



EXPERT Welding ENGINEERING & Inspection

Engineering Excellence

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PROFESSIONAL SUMMARY

Dr. Foster is an expert in welding engineering, specializing in the design, production, testing, and safety of welded structures. With a wealth of experience in both academia and industry, Dr. Foster holds a PhD in Welding Engineering and numerous certifications in welding, inspection, and engineering. This extraordinary background equips Dr. Foster with the skills to effectively analyze failures and tackle challenges that arise in welded structures.

General Specialties: Welding Engineering, Weld Inspection, Failure Analysis, Workforce Development/Training, Industrial Safety, Plasma/Oxyacetylene Cutting

Specialty Focus: Welding Engineering, Welding Failures, Welding Safety, Welding Design, Engineering Education, Additive Manufacturing, 3-D Printing of Metals, Welding Processes, Welding Inspection and Testing, Welding Metallurgy, Welding Defects, Structural Welding Fabrication, Polymer Welding, Brazing, Soldering, Cutting, Welding Process Efficiency and Streamlining, Welding Codes Compliance, Welding Consulting, Quality Assurance, Non-Destructive Testing, Manufacturing, Welding and NDT Auditing and In-situ Process Monitoring



EDUCATION

The Ohio State University Doctor of Philosophy in Welding Engineering	GPA: 3.84 / 4.00	Columbus, OH August 2014
The Ohio State University Master of Science in Welding Engineering	GPA: 3.86 / 4.00	Columbus, OH August 2008
The Ohio State University Bachelor of Science in Welding Engineering		Columbus, OH June 2007

LICENSES & CERTIFICATIONS

- Certified Welder (CW) -- American Welding Society
- Certified Welding Educator (CWE) -- American Welding Society
- Certified Welding Supervisor (CWS) -- American Welding Society
- Certified Welding Inspector (CWI) -- American Welding Society
- Certified Welding Engineer (CWEng) -- American Welding Society
- Visual Testing Level III Inspector (NDT III) -- American Society of Non-Destructive Testing
- Ultrasonic Testing Level III Inspector (NDT III) -- American Society of Non-Destructive Testing
- Professional Engineer (PE) -- Machine Design and Materials -- Licensed in VA
- Welding Inspection and Metallurgy Certification (API 577) -- American Petroleum Institute

TEACHING

Expert Engineering and Education Staff Instructor

Greater Philadelphia Area
July 2017- Present

- Contracted Training Course: Welding Engineering Oversight Training for Engineers and Managers
 - Naval Surface Warfare Center--Philadelphia (NSWC-PD) (2021 & 2023)
 - United States Army Corps of Engineers (USACE)-Marine Design Center--Philadelphia (2021)
- Contracted Training Course: Applied Finite Element Method
 - United States Army Corps of Engineers (USACE)-Marine Design Center--Philadelphia (2022)
- Contracted Training Course: Fundamentals of Welding Engineering: Reducing Shipbuilding Costs Through the Proper Use of Welding Engineering
 - Mega Rust Conference (2019)
 - Fleet Maintenance and Modernization Symposium (2018)

Old Dominion University

Assistant Professor- Mechanical and Aerospace Engineering Department

Norfolk, VA
August 2014- May 2017

- MET 200: *Manufacturing Processes and Materials*
- MET 495: *Introduction to Welding Technologies*
- MAE 495: *Fundamentals of Welding Engineering*
- MAE 595: *Fundamentals of Welding Engineering*

The Ohio State University

Graduate Teaching Assistant- Welding Engineering Department

Columbus, OH
August 2012- August 2014

- WE 4201: *Engineering Analysis for Design and Simulation of Welded Structures*
- WE 7201: *Engineering Analysis for Design and Simulation of Welded Structures*
- WE 4202: *Welding Metallurgy II (SS, Al, Ni, Cu, Mg, & Ti alloys)*
- WE 7102: *Welding Metallurgy II (SS, Al, Ni, Cu, Mg, & Ti alloys)*

