterization, and the prototype inverter testing, said Laura Marlino, FreedomCAR and Vehicle Technologies Technical Program Director. ORNL is also a partner on a GM project to develop a combined traction motor and inverter that is lighter, smaller, more efficient, and less expensive. PEEMRC researchers will work on various system design issues, Marlino said.

High-temperature operation of power electronics in electric drive systems is a key issue, Marlino said. Automakers want to eliminate the extra cooling loop now used to cool power electronics and instead use the coolant from the engine cooling system at about 105°C. The current generation of power electronics cannot operate for long at that temperature, and PHEVs require electronics that can operate even longer at higher temperatures than those in HEVs because of their prolonged operational duty cycles.

PHEVs have batteries that can be recharged by plugging them into a regular household electrical outlet, along with a backup internal combustion engine. Because electricity costs less per mile traveled than gasoline, PHEVs will cost less to drive than conventional vehicles. Additionally, electricity generation emits less pollution than gasoline combustion and refining, so PHEVs will help alleviate air pollution and greenhouse gas emissions.

Working in partnership with industry is extremely valuable for PEEMRC, Marlino noted. "It's an opportunity for us to reinforce our industrial relationships, which helps ensure that resulting technologies are readily deployable when mature."

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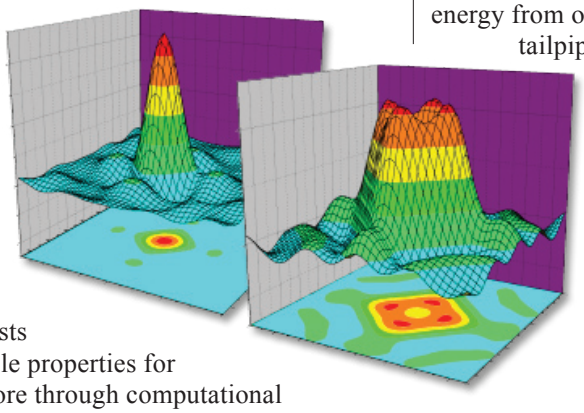
Sponsor: DOE/EERE Office of FreedomCAR and Vehicle Technologies

ORNL Explores Custom-designed Materials

Imagine being able to have your special materials "tailor-made" to fit the requirements of your application. ORNL's "Materials by Design" effort is exploring that concept and plans a significant thrust in thermoelectric materials.

Materials by design, a theory and computation-driven approach, is not a new concept. However, advances in materials theory, high-performance computing, and specialized characterization tools now make it possible to design materials from first principles modeling of the electronic structure of the constituent atoms. Using materials by design principles, scientists can compile a list of desirable properties for given applications and explore through computational simulation which combinations of materials would provide the targeted result. This contrasts with a traditional trial and error approach, which adds costs and cycle time.



ORNL hopes to demonstrate the approach for DOE in the design of thermoelectric materials (materials that directly convert heat to electricity). Thermoelectric-based devices recover energy from otherwise wasted heat in vehicles (e.g., from the tailpipe and radiator). Vehicles waste huge amounts of potentially recoverable heat energy—DOE estimates the U.S. transportation sector contributes about 38% (21.2 quadrillion Btu) of the waste heat from primary energy sources in our economy.

Images such as this one, generated by the neutron crystallography analysis technique, can be used to study the atomic structure of thermoelectric materials.

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Materials Innovations at ORNL Win Three R&D 100 Awards

Research and development funded by ORNL's EERE and OE programs won three R&D 100 Awards in 2007. A total of six awards went to ORNL researchers in all fields. *R&D Magazine* presents these awards annually to the year's most technologically significant new products.

Cast Nickel Aluminide

Cast nickel aluminide for improved productivity of steel heat-treating furnaces was developed jointly by ORNL, its industrial partners Duraloy Technologies and Mittal Steel USA, and consultant Anthony Martocci. Vinod Sikka and Michael Santella of the Materials Science and Technology Division and Jeffrey McNabb of the Fabrication Division were the ORNL staff named in the award.

