

EWI Public Private Partnership

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Chief Technology Officer

Topics

- EWI Overview
- Founding and transition from I/UCRC
- Ongoing university collaboration
- Ongoing private/public partnership examples



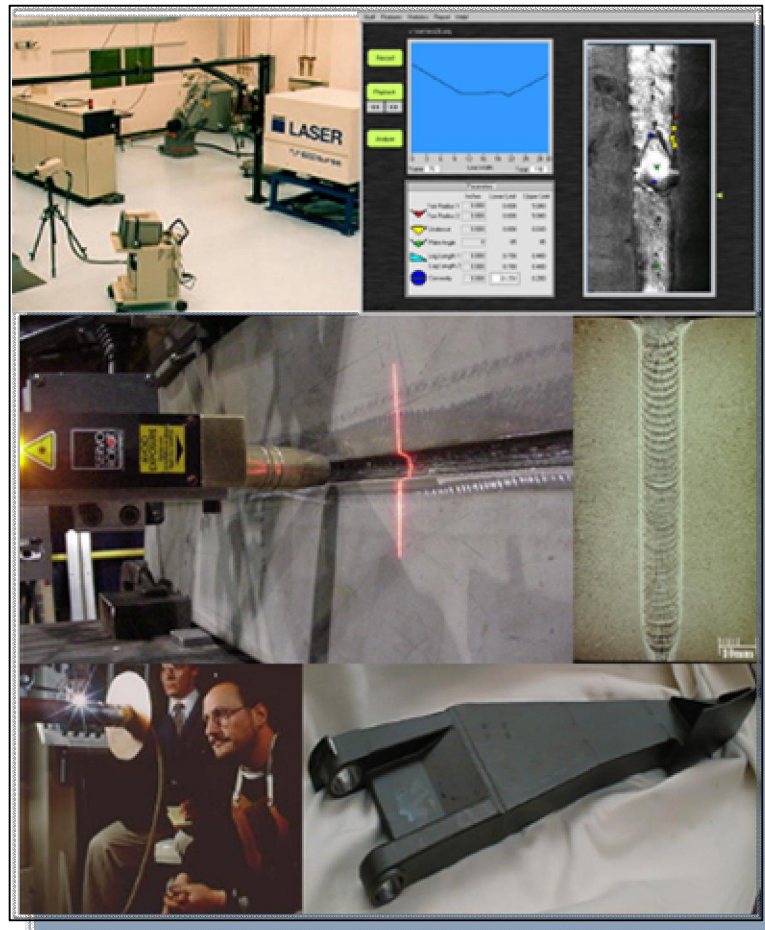
EWI Overview



- Independent non-profit 501(c)(3) corporation
 - Most extensive materials joining expertise and capabilities in US
 - 140 staff; 132,000 sq. ft. facility; >\$25M in Capital Equipment
 - > \$25M annual revenue
- Member based
 - > 200 member companies; thousands of plant locations
 - Industry Advisory Board identifies needs and research priorities
- Core business is customer sponsored projects
 - > 500 projects / year
 - Focus on technology development and insertion
- Strong industrial relationships:
 - Advanced energy, automotive, aerospace, heavy manufacturing, defense, oil & gas, etc.
- Government-funded technology development:
 - DOE, NASA, DOT, Navy, Army, Air Force, etc.



EWI Mission



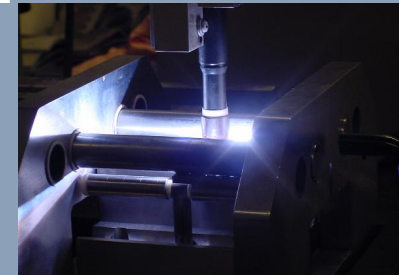
Advance Our Customers' Manufacturing Competitiveness through Innovation in Joining and Allied Technologies

Innovation is Our Product



Translational R&D

EWI Overview



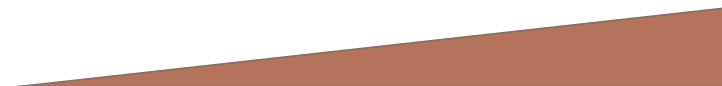
University



EWI



Industry



Concept

Feasibility

Development /
Validation

Implementation

Continuous
Improvement



Extremely Abbreviated History

- 1977:
 - American Welding Society (AWS) strategy conference identifies need for a US welding institute
- 1980:
 - NSF I/UCRC Center for Welding Research established at The Ohio State University
- 1983:
 - Ohio Edison Technology Center program in response to manufacturing down-turn
- 1984:
 - Edison Welding Institute incorporated
- 1985:
 - Business begins to take off; Growth in membership, staff, and technical capability
- 1993:
 - First major federal program; Navy Joining Center (NJC)
- 1996:
 - EWI moves into new purpose-build facility in OSU Research Park
 - Also home to OSU's Welding Engineering laboratories
- 2007:
 - Private / public partnerships becomes strategic focus
- 2010:
 - EWI / AWS strategy conference to explore new public/private collaboration approaches