PROFESSIONAL ACTIVITIES

- Excellent Reviewer in 2019 Award, Journal of Materials Engineering and Performance
- Journal Publication Reviewer, Journal of Materials Engineering and Performance
- Journal Publication Reviewer, Welding Journal
- Journal Publication Reviewer, Science and Technology of Welding and Joining
- Journal Publication Reviewer, Rapid Prototyping Journal
- Journal Publication Reviewer, Materials and Design
- Journal Publication Reviewer, Materials Processing
- Journal Publication Reviewer, Materials Characterization
- Journal Publication Reviewer, International Journal of Computational Methods
- Book Reviewer, AWS Welding Handbook 9th Edition, Welding Processes Part 2: Laser Welding
- Book Reviewer, Welding Engineering: An Introduction: Chapter 2- Arc Welding
- Session Chair of FABTECH's Welding Research Panel: *Progresses in Filler Metals* (Nov 2015)
- Judge, American Welding Society (AWS) Graduate Poster Competition (2015)

EXPERIENCE

Expert Engineering and Education

Principal Engineer

Greater Philadelphia Area

July 2016-Present

Duties: Engineering Services, Inspection & Testing Services, Research & Development, Project Management, Operations Management, Personnel Training, Curriculum Development, Course Development, Course Instruction, Business Development, Proposal Writing, Report Writing, Conference Speaking, and Marketing

Old Dominion University

Assistant Professor

Norfolk, VA

July 2014-August 2017

Mechanical and Aerospace Engineering Department & Engineering Technology Department

Duties: Engineering Services, Inspection & Testing Services, Research & Development, Project Management, Operations Management, Personnel Training, Curriculum Development, Course Development, Course Instruction, Business Development, Proposal Writing, Report Writing, Conference Speaking, and Marketing

NASA Glenn Research Center

NASA Glenn Faculty Fellow

Cleveland, OH

June 2015-August 2015

Duties: Engineering Services, Research & Development, and Report Writing

The Ohio State University

Graduate Teaching Assistant WE 7102 and 7201

Columbus, OH

August 2013-December 2013

Engineering Analysis for Design and Simulation of Welded Structures; & Welding Metallurgy II

Duties: Grading, Course Support and Course Instruction

NASA Ohio Space Grant Consortium Fellow

September 2009-August 2013

Duties: Engineering Services, Inspection & Testing Services, Research & Development, Personnel Training, Proposal Writing, Report Writing, and Conference Speaking

Nano-Scale Science and Engineering Center (NSEC)

Research Associate

Columbus, OH

June 2005-August 2006

Duties: Engineering Services, Inspection & Testing Services, Research & Development, Personnel Training, Report Writing, and Conference Speaking

CURRENT PROFESSIONAL AFFILIATIONS

- AWS, American Welding Society– (2004- Present)
 - Safety and Health Committee Applicant Member– (2018- Present)
- ASNE, American Society of Naval Engineers– (2014- Present)
 - Professional Development Committee Member
- ASNT, American Society of Non-Destructive Testing– (2017- Present)
- VSRA, Virginia Ship Repair Association– (2015- Present)
 - Quality Assurance Committee Member
- National Association of Fire Investigators– (2021- Present)

SELECTED EXPERIENCE

NAVSEA Welding Code Compliance

- Consulted a sub-contractor for Bath Iron Works-General Dynamics to meet NAVSEA welding requirements.
- Advised on qualifying welders, developing welding procedures and performing weld inspections to comply with NAVSEA Regulations.

Failure Analysis of Power Plant Cooling

- In a newly built gas power plant, water-filled 316 stainless steel piping developed leaks in various locations, especially at the weld joints, within a few months of installation.
- A failure analysis investigation determined that microbial corrosion, caused by metal-eating bacteria, was the reason for the leaks. The water source used for cooling, along with ideal temperature conditions, facilitated bacterial growth and subsequent corrosion.