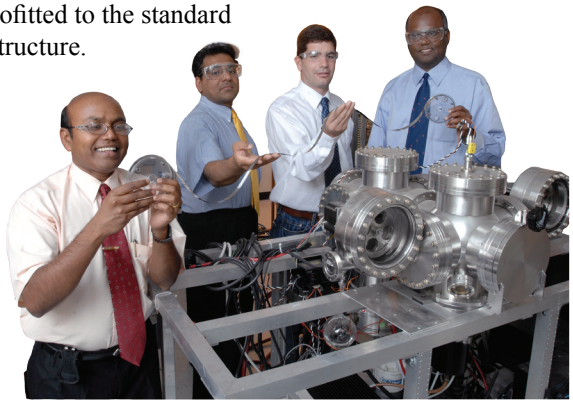
Cast nickel aluminide has a unique combination of high-temperature strength and oxidation resistance, which is critical for continuous operation of steel plate heat-treating furnaces. The nickel aluminide eliminates the need for frequent furnace shutdowns, provides significant energy and cost savings, and reduces CO_2 emissions from steel plants.

The research was sponsored by DOE's Industrial Technologies Program.

Left to right: Michael Santella, Jeffrey McNabb, and Vinod Sikka, all of ORNL.

LMO-enabled HTS Wires

High-performance lanthanum manganese oxide (LMO)-enabled high-temperature superconducting wire (LMOe-HTS) is a high-current superconducting wire with the strength, flexibility, fabricability, throughput, and low cost needed for power-grid applications, including coils and motors. The wire set three world records for superconducting capacity in 2006. As replacements for copper power cables, cables made from the ORNL/SuperPower wire will carry more electricity much more efficiently and can be retrofitted to the standard grid infrastructure.

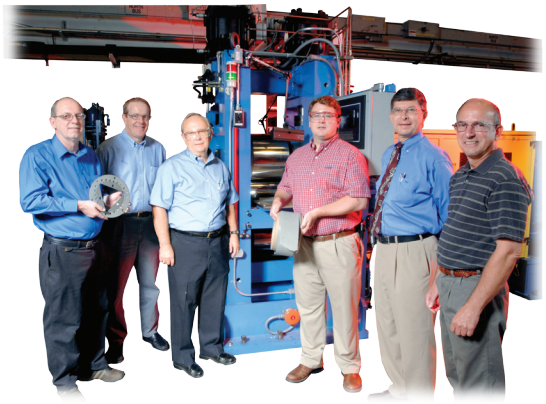


Left to right: Parans Paranthaman, Amit Goyal, and Tolga Aytug, all of ORNL, and Venkat Selvamanickam of SuperPower.

LMOe-HTS was developed by Parans Paranthaman and Tolga Aytug of ORNL's Chemical Sciences Division and Amit Goyal of the Materials Science and Technology Division and by industrial partner SuperPower, Inc. The project was funded through DOE-OE's High Temperature Superconductivity R&D Program.

The Armstrong Process

The Armstrong Process is a new method of producing titanium powder that reduces costs significantly. The process extracts titanium from ore much less expensively than conventional methods, making titanium feasible in many new applications. It is the most significant development in the titanium industry in 50 years. Unlike other methods, it can produce titanium continuously. The strength, low mass, and corrosion resistance of titanium make it ideal for many applications, but it has been prohibitively expensive until now because of the difficulty and expense of processing it.



Left to right: Jim Kiggans, Craig Blue, Art Clemons, William Peter, Phil Sklad, and Stephen Nunn, all of ORNL.

The Armstrong Process research was conducted by Craig Blue, Jim Kiggans, Stephen Nunn, and Phil Sklad of ORNL's Materials Science and Technology Division; ORNL postdoctoral fellows William Peter and John Rivard; Art Clemons of ORNL's National Security Directorate; and International Titanium Powder and other industrial partners. Funding sources included DOE-EERE's Office of FreedomCAR and Vehicle Technologies.

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S&T Highlights is a communication of Oak Ridge National Laboratory's *Energy Efficiency and Renewable Energy (EERE), and Electricity Delivery and Energy Reliability (OE) Programs*

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Oak Ridge National Laboratory is managed by UT-Battelle for the U.S. Department of Energy under contract DE-AC05-00OR22725.

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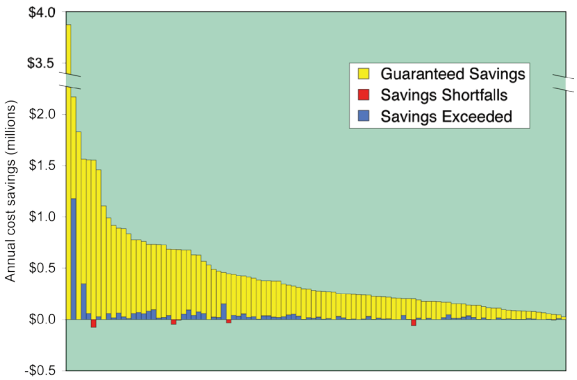
Study Shows Super ESPC Savings Exceed Expectations

A team of ORNL researchers has completed the first stage of a three-tier evaluation of savings achieved through DOE's Super Energy Savings Performance Contracts (Super ESPCs). The data show the energy savings are exceeding expectations.

