

## INDUSTRIAL TECHNOLOGIES PROGRAM

### Manufacturing Advanced Engineered Components Using Lost Foam Casting Technology

The Lost Foam Casting Process produces high value parts by consolidating several cast components into one single casting, improving energy efficiency by reducing machining and assembling costs, achieving better metal yields, reducing materials consumption by eliminating cores, and improving casting dimensional accuracy. All of these unique process features reduce the energy consumption during manufacturing.

Lost foam casting production has grown in value from about \$5,000,000 per year in 1988 to \$800,000,000 in 2002. This is the result of persistent investment by the industry with financial assistance from the DOE Industrial Technology Program to support technical developments. During this time period, many

technical issues have been resolved and the technology has been transferred to the production floor, resulting in scrap reductions from 25 percent to less than three percent.

The proposed R&D program led by a research team at the University of Alabama at Birmingham would further decrease casting scrap and mature the technology through expanding the Lost Foam marketplace. Reducing porosity and fold defects will improve (1) production efficiency, (2) mechanical properties, and (3) marketability of castings. All three benefits will reduce energy consumption in the casting process.

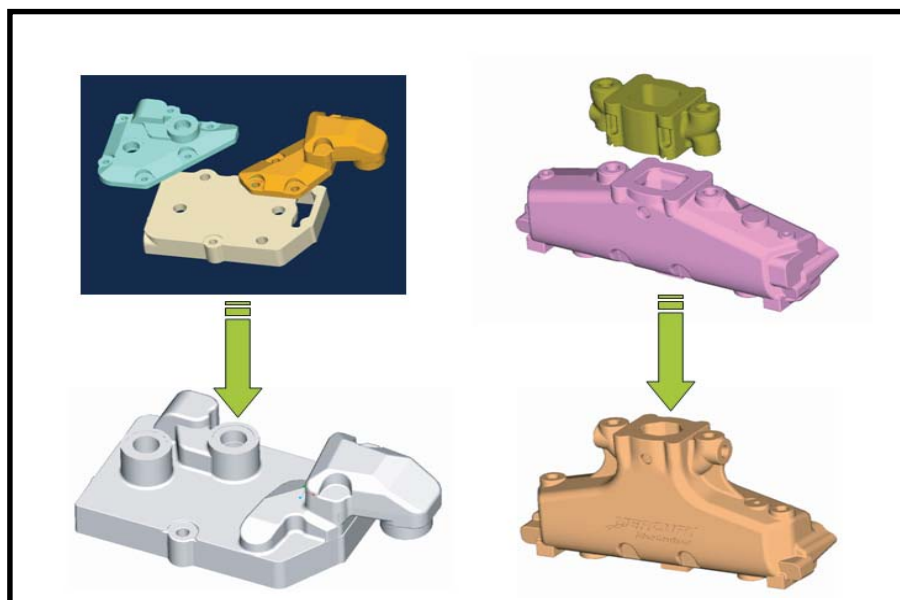


#### Benefits for Our Industry and Our Nation

- Increase lost foam casting quality.
- Improvements in production efficiency.
- Reduction in energy consumption.
- Improvement in marketability of castings.
- Reduction in scrap.

#### Applications in Our Nation's Industry

Reduced porosity and fold defects in lost foam castings will increase production efficiency, mechanical properties, and marketability of lost foam castings. The European Lost Foam Council at Paderborn University formed last year recognizes the successes of this approach for the rapid development and commercial deployment of lost foam casting technology.



## Project Description

There are five objectives listed below.

1. Increase understanding of the metal/pattern replacement process to reduce casting defects and improve computational models.
2. Improve pattern quality and consistency to reduce casting defects.
3. Develop innovative techniques to expedite pattern pyrolysis product removal to reduce casting defects and improve casting quality.
4. Develop techniques and procedures for solidification under pressure to improve casting quality for safety-critical applications.
5. Develop a design package for casting designers and implement a marketing plan to increase Lost Foam casting applications.

## Milestones

### Results to Date

1. Modeling of pattern replacement and solidification has been performed
2. A prototype tool was designed to improve pattern quality and consistency
3. Determined effects of several coating additives on pattern degradation and castings
4. Preliminary evaluation of shrinkage under pressure has been completed

### Future Milestones

1. Design Data and Marketing Plan
2. Technology transfer

## Project Partners

*University of Alabama-Birmingham*  
Birmingham, AL  
*American Founders Society*, Schaumburg, IL  
*Cast Metals Coalition Partnership*  
Charleston, SC  
*American Foam Cast*, Sylacauga, AL  
*Arena Flow*, Albuquerque, NM  
*BMWAG, Landshut*, Germany  
*Bombardier*, Spruce Pine, NC  
*Carbo Ceramics*, New Iberia, LO  
*Citation Foam*, Columbiana, AL  
*Copeland Corp.*, Chicago, IL  
*ESI North America*, Annapolis, MD  
*Flow Science*, Santa Fe, NM  
*Foseco Moval*, Bessemer, AL  
*Fundilag*, Torreón, Mexico  
*General Kinematics*, Barrington, IL  
*GM Powertrain*, Saginaw, MI  
*HA International*, Westmount, IL  
*Lovink -Terborg b.v.*, The Netherlands  
*Magma Software*, Arlington Heights, IL  
*Mercury Marine*, Fond du Lac, WI  
*Montupet*, Belfast, N. Ireland  
*Mueller Co.*, Chattanooga, TN  
*Mueller Co.*, Albertville, AL  
*Nemak*, Monterrey, Mexico  
*PSA Peugeot Citroen*, France  
*Southeastern Foundry Products*, Alabaster, AL  
*Styrochem Int.*, Fort Worth, TX  
*Teksid Aluminum*, Sylacauga, AL  
*Vulcan Engineering*, Helena, AL

## A Strong Energy Portfolio for a Strong America

Energy efficiency and clean, renewable energy will mean a stronger economy, a cleaner environment, and greater energy independence for America. Working with a wide array of state, community, industry, and university partners, the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy invests in a diverse portfolio of energy technologies.



U.S. Department of Energy

### Energy Efficiency and Renewable Energy

Bringing you a prosperous future where energy is clean, abundant, reliable, and affordable

Last updated: 2005