3-D Vision for Welder Training and Production Arc Welding

- Researched and tested the viability of a newly developed 3-D Vision for Welder Training and Production Arc Welding. Determined effectiveness, optimal implementation, and ROI due to implementation.

Hybrid Turbine Blades

- Conducted research in the High Temperature and Smart Materials Department of NASA Glenn.
- Investigated the feasibility of a hybrid turbine blade by using linear friction welding to bond a single crystal nickel turbine blade with a polycrystalline central hub to increase turbine efficiency.

Improving Technical Arc Welding Education Using Real-Time Sensory Feedback

- Directed a research project to test the viability of a newly developed process monitoring welding system to improve welder education and reduce arc welding training costs.
- Evaluated cost reductions due to reduction in training time, instructor load, and material reduction.
- Produced a report detailing analysis of cost savings, educational benefits, and the optimal implementation and utilization of equipment.

Thermal and Mechanical Characterization of Ultrasonic Additive Manufacturing

- Investigation of *in-situ*, along with post-consolidation, mechanical and thermal property changes due to the creation of layered metal matrix composites using ultrasonic energy.
- Developed a non-destructive process monitoring technique that can be used to determine bond quality of aluminum alloys *in-situ*.
- Investigated mechanical and thermal anisotropy due to interfacial bonding defects.
- Participated in design reviews to develop the next version of the manufacturing system.
- Trained colleagues to use the Ultrasonic Additive Manufacturing and Ultrasonic Welding systems.

Resistance Spot Welding of Dissimilar Metals

- Investigated material and mechanical properties of resistance spot welds between super austenitic stainless steel (Al-6XN) and nickel alloys (Hastelloy C-22 and Inconel 625).
- Developed optimum process parameters as well as performed mechanical and metallurgical characterization of dissimilar welds.

Through Transmission Laser Welding of Polypropylene Nanocomposites

- Performed research for Edison Welding Institute investigating the use of a scanning Nd:YAG laser to create hermetical seals in polypropylene nanocomposites for packaging applications.
- Won 3rd Place in the AWS National Undergraduate Research Poster Competition.

Microlaser Welding of Polypropylene Nanocomposites

- Conducted research for Nano-scale Science and Engineering Center (NSEC) exploring the possibilities of using low-power laser welding (diode laser) in producing micro-sized hermetical seals between a polypropylene nanocomposite film substrate for packaging applications.

Hybrid Laser Welding of Polymers

- SROP (Summer Research Opportunities Program) sponsored research that explored the applications and feasibility of hybrid laser welding using a Ti:Sap femtosecond laser and a ytterbium fiber laser to weld clear plastics.

PUBLICATIONS

- Y. Lu, H.Y. Song, **D.R. Foster**, G.A. Taber, G.S. Daehn, W. Zhang, In-Situ Measurement of Relative Motion during Ultrasonic Spot Welding of Aluminum Alloy using Photonic Doppler Velocimetry, *Journal of Materials Processing Technology*, (2016), 431-440
- **D.R. Foster**, G.A. Taber, S.S. Babu, G.S. Daehn, In-situ Velocity Measurements of Ultrasonic Additive Manufacturing Using a Photonic Doppler Velocimeter, *Science and Technology of Welding and Joining*, 19 (2014) 157-163
- **D.R. Foster**, S.S. Babu, M.J. Dapino, Elastic Constants of Ultrasonic Additive Manufactured Al 3003-H18, *Ultrasonics*, 53 (2013) 211-218
- M.R. Sriraman, M. Gonser, **D.R. Foster**, H T. Fujii, S.S. Babu, Matt Bloss, Thermal Transients During Processing of 3003 Al-H18 Multilayer Build by Very High Power Ultrasonic Additive Manufacturing, *Metallurgical and Materials Transactions B*, 43 (2012) 133-144
- D.E. Schick, S.S. Babu, **D.R. Foster**, M.J. Dapino, M. Short, J.C. Lippold, Transient Thermal Response in Ultrasonic Additive Manufacturing of Aluminum 3003, *Rapid Prototyping Journal*, 17 (2011) 369 – 379
- **D.R. Foster**, D.W. Dickinson, Characterization of Resistance Spot Welding of Al-6XN to Hastelloy C-22 and Inconel 625, *Journal of Material Processing Technology*, to be submitted