Federal agencies use Super ESPCs to finance energy projects, with guaranteed cost savings paying for energy improvements over the term of the contract.

The evaluation uses a three-tier, nested design, with increasingly more intensive and rigorous methods being applied to smaller and smaller samples. In this first stage of the analysis, predicted and guaranteed Super ESPC cost and energy savings were compared with the savings reported in the latest annual measurement and verification reports for all ongoing Super ESPC projects. For the 100 reports that contained sufficient information to make the comparison, the total guaranteed cost savings for the reporting periods covered was $42.9 million, and the total reported cost savings was $46.4 million. In the aggregate, the projects reported 108% of their guaranteed cost savings.



Most of the 100 Super ESCP projects met or exceeded their cost savings guarantee.

For 91 of the projects, estimated savings (on which contractors base the guaranteed savings) could be compared. For this group, ESPC contractors guaranteed about 91% of the estimated cost savings, and projects reported achieving about 99%.

These results are important because they serve as a first-level measure of the aggregate performance of Super ESPC projects with respect to their energy conservation goals and cost savings guarantees. Until now, detailed, program-wide information of this nature has not been available.

An interim report detailing the results of this first stage of the analysis, *Evaluation of the Super ESPC Program Reported Energy and Cost Savings: Interim Report*, is available at www.ornl.gov/sci/femp/pdfs/200705_interim_report.pdf.

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Sponsor: DOE/EERE Federal Energy Management Program

ORNL Tool Measures Success of Efficiency Upgrades

ORNL researchers recently completed a new benchmarking tool for the New York State Energy Research and Development Authority (NYSERDA) that verifies energy savings in buildings after energy efficiency upgrades are completed. The tool scores the energy performance of a multifamily building relative to comparable buildings and determines whether the energy use target set for the upgrade of the building is met. If the target is met, the owner receives a financial incentive of up to several thousand dollars from NYSERDA to offset a portion of the cost of the upgrade (the amount of the financial incentive depends on the building's size).

NYSERDA and other agencies that provide monetary incentives for owners to improve their buildings need assurance that their programs are working. The new tool effectively provides this verification. The ORNL tool is enabling NYSERDA to base its incentive payments in its multifamily building program on measured performance improvements for the first time. If the program works well, it may lead to increased reliance on performance achievement for financial incentives at NYSERDA and may serve as a model for other incentive programs across the country.

The Environmental Protection Agency and Department of Housing and Urban Development also participated in the project.

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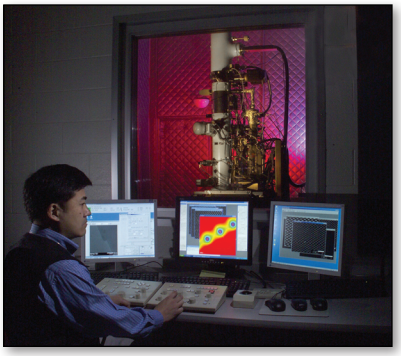
ORNL Explores Custom-designed Materials continued from p. 2

For continued advances in the conversion efficiency of thermoelectrics, significant materials barriers must be addressed. Some of the barriers occur at the atomic and molecular scale (or nanoscale), and that's where first-principles theory and computation will be especially important.

An organizing workshop at ORNL drew thermoelectrics experts from around the United States and produced a research roadmap document, *A Science-Based Approach to Development of Thermoelectric Materials for Transportation Applications*. Research funded by DOE-EERE's Office of FreedomCAR and Vehicle Technologies is expected in FY 2008. A demonstration of materials by design for catalyst materials for exhaust treatment begun in 2006 has already resulted in significant insights into how catalyst "clusters," tiny groups of atoms, behave and control the catalytic reactions.



Aberration-corrected electron microscopes are among the tools used to design materials.

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ORNL Research Helps Keep the Power Grid Humming

Although the load on the electricity delivery system has risen dramatically over the past several decades, only modest investments have been made to update it. As a result, components of the system are deteriorating as the demands on it are increasing. For example, the average transformer in service is over 30 years old, and the lead time required to replace a failed medium to large transformer and restore power is from several months to more than a year. If the aging of the system is not addressed, it could contribute to more widespread power outages and impact the safety and economic well-being of the country.

