

Industrial Technologies Program

Oak Ridge National Laboratory (ORNL) is the lead DOE Lab for the Industrial Technologies Program (ITP). Our program works to reduce industrial energy intensity and to develop energy saving products and processes for industrial application. ORNL is a global leader in Materials Science and Technology, Reactions and Separations, Controls and Sensors, and BestPractices for Industrial Energy Efficiency. We are actively engaged with industry to reduce energy use and carbon emissions and to improve industrial competitiveness. We are currently involved in collaborative efforts with industrial partners in energy intensive processes, advanced materials, separations technologies, nanomanufacturing, alternative fuels and feedstocks, wireless sensors, industrial distributed energy, and industrial energy assessments.



ORNL-developed cast nickel aluminide rolls prior to installation

Technologies developed by ITP scientists and engineers, in collaboration with industrial partners, have won four R&D 100 Awards in the last five years.

- **Cast Nickel Aluminide for Improved Productivity of Steel Heat-Treating Furnaces (2007)**—developed a new intermetallic nickel aluminide alloy, and associated forming and joining methods, with improved strength and oxidation resistance.
- **Metal Infusion Surface Treatment (MIST) (2006)**—a process for infusing up to 51 elements into metal and alloy surfaces, MIST lengthens the life of metalworking and cutting tools, increases production rates, and reduces overall manufacturing costs.
- **TMA 6301 and TMA 4701 Steel Alloys (2006)**—enable higher temperature operation with increased durability and improved strength materials for process equipment.
- **Advanced Heating System for High-Performance Aluminum Forgings (2004)**—enables nanoscale refinement of forgings for improved performance while using less energy.

Energy Intensive Industrial Processes and Materials

By combining industrial needs with scientific research, the Industrial Technologies Program at ORNL works to reduce energy intensity by 25% over ten years and to reduce industry's carbon footprint. The program works to develop novel materials, innovative materials processing capabilities, novel joining technologies, and new energy efficient products. Current R&D areas include high-temperature processing, industrial reactions and separations, waste heat minimization and recovery, and sustainable manufacturing.

ORNL has developed numerous energy efficient high-temperature process technologies for producing metals and non-metallic minerals including, magnetic field processing for alloys, surfacing and interference metallurgy, laser assisted friction stir welding, electron beam processing, twin roll casting of advanced alloys, functionalization of nanomaterials, and nonthermal processing of composites. We also work in industry-specific applications for steel-making, aluminum, metal casting, chemicals, and forest products, and are leaders in next generation superboiler technology and the deployment of industrial wireless technologies.



ORNL –developed magnetic field processing

Nanomanufacturing

ORNL fosters the development of innovative nanomanufacturing through the discovery of new materials and processing techniques that enable control of material properties at the nanoscale. ORNL has helped developed nanoscale coatings for increased durability, developed a rapid infrared heat treatment technology for nanoscale grain refinement of forgings, pioneered laser fusing of powder coatings for nanoscale penetration and improved hardness, developed novel superhydrophobic coatings, and has developed pulse thermal processing techniques for light-emitting diodes (LED) and thin-film nano-particle photovoltaic (PV) materials. Other work includes the development of carbon materials with nanoscale porosity for use in energy storage, development of new catalysts and catalyst activation technologies, and the development of real-time nanoparticle characterization techniques for nanomanufacturing. Our goal is to enable reliable nanomaterial production, commercial manufacturing processes, and energy saving products.

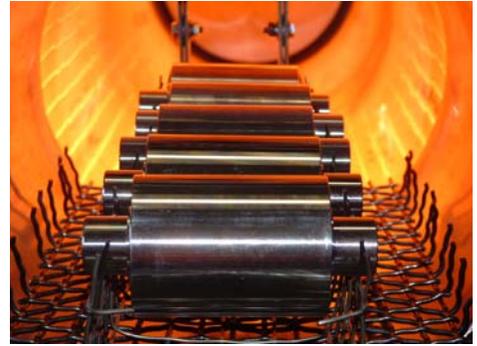
The NanoApplications Center (NAC) employs state-of-the-art facilities and multidisciplinary R&D capabilities to transition nanoscience to innovative technologies for energy, environment, and economic competitiveness. NAC fosters innovation and helps transform industry by enabling the responsible development of processes for production and application of nano-scale materials, structures, devices, and systems that provide unprecedented energy, cost, and productivity benefits.

Technology Delivery

ORNL leads in technology delivery by providing BestPractices support to industry through the Save Energy Now Program (SEN). ORNL is active in developing BestPractices training materials and leads the development of End User, Qualified Specialist training programs for steam, process heating, pump, and fan systems. ORNL guided the initial development of steam, process heating, pump, fan software tools. ORNL is a founding partner in the Southeast Industrial Energy Efficiency Coalition. ORNL's buildings experts contributed to the development of protocols for manufacturing plant certification and supports validation and training efforts. ORNL also leads in the development of metrics for technology delivery impacts for both BestPractices and Industrial Assessment Centers (IAC). ORNL supports the IAC on performance metrics, on student and alumni activities, and also supports the Secretary of Energy's China Industrial Energy Efficiency Initiative.

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Metal Infusion Surface Treatment received a 2006 R&D 100 Award



ORNL supports SEN by providing technical reviews and implementation follow-up



New Materials for Basic Oxygen Furnaces Wins 2006 Ohio Governor's Award for Energy Efficiency