

WHY-12?



MICROWAVE and PROCESS TECHNOLOGIES

Microwave Technologies

The Y-12 National Security Complex is considered a “world leader” in microwave metal and ceramic processing technologies. Y-12 has more than 50 patents and disclosures in the field of microwave research and four licensing agreements. The number of industrial partners surrounding Y-12 in the field of microwave technology is growing dramatically.

Microwave metal melting and processing techniques developed at Y-12 are providing extraordinary potential for metalworking and ceramic capabilities. Y-12 is exploring the range of industrial processing that can benefit from applications of our advancing microwave technologies.

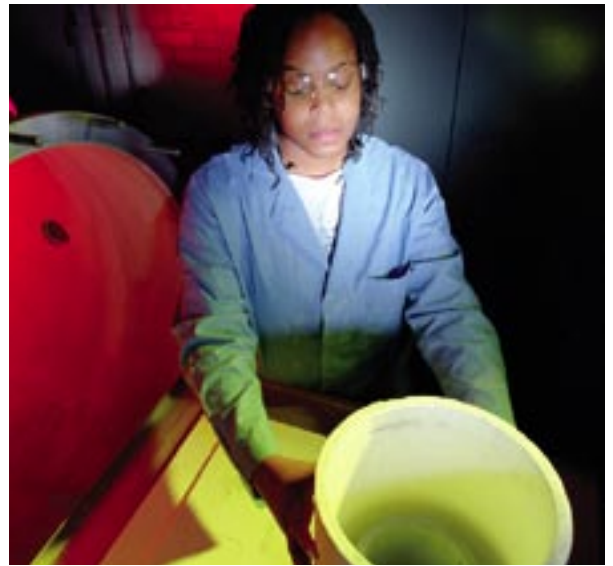
Y-12 now has five R&D microwaves and has placed a production-scale prototype unit in a manufacturing area to augment current capabilities. Y-12 has demonstrated fluidized bed processing, heat treating, production

of nano-structured materials, and other innovative applications. We are also actively involved in desktop tools for cavity modeling, crucible optimization, energy mapping, and conservation. Y-12 is infusing microwave melting of metals into production to replace other, inefficient heating techniques.

Recently, Y-12 has made vast improvements in ceramic systems that make microwave technology possible and has found ways to heat other materials that do not

readily lend themselves to microwave processing. We have also found ways to control localized overheating and other over-temperature problems.

Y-12 is continuing to investigate areas as diverse as ceramics, nanotechnology, material properties, welding, metal processing, ore and oxide conversion, and plasma generation and control technologies.



A Y-12 engineer loads a microwave furnace prior to a test melt



Stainless-steel melt demonstrates energy-efficient microwave melting techniques

CAPABILITIES

| Unit | Frequency (GHz) | Power (kW) | Chamber dimensions | Materials |
|------------------------------|-----------------|------------|------------------------------|-------------------------------|
| Ceramics sintering prototype | 24 | 5 | 0.84 m diam 0.87 m length | Ceramics |
| Large prototype | 2.45 | 30 | 1.8 m diam 3 m length | Metals |
| Rectangular | 2.45 or 28 | 48 | 1.5 m x 1.3 m x 3.6 m | Metals, ceramics |
| Medium (2) | 2.45 | 12 | 1 m diam 1.4 m length | Metals |
| Table top | 2.45 | 12 | 0.72 m diam 0.81 m length | Ceramics, metals/ polymers |

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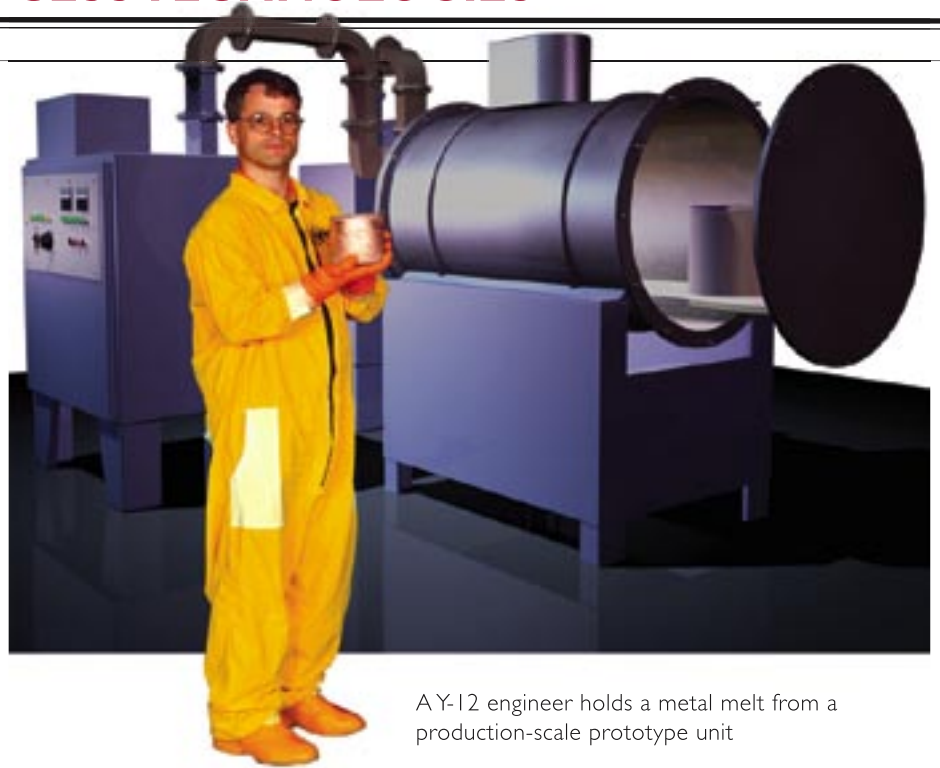
Microwave Casting

Y-12 is working with microwaves to develop the next-generation of casting methods for melting metals. A production unit is now deployed in manufacturing operations for production processing studies.

Microwave casting is safe, energy efficient, and easy to maintain and produces high-quality metal with significantly fewer inclusions and carbon contamination versus vacuum-induction melting in existing furnaces. Other production applications will follow successful deployment.

Partnerships

Y-12 is working closely with local industry, Tennessee State University and the Oak Ridge National Laboratory to explore the range of potential industrial processes that can benefit from the application of microwave technologies. With these partnerships, Y-12 is working to make



A Y-12 engineer holds a metal melt from a production-scale prototype unit

the Tennessee Technology Corridor a hub for the development of microwave technology.

In the industrial and commercial area, a mentor-protégé agreement has been signed with MS Technologies, Inc., of Oak Ridge, and there are several commercial licenses with other companies to move this technology into the marketplace. Y-12 now has licensing agreements with Microwave Synergy, Tesla USA, and Microwave Materials Technologies.

The energy savings to U.S. industry in using microwaves to heat metals could be billions of dollars. The casting industry alone is a \$20 billion per year industry that spends about \$11 billion per year on heating costs for melting metals. Microwave casting could cut that cost by 30%. That equates to an annual savings of over \$3 billion.



Y-12 interns working with microwave at MS Technologies, Inc.



Microwave Synergy staff with Y-12 engineers