Mobile transformers must be compact enough to fit on a semi-trailer.

In response to these issues, ORNL and Waukesha Electric Systems are developing a transformer with higher power density for use in compact substations and modular power transformer systems. These modular systems— consisting of high-power-density transformers and protective equipment such as breakers and surge arresters, switchgear, monitoring, and cooling systems—are being designed to meet needs arising from regional differences in the electrical grid. (The electrical substation is the heart of the electric grid; its transformers increase or decrease voltage levels to deliver power more efficiently.) The modular system components could be mounted on separate trailers for easy transportation and would be designed for flexibility and ease of connection.

Presently, mobile transformers that can be temporarily installed in existing substations or directly connected to existing service lines are used to restore electric power service following electrical system disturbances and substation transformer failures. Because of transportation regulations and technical limits, these mobile units are restricted to a size that fits on a semi-trailer. The size restrictions limit the magnitude of emergencies that can be handled with currently available technology. The largest mobile unit currently available is nominally 50 MVA, so large transformers cannot be replaced in an emergency. Additionally, these mobile transformers cannot be used everywhere in the country because of different local requirements for voltage, power, and impedance. Since the purpose of a mobile transformer system is to reestablish electrical service rapidly following an interruption, it is clear that the capacity of mobile systems must increase to meet future demands for handling national emergencies.

To achieve the power densities necessary for higher ratings, higher voltages, and operational flexibility, transformer flux densities must be increased and insulation systems must be developed that can withstand higher operating temperatures (a rise in temperature of about 90°C). To achieve these improvements in flux densities and insulation systems, both fundamental and applications research, in addition to characterizing designs for the basic modular system, are necessary.

Higher-flux transformer steels are one method of increasing the power density of transformers and thereby reducing their size. By increasing operating flux density, it may be possible to reduce weight, volume, and price by as much as 25%. Through alloying additions and proper texturing, ORNL researchers hope to increase the saturation magnetization levels.

The use of higher-temperature insulation would allow size and weight reductions up to 30%. New insulation systems, using a combination of plastics and cellulose, are a possible solution for higher-power-density applications. The dominant dielectric materials currently used in power transformers are oil-impregnated cellulose papers, sheets, and boards using mineral or silicone-based oils. To reduce transformer size and weight and increase the operating temperature for the dielectric, other materials are needed. The temperature limitation of paper-oil is about 105ºC; the temperature requirement of a compact high-power-density transformer may be as high as 180ºC. ORNL is studying synthetic materials as potential replacements for paper and is analyzing synthetic oils as possible replacements for lower-temperature oils.

Through this partnership, ORNL is helping the federal government and industry ensure that the electric grid will provide efficient and reliable power for years to come.

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Sponsor: DOE/OE Visualization and Controls

Cover Story

Hybrid solar lighting

Journal of Industrial Ecology 11(1) (Winter 2007).

Photos of hybrid solar lighting technology developed at ORNL were featured on the cover of the *Journal of Industrial Ecology*, owned and edited by Yale University's School of Forestry and Environmental Studies and published by MIT Press. It is the official journal of the International Society for Industrial Ecology.

ORNL Develops Improved Materials for Containing Molten Metal

ORNL and its partners have developed new corrosion- and wear-resistant materials that have the potential for significant savings in energy use and production costs for the aluminum industry. Refractory corrosion and wear has long been problematic for materials used in aluminum contact applications. Deterioration of refractory materials leads to decreased thermal efficiency of the aluminum processing unit and eventual production outages, causing large energy losses. Additional energy is lost when furnaces are cooled and then reheated during the outages.

Characterization and analysis of new and currently used materials performed by ORNL, the University of Missouri, Rolla, and industrial partners led to an understanding of the corrosion and wear mechanisms associated with aluminum contact refractories. They found that the most severe reactions occur at the furnace melt line where solid refractory material is in contact with both molten metal and the gaseous species above the metal.

Vessel used in industrial trial at Energy Industries of Ohio. TCON plates are embedded in castable bonite.