CONFERENCE PUBLICATIONS

- J. Cheng, A. Chaudhary, S.S. Babu, M. Norfolk, **D.R. Foster**, D. Boone, Process Simulation of Ultrasonic Additive Manufacturing and The Prediction of Interface Bonding, *Materials Science and Technology 2013 Conference and Exhibition*, Oct. 2013, Montreal, Quebec, Canada
- S.S. Babu, A.G. Troug, S. A. Channagiri, **D.R. Foster**, X-Ray Tomography of Very High Power Ultrasonic Additive Manufactured builds, *Solid Freeform Fabrication Symposium 2012*, Jul. 2012, Austin, Texas
- C. D. Hopkins, **D.R. Foster**, M.J. Dapino, L., Zhang. In *Proceedings Metal Matrix Composite Metamaterials with Smart Switches Embedded by Ultrasonic Consolidation. ASME 2010 Conference on Smart Materials, Adaptive Structures and Intelligent Systems*, Oct. 2010, Philadelphia, Pa
- M. Dapino, R. Hahnen, **D.R. Foster**, C. Hopkins, UAM of Adaptive Metal-Matrix Composites. In *Proceedings of the 2009 Ultrasonic Additive Manufacturing Symposium*, Oct. 2009, Columbus, Ohio

CONFERENCE PRESENTATIONS

- Steve Edelman (Visible Welding LLC), **D.R. Foster**; National Shipbuilding Research Program – Workforce Development Panel, “3-D Vision for Welder Training and Production Arc Welding,” September 2017
- **D.R. Foster**; National Shipbuilding Research Program – All Panel Meeting –Workforce Development Panel, “Practical Welder Training Using Augmented Reality,” March 2017
- **D.R. Foster**; National Shipbuilding Research Program – Joint Panel Meeting–Workforce Development Panel, “Fundamental Welding Engineering Training for Naval Engineers,” May 2016
- **D.R. Foster**; National Shipbuilding Research Program – Joint Panel Meeting–Workforce Development Panel, “Improving Technical Arc Welding Education Using Real-Time Sensory Feedback: Update Status Report,” May 2016
- **D.R. Foster**; National Shipbuilding Research Program – All Panel Meeting–Workforce Development Panel, “Improving Technical Arc Welding Education Using Real-Time Sensory Feedback,” March 2015
- Y. Lu, **D.R. Foster**, G.A. Taber, G.S. Daehn, W. Zhang, In-Situ Velocity Measurement During Ultrasonic Spot Welding of AA 6061-T6 Using Photonic Doppler Velocimetry, Materials Science & Technology 2015 Conference and Exhibition: Joining of Advanced and Specialty Materials (JASM XVII), Columbus, Ohio
- **D.R. Foster**, Materials Joining and Additive Manufacturing, ARL Research Symposium 2015, Mar. 2015 Anaheim, California
- **D.R. Foster**, S.S. Babu, G.S. Daehn, In-situ Velocity Measurements of Ultrasonic Additive Manufacturing Using a Photonic Doppler Velocimeter, Materials Science and Technology 2012 Conference and Exhibition, Oct. 2012, Pittsburgh, Pennsylvania
- S.S. Babu, A.G. Troug, S. A. Channagiri, **D.R. Foster**, X-Ray Tomography of Very High Power Ultrasonic Additive Manufactured builds, Solid Freeform Fabrication Symposium 2012, Jul. 2012, Austin, Texas
- **D.R. Foster**, S.S. Babu, G.S. Daehn, In-situ Velocity Measurements of Ultrasonic Additive Manufacturing, Solid Freeform Fabrication Symposium 2012, Jul. 2012, Austin, Texas
- **D.R. Foster**, S.S. Babu, Resonance Testing of Ultrasonic Additive Manufactured Components, Ohio Space Grant Consortium Student Research Symposium, NASA Glenn/Ohio Aerospace Institute, Apr. 2012, Cleveland, Ohio
- **D.R. Foster**, S.S. Babu, M.J. Dapino, Elastic Constants of Ultrasonic Additive Manufactured Al 3003-H18, NASA Future Forums, Feb. 2012, Columbus, Ohio
- **D.R. Foster**, S.S. Babu, M.J. Dapino, Elastic Constants of Ultrasonic Additive Manufactured Al 3003-H18, Materials Science and Technology 2011 Conference and Exhibition, Oct. 2011, Columbus, Ohio
- **D.R. Foster**, S.S. Babu, G.A. Taber, G.S. Daehn, Low Velocity Photonic Doppler Velocimeter Measurements, 6th Annual Photonic Doppler Velocimeter Conference, Sept. 2011, Livermore, California
- **D.R. Foster**, S.S. Babu, M.J. Dapino, Elastic Constants of Ultrasonic Additive Manufactured Al 3003-H18, Ohio Space Grant Consortium Student Research Symposium, NASA Glenn/Ohio Aerospace Institute, Apr. 2011, Cleveland, Ohio
- **D.R. Foster**, M.J. Dapino, Fundamental Understanding of Ultrasonic Additive Manufacturing, NASA Glenn/Ohio Aerospace Institute, Apr. 2010, Cleveland, Ohio