EWI Start-up Success Factors

- **Champion with a Vision**
 - OSU WE Department Chair, Dr. Karl Graff (later EWI's second Executive Director)
- **Separate Corporate Entity**
 - Outside of the university structure
 - Focus on commercial business growth and financial sustainability
- **Location**
 - Located in manufacturing heart land within 450 miles of over 70% of US manufacturing
 - Proximity to OSU supported talent attraction
- **Timing**
 - Need for a US welding institute had been identified
 - US exiting from the last great recession



EWI Start-up Success Factors

- **Key Private/Public Partnerships**
 - Battelle Memorial Institute, The Ohio State University, Ohio Department of Development, The Welding Institute (UK)
- **Facility**
 - OSU acquired and renovated a facility for EWI
- **Credible Capabilities**
 - BMI, TWI, and OSU contributed staff, equipment, research base, and other support; provided “critical mass” of capabilities
- **Start-up Funding**
 - State of Ohio Edison Technology Center program provided major start-up funding
- **Customers**
 - 85 TWI US members transferred to EWI
 - OSU-WE alumni network helped expand customer base

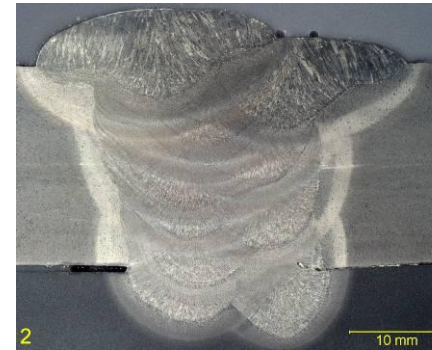
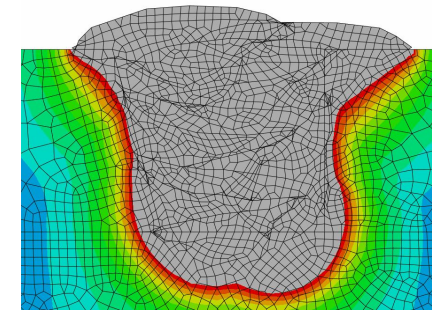


Battelle



On-going EWI / OSU Collaboration

- OSU representatives on EWI boards
- EWI facility houses OSU-WE laboratories
- Access to technical capabilities
- EWI is a member of three OSU centers and contributes to many more
- Jointly host conferences and workshops
- Joint EWI staff / OSU faculty appointment
- EWI support for undergraduate and graduate student projects
- Joint proposals and EWI subcontracts



EWI on-line weld modeling tools hosted by OSU super computer center



EWI Today: Leading many public / private partnerships

- Targeted technology development efforts
 - Friction stir welding
 - Ultrasonic additive manufacturing
 - Hybrid laser-arc welding
- Centers
 - Navy Joining Center
 - Ohio Edison Center
 - DOE Advanced Energy Manufacturing Center
- Consortia
 - Nuclear Fabrication Consortium
 - Additive Manufacturing Consortium (new)



Targeted Technology Development

Friction Stir Welding (FSW):

- Emerging solid state welding process
- EWI leveraged Ohio Edison Center and internal funding to develop initial capability
- Series of multi-million dollar programs to advance the technology
 - Navy program with amphibious vehicle manufacturer
 - Air Force program with aircraft engine manufacturer
 - Army program with armored vehicle manufacturer
 - Army contractor implements large FSW machine into production in 2009
- EWI is a leader in FSW of hard metals with many commercial and defense applications



EWI FSW System



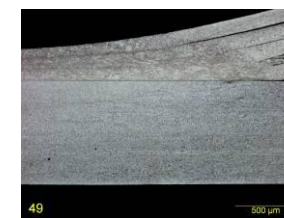
Amphibious vehicle



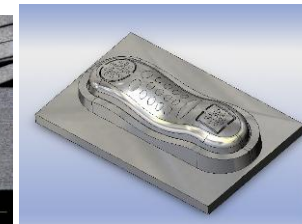
Targeted Technology Development

Ultrasonic Additive Manufacturing (UAM):

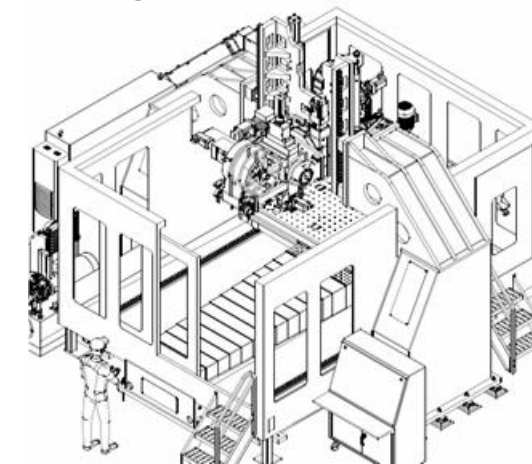
- Novel technology to build net-shapes by solid-state deposition
- Leveraged internal funding to develop initial capability
- Multi-year program to develop next generation high-capacity system
 - \$2.5M Ohio Wright Project
 - Multiple industry / federal government partners providing cost match
 - University collaboration to understand fundamental bonding mechanisms
 - Working with partner to commercialize
- EWI global leader in high-power UAM



Titanium deposit



Net-shape



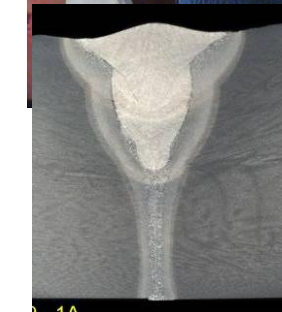
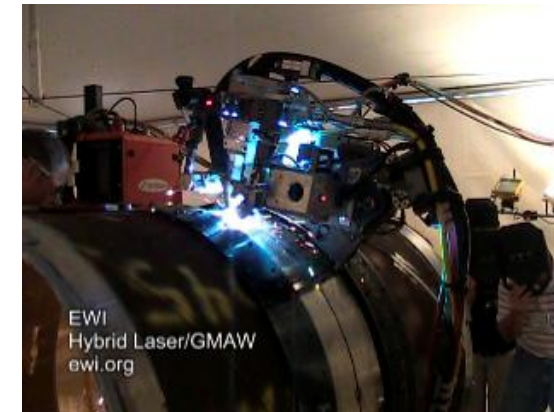
Next generation System



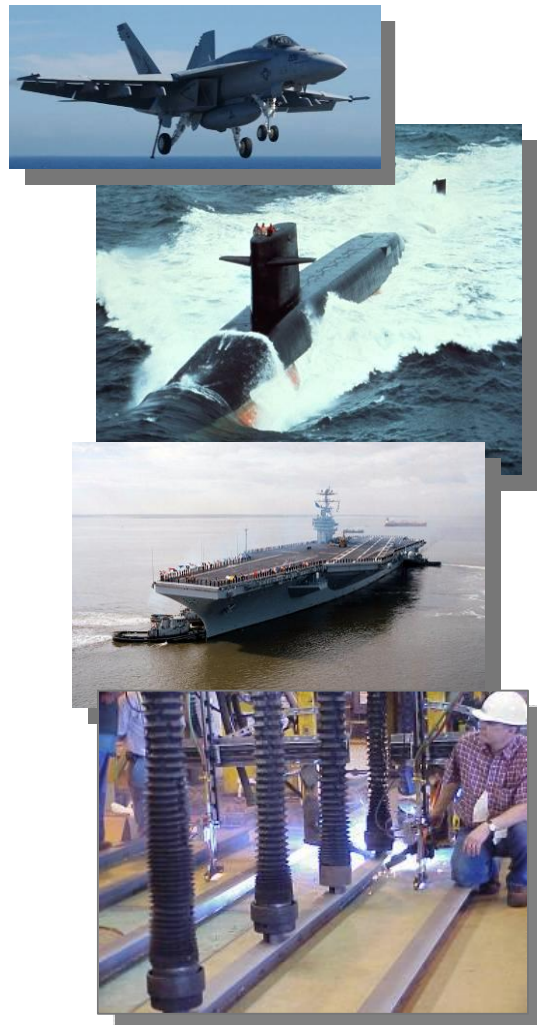
Targeted Technology Development

Hybrid Laser-Arc Welding (HLAW):