As a result of the project, two new materials have been developed for improved corrosion and wear resistance, which when used in combination may also offer better thermal management in molten aluminum contact applications. A castable refractory based on calcium aluminate (bonite) was developed with industrial partner Missouri Refractory Company. The other material, an alumina/silicon carbide composition (TCON), was developed with Fireline, Inc. These materials have been validated through the exposure of material samples in an industrial setting at Energy Industries of Ohio.

These materials performed successfully for 2,000 hours with no detectable signs of aluminum penetration and no mechanical degradation due to surface cleaning of dross above the metal line. Greatly improved corrosion and wear resistance and improved thermal management are expected in aluminum contact applications for these new materials. The aluminum industry is expected to see total energy savings of over 0.55 trillion Btu per year from use of these new materials.

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Sponsor: DOE/EERE Industrial Technologies Program

Industrial-size Energy savings continued from p. 1

Wireless in the workplace

ORNL researcher Wayne Manges has been urging industry to install wireless technology to reduce energy use since 1996. Three companies are now demonstrating and evaluating wireless technology developed in a DOE program started after Manges organized a workshop at ORNL. Honeywell is developing wireless for use in oil refineries and the petrochemical industry; Eaton, for electricity distribution and electric motors; and General Electric, for use in the paper industry.

Wireless technology is safe, effective for controlling industrial processes, and relatively inexpensive, Manges says, noting that installing wiring in harsh industrial environments can cost from $40 to $2000 a foot.

Overheating of electric motors in industrial plants wastes energy and damages motor parts. Although a motor might operate for 10 years before failing, most companies replace good motors every 2 years just to avoid breakdowns. Some companies are installing wireless temperature and vibration sensors instead that detect early signs of motor failure and alert operators. This allows good motors to run longer, reducing maintenance and downtime and resulting in greater productivity.

For more information about ORNL's industrial efficiency programs, see www.ornl.gov/eere/industry.

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Sponsor: DOE/EERE Industrial Technologies Program

Calendar

Southeast Solar Summit, ORNL, October 24–25, 2007

ORNL, the Southern Alliance for Clean Energy, and other organizations are hosting the first Southeast Solar Summit in Oak Ridge, Tennessee, October 24–25, 2007. Participants from across the Southeast will share research and pathways to the marketplace through papers, workshops, and discussions on solar power.

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Details are available at www.ornl.gov/solarsummit.

Energy Efficiency and Global Forum and Exposition

The Energy Efficiency and Global Forum and Exposition will be November 11–14, 2007, in the Washington, D.C., Convention Center. The Forum will provide information on how energy efficiency can have a positive impact on every end-use sector, including transportation, buildings, and electricity generation. For more information or to register, see www.eeglobalforum.com.

Solar Technologies

ORNL and the Southern Alliance for Clean Energy are hosting the first Southeast Solar Summit on October 24–25, 2007, at the ORNL Conference Center. The purpose of the summit is to promote collaborative solar R&D and market transformation in the Southeast. A technical report will be prepared as an outcome of the Summit.

Participating organizations include DOE, Tennessee Department of Economic and Community Development, Solar Energy Industries Association, Solar Electric Power Association, Sharp Solar, Lightwave Solar Electric, Sterling Planet, Lakeland Electric, Tennessee Valley Authority (TVA), Florida Solar Energy Center, North Carolina Solar Center, and Georgia Institute of Technology.

This summer, in preparation for the Summit, ORNL's solar team is installing new hardware around the ORNL campus. Highlights of those activities include the following:

- **PV (photovoltaics)**—A new ORNL user center will be unveiled at the Summit: the Center for Advanced Thin Film Solar Cells. In addition, there will be a dedication ceremony near the ORNL Visitor Center for a new 5 kW PV system provided by Arizona Public Service.
- **CPV (concentrating photovoltaics)**—An industry partner, JX Crystals, is installing a CPV panel for beta tests.

Arizona Public Service single-axis tracker

- **Hybrid solar lighting**—This innovative technology (2006 R&D 100 Award winner) was developed, patented, and licensed by ORNL to Sunlight Direct, Inc., and is in the final year of R&D and testing.

Additional information is at www.ornl.gov/solarsummit.

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Sponsor: DOE/EERE Solar Technologies Program

Three Tours and Workshop Bonus for Summit Attendees

- Tour of near-zero energy homes at the Habitat for Humanity subdivision in Lenoir City, TN.
- Tour of Buffalo Mountain Wind Farm (provided by TVA).
- Tour of the Spallation Neutron Source.
- Workshop on Hybrid Solar Lighting (provided by Sunlight Direct, Inc.)