INVITED TALKS

- **D.R. Foster**, Fundamentals of Welding Engineering: Reducing Shipbuilding Costs Through the Proper Use of Welding Engineering, Invited Talk and Short Course, American Society of Naval Engineers, Fleet Maintenance and Modernization Symposium 2018, Virginia Beach Convention Center, Sept. 2018, Virginia Beach, VA
- **D.R. Foster**, Welding Engineering for Marine Applications: University Status Report, Invited Talk to American Welding Society: Tidewater Chapter, Jan. 2017, Newport News, Virginia
- **D.R. Foster**, Utilization of Linear Friction Welding to Develop Hybrid Turbine Disks, Invited Talk at National Aeronautics and Space Administration Glenn Research Center, Jul. 2015, Cleveland, Ohio
- **D.R. Foster**, Welding Engineering for Marine Applications, Invited Talk to American Welding Society: Tidewater Chapter, Mar. 2015, Newport News, Virginia
- **D.R. Foster**, Process Monitoring of Ultrasonic Additive Manufacturing, Invited Talk at the Air Force Research Laboratory, Wright-Patterson Air Force Base Nov. 2013, Dayton, Ohio

TECHNICAL REPORTS

- **D.R. Foster**; National Shipbuilding Research Program – Workforce Development Panel, “Improving Technical Arc Welding Education Using Real-Time Sensory Feedback,” January 2018
- Visible Welding LLC, **D.R. Foster**; National Shipbuilding Research Program – Workforce Development Panel, “3-D Vision for Welder Training and Production Arc Welding,” October 2017
- **D.R. Foster**; Virginia Space Grant Consortium – New Investigator Program, “Process Monitoring of Ultrasonic Welding,” September 2016
- **D.R. Foster**, National Aeronautics and Space Administration Glenn Research Center, “Utilization of Linear Friction Welding to Develop Hybrid Turbine Disks” August. 2015, Cleveland, Ohio
- **D.R. Foster**; Doctoral Dissertation; Welding Engineering Program; Dept. of Materials Science and Engineering, The Ohio State University, “Thermal and Mechanical Characterization of Ultrasonic Manufacturing” August 2014
- **D.R. Foster**; Masters Thesis; Welding Engineering Program; Dept. of Industrial, Welding & Systems Engineering, The Ohio State University, “Resistance Welding of Dