METAL CASTING

Success Story

METAL CASTING TECHNOLOGY SHOWCASE

BENEFITS

The Showcase illustrated how the Industries of the Future strategy, coupled with OIT's integrated delivery strategy, is resulting in measurable energy savings, productivity improvements, and local economic development.

- Lester showcased a variety of energy savings recommendations.
- OIT, INEEL, and Lester are continuing to work together to improve the waste water separation technology.
- Initial implementation of OIT-funded research at the Lester facility is saving an estimated five billion Btus annually. Now that these measures are proven, Lester is applying them more broadly, resulting in the potential to save 30 billion Btus per year.

APPLICATIONS

The Showcase was testimony to the industry's continued progress in achieving its vision of the future. The research results applied at Lester can be applied throughout the industry. Dan Twarog of NADCA described the Showcase as a prime opportunity to demonstrate the utility of research results in a practical operation. Moreover, the Showcase demonstrated OIT's integrated delivery strategy is helping industry to improve efficiency and productivity through all facets of manufacturing and plant operations.

LESTER PRECISION DIE CASTING DEMONSTRATES ENERGY EFFICIENCY AND PRODUCTIVITY IMPROVEMENTS

The state-of-the-art in die casting technology was showcased in an event co-hosted by industry and the U.S. Department of Energy (DOE), Lester Precision Die Casting, and the North American Die Casting Association (NADCA). Lester and NADCA partner on cost-shared research through the DOE Office of Industrial Technologies Metal Casting Industry of the Future Program. The results demonstrated during the showcase illustrated the opportunities for simultaneous improvements in energy efficiency, productivity, and competitiveness. Lester Precision Die Casting is applying the results of many metal casting research efforts. It offers a model of pour, cast, extract cooling and trim cells with a just-in-time plant layout.

In a welcome letter from Energy Secretary Bill Richardson to Showcase participants, the Secretary stated that "Americans are increasingly aware of the importance of energy conservation and global competition. Organizations such as NADCA play a special role in translating both of these concepts into reality....The entire Nation benefits through the energy efficiency and technology results derived from this program." The importance of energy efficiency technologies was clearly demonstrated at the Showcase.

OIT encourages its partner industries to hold Technology Showcases to share the positive results of the IOF process. Through plant tours and poster presentations, guests saw how Lester is using computer-based tools to improve die design; how it is using advanced computer modeling to reduce die distortion during die casting; how research findings are leading to increased die life; and how it will save energy and improve waste water treatment. As stated by Allen Adams of Lester, these technologies are evidences of the company's "attempt to finding ways of achieving higher productivity and plant performance." They are "necessary to meeting the ever-increasing customer product demand."

Global Metal Technologies Inc. GMTI LESTER PDC SHOWCASE November 1-4, 1999 Lester Precision Die Casting

North American Die Casting Association NADCA United States Department of Energy

Showcase Description

Goal: Technology Showcases illustrate how industry and the Nation can achieve energy, environmental and competitiveness benefits through the successful Industry of the Future strategy. They illustrate the positive results of government-industry research performed through the IOF as well as energy efficiency opportunities in plant operations through OIT's Industrial Assessments, BestPractices and other services.

Technologies Showcased at Lester

Lester staff gave guests plant tours and poster presentations on the advanced metal casting technologies and energy efficiency measures. Technologies showcased at Lester started from the beginning of the process in terms of alloy development, through die design and modelling, die coating, die material, and plant-wide energy saving opportunities. Also, leading researchers from Case Western Reserve and Ohio State Universities gave Tech Talks on research advances.

- **Deflection of Die Casting Dies (Ohio State University)** - Dimensional problems resulted in scrap on the 1114 Ford Transmission Valve Body. Based on die deflection modeling data, Lester modified the insert and reduced scrap from 20% to 9%.

- **Simple Visualization Tools (Ohio State University)** - To reduce scrap rates on the 1136 Channel Plate, CastView (a simple model easily integrated with most 3-D CAD systems) was used to identify die design improvements. The result was a 20% extension in usable time between maintenance cycles, up to 20% less scrap, and increased production from 50 parts/hr to 60 parts/hr.

- **Aluminum Alloy-Microstructure-Performance Interaction (Worcester Polytechnic Institute)** - A higher Mg content was used with the aluminum alloy composition to achieve a light weight, high tensile strength 1111 Rack & Pinion Housing casting which met the required proof load. This has set the precedent for thinner, lighter weight rack & pinion housing designs.

- **Thermal Fatigue and Toughness of High Performance Die Steels (Case Western Reserve University)** - Based on the results of this project, KDA1 die steel was used in a test mode and determined to yield an improvement in die life of 20-30% over H-13. Lester is performing further tests to decide whether to use KDA1 and/or modified heat treatment for all future dies.

- **Evaluation of Coatings for Die Surfaces (Ohio State University)** - Major downtime occurs when cores or segments solder. NADCA recommended coatings were applied to solder problems reducing $25,000/year and 100 hours/year on one job. These coatings are being applied to 15 more jobs to reduce solder problems.

- **High Speed Milling and Pulsed ECM (Ohio State University)** - Based on the guidelines of this research, a high speed mill was purchased resulting in a 50% reduction in machining time and eliminating one full machine.

- **Waste Water Separation (Idaho National Engineering and Environmental Laboratory)** - Waste water generated from the facility consists of soaps, glycol, oils, hydrocarbons, heavy metals and silicones. There are many operational problems in the existing treatment process. Lester, OIT, INEEL and membrane companies are testing alternative methods for waste water separation.

- I**ntegrated Assessment** - A team from Rutgers, Oak Ridge National Laboratory, and West Virginia University made several energy saving recommendations including shutting down the trim compressor when not in use, reducing the pressure on the air compressor, and periodically reviewing the logic of the Programmable Logic Controller.

- **MotorMaster+** - The OIT MotorMaster+ software is being used to identify opportunities to improve motor efficiency at the facility.

- **Meta-Lax Stress Relief (Bonal Technology)** - Lester is using the Meta-Lax process for stress relief and weld repair. This process uses subresonant vibrational energy to relieve stress in metal objects, reducing energy consumption significantly when compared to gas-fired heat treating furnaces.

- **Oscillating Combustion (Institute of Gas Technology) -** OC increases heat transfer by enhancing flame luminosity and turbulence; and retards NOx formation by avoiding stoichiometric combustion. The retrofit requires the installation of an oscillating valve on the fuel line to each burner and the associated electronic valve controller. The benefits of OC and its potential in melting in other facilities were presented at the Showcase.

Showcase Attendees

Over a period of four days, 300 attendees participated in the Showcase. Many participated in plant tours and poster presentations. Types of organizations represented included:

Die Casters
Foundry Operators
Suppliers
Cast Product Customers
State and Local Development Agencies
Ohio Governor's Office
Federal Government
National Laboratories
Colleges and Universities

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