Staff Honors

Greene Receives Barry D. McNutt Award

David Greene, an ORNL Corporate Fellow, received the Society of Automotive Engineers International's Barry D. McNutt Award for Excellence in Automotive Policy Analysis. The award recognizes outstanding contributions to the development of efficient and effective federal policies related to the automotive sector. Greene conducts transportation and energy policy research at ORNL.

Goyal and More Elected Fellows of the American Ceramic Society

Amit Goyal is an ORNL Distinguished Scientist and Battelle Distinguished Inventor, whose election as fellow recognizes his achievements in high-temperature superconductivity (HTS) R&D. His work on developing the science and technology for long-length, high-performance, low-cost uniform HTS wire has been recognized by a number of prestigious awards, including R&D 100, Nano50, and Energy 100 awards.

Karren L. More is an ORNL scientist whose election as fellow recognizes her expertise in the research areas of silicon-based ceramic matrix composites, electron microscopy of ceramics and interfaces, catalyst characterization, and fuel cell materials. Both Goyal and More will be formally recognized during the American Ceramic Society's 109th annual meeting in Detroit.

Martin receives President's Call to Service Award

ORNL high-temperature superconductivity research staff member Patrick M. Martin has received the President's Call to Service Award—the highest level of recognition in the President's Volunteer Service Award Program. Martin received the award for his work in youth achievement, parks and open spaces, and healthy communities.

Best Poster Award Named for Blau

The organizing committee for the series of International Conferences on Wear of Materials has named its Best Conference Poster Award after ORNL staff member Peter Blau, a long-time contributor to the FreedomCAR and Vehicle Technologies Program. The first "Peter J. Blau Best Poster Award" will be given in 2009 in Las Vegas, Nevada.

ORNL Project Wins Best Paper Award

A team led by Jim Keiser has won its eighth best paper award for research on materials for recovery boilers. The award was given at the 2007 International Chemical Recovery Conference in Quebec City, Canada, for the paper entitled "Recovery Boiler Superheater Corrosion Studies." Adam Willoughby and Kim Choudhury of ORNL and project partners Joey Kish, Doug Singbeil, and Laurie Frederick were coauthors of the paper.

News Briefs

2007 Federal Laboratory Consortium Award

The ORNL's Solar Technologies Team won the Federal Laboratory Consortium's (FLC) "Excellence in Technology Transfer Award." It was presented at the 2007 FLC National Awards Ceremony in Arlington, Texas, in May. Additional information is at www.federallabs.org/pdf/2007_FLC_Awards_Program.pdf.

Alexander Praises Zero Energy Buildings Research

In a press release from his office, Senator Lamar Alexander praised the work of the ORNL Building Envelope Group on the development of zero-energy buildings. Alexander also praised the work of ORNL, Habitat for Humanity, and the Tennessee Valley Authority in designing, building, and monitoring zero-energy houses in Lenoir City, Tennessee. "Homes like these, which produce as much energy as they use, will allow us to be more efficient and energy independent," said Alexander.

ORNL NanoApplications Center Debuts at NanoNexus

ORNL's NanoApplications Center debuted to industry and university participants at the NanoNexus Meeting held at ORNL in April 2007. The event was an opportunity to show off ORNL's applied R&D capabilities in a variety of nanotechnology applications.

Speakers included Mark Deininger of C3 International, who described his company's coating technology that was developed at ORNL. He announced that C3 will be the first to lease space in the new ORNL Science and Technology Park. Emory Ford of Vision2020 spoke about the group's combined efforts with ORNL to develop equipment and techniques for real-time characterization of nanomaterials production at Luna Nanoworks.

ORNL HTS/LDRD Project Named R&D Magazine's 2007 Micro/Nano 25 Award Winner

An ORNL project entitled "Nanocomposites via Epitaxial, 3-D Self-Assembly of Nanodots of One Complex Material Within Another" was named by *Micro/Nano*, a newsletter produced by *R&D Magazine*, as one of the year's 25 top technologies. The awards recognize top micro/nano technologies of the year. Sponsored jointly by DOE-OE and ORNL Laboratory Directed Research and Development funds, this work seeks to develop fundamental scientific understanding of a self-assembled nano-heterostructure formation mechanism, as well as the technique to fabricate these "designer" nanocomposites. These nano-heterostructures comprise a novel class of materials for applications including very high-performance, high-temperature superconducting wires.

Included in This Issue:

Science and Technology Highlights
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