- Emerging high-productivity welding process
- Leveraged internal funding and Ohio funding to develop initial capability
- Multi-year program for pipeline welding
 - 11 commercial sponsors plus US Department of Transportation
 - Designed, built and successfully demonstrated a system for fiber laser hybrid pipe welding
- EWI is a global leader in high-power HLAW with programs in multiple industry sectors



Navy Joining Center

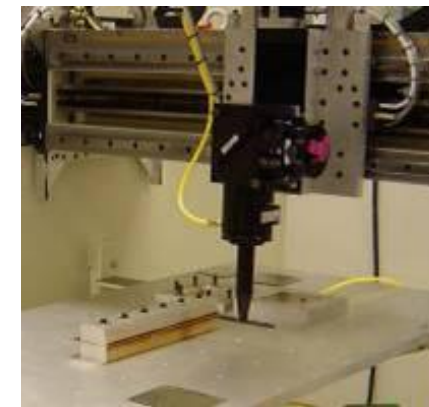


- Operated by EWI since 1993
- Addressing Navy needs for materials joining technology
- Improving life-cycle affordability and mission capability of Navy platforms
- Leveraging close relationships with shipbuilders / aircraft manufacturers
- Delivering advanced manufacturing technology solutions to industry



Ohio Edison Center

- Lead Center for “Advanced Energy and Environmental Technologies”
- Helping manufacturers improve competitiveness and create new products
- Commercialization Example:
 - Transformational thin sheet laser welding technology to dramatically increase productivity
 - 2007-2008: Built unique prototype and demonstrated capabilities for a variety of materials
 - 2008-2009: >\$2M in follow-on client funding for specific battery and fuel cell applications
 - 2010: Commercialization partner building equipment for battery manufacturer



Ultra-high speed laser welding device



Thin-sheet dissimilar metal weld



Nuclear Fabrication Consortium

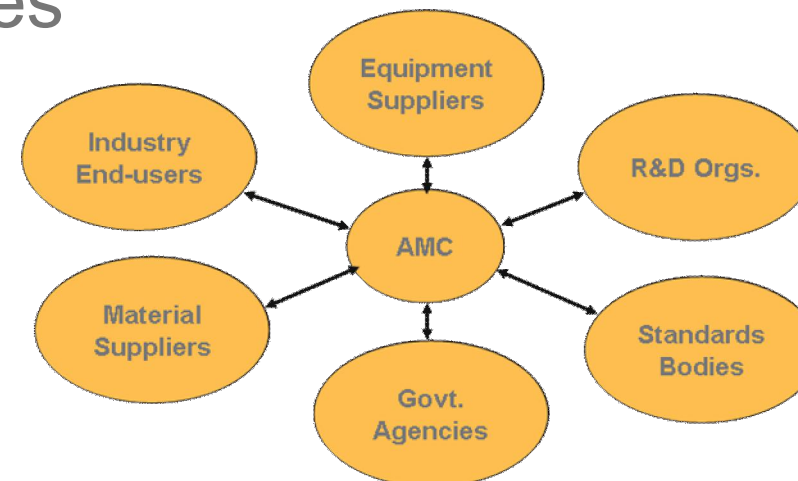
- Objectives:
 - Reduce cost, improve quality, and enhance safety through insertion of modern fabrication technologies
 - Stimulate the creation of a vibrant U.S. nuclear equipment supply chain
- >20 consortium partners (and growing) leveraging DOE-Nuclear Energy funding
- \$2M project portfolio



Additive Manufacturing Consortium (Emerging)



- Advancing manufacturing readiness of metal AM technologies through collaborative technology development
- Involving industry, suppliers, academia, government, standards bodies



2010 Strategy Conference

- Future of Materials Joining in North America
 - August 2010 in Columbus, Ohio
 - Partnering with AWS and commercial sponsors
 - Involving leaders from industry, academia, government, and non-profits
 - Assess global competitive technology position
 - Identify critical technology needs
 - Explore new approaches to public/private partnerships to advance technology

EWI

 **American Welding Society**



Summary

- EWI's success is a result of a series of public-private partnerships, from our initial founding right through to the present
- Made possible by
 - Being an independent entity
 - Close relationships with industry, government, and academia
 - Focus on developing and implementing technologies to impact client challenges
 - Support from commercial clients, the State of Ohio, and federal programs to expand capabilities





Questions ?

Chris Conrardy