

# METALCASTING

Success Story



## META-LAX STRESS RELIEF PROCESS SAVES ENERGY

### BENEFITS

- Reduces energy consumption by up to 98% compared with natural-gas fired heat treatments
- Operates on standard line voltage
- Requires nearly 98% less time for stress relief
- Reduces production costs and weld cracking by approximately 95%
- Offers comparable or better work piece performance than thermally stress-relieved parts
- Portable and lightweight for on-site treatment
- No part size or weight limitations

"The DOE grant has given us credibility, to a certain extent, away from being an unknown, unendorsed company, that just created a better mousetrap."

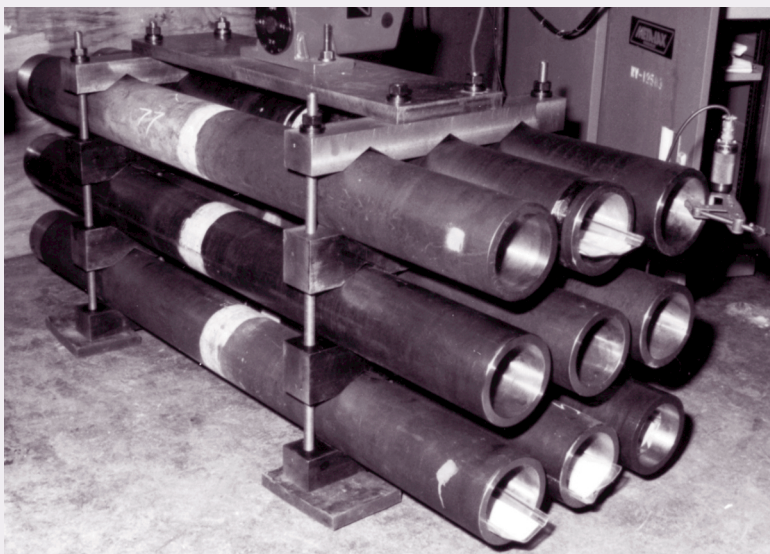
— Tom Hebel, Vice President,  
Bonal Technologies, Inc.

## META-LAX STRESS RELIEF METHOD GREATLY REDUCES ENERGY CONSUMPTION AND ELIMINATES POLLUTION

It's nearly impossible to go through an entire day without coming in contact with an item that was produced from metal tooling. The cars we drive, the appliances we use, and the water heaters that warm our homes were all manufactured using metal tooling. The manufacturers of the products we use rely heavily on tooling for manufacturing quality products. And, consumers expect these products to last.

Items that have been manufactured through fabricating, forging, casting, or machining are typically stress-relief treated to ensure that the metals hold up under the pressure of daily wear and tear. Thermal stress is the result of a sharp temperature drop during metal processing and it can create distortion and premature cracking. "Stress relieving" reduces these problems. But, the most common method of stress relief has problems of its own. Heat treatment is costly, both in terms of time and energy. It may take hours or days to treat metal items in a furnace and those hours and days of furnace time equal large amounts of fuel that must be burned.

### META-LAX STRESS RELIEF PROCESS



(photo courtesy of Watervliet Arsenal)

The Meta-Lax process is currently being applied at the U.S. Army's Watervliet Arsenal. Use of the process for one weapons system alone created \$230,000 in annual energy savings and eliminated approximately 50% of product waste derived from heat treatment distortion.



## Solution

Bonal Technologies has created a solution to the stress relief dilemma with the help of a grant funded by the Inventions and Innovation Program through the Department of Energy's (DOE) Office of Industrial Technologies. The company's patented Meta-Lax process relieves thermal stress within metal components by using nondestructive, highly efficient sub-harmonic vibrations to prevent distortion and cracking. The \$65,000 grant awarded in 1989 gave Bonal Technologies the chance to refine and prepare its process for the marketplace, including third-party documentation.

Meta-Lax, short for "metal relaxation," is a proven substitute for 80% to 90% of heat-treatment stress relief in metal working applications. It improves the inconsistencies of the previous resonant-vibration technology by using more efficient, more consistent "sub-harmonic" vibrational energy, which is the optimum vibration stress-relief frequency.

Meta-Lax treats a wider variety of work pieces with a versatile, portable unit and yields results much more quickly than conventional, stationary heat-treating furnaces. Conventional heat treatments may require over 6 hours while the Meta-Lax process requires about 30 minutes on average.

## Results

The Meta-Lax process was commercialized in 1991 and approximately 1200 units are currently operating in the United States. Payback time is estimated to be between 6 and 9 months. The United States Army reports a \$230,000 annual return on investment for their investment in this technology.

According to DOE's Office of Industrial Technologies *Impacts* publication, the Meta-Lax stress relief process was rated the second highest energy saving technology from over 100 new energy savings products monitored in 1997, saving an estimated 13.6 trillion Btu. Meta-Lax's energy savings represent about 12% of the total energy savings of all companies listed in the *Impacts* document.

Bonal Technologies develops sub-harmonic vibrational metal stress relief and welding conditioning technology. Bonal Technologies employs 23 people and has annual sales of approximately \$2 million.



The Inventions and Innovation Program works with inventors of energy-related technologies to establish technical performance and conduct early development. Ideas that have significant energy savings impact and market potential are chosen for financial assistance through a competitive solicitation process. Technical guidance and commercialization support are also extended to successful applicants.

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## INDUSTRY OF THE FUTURE—METAL CASTING

*The metal casting industry – represented by the American Foundrymen's Society (AFS), North American Die Casting Association (NADCA), and the Steel Founder's Society of America (SFSA), has prepared a document, "Beyond 2000," to define the industry's vision for the year 2020. OIT's Metal Casting Vision Team partners with metal casters, national laboratories, universities, and trade/environmental/technical organizations to develop and implement energy efficiency technologies that benefit both the industry and the United States. Recently, the Metal Casting Team facilitated the development of the Metal Casting Technology Roadmap, which outlines industry's near-, mid-, and long-term R&D goals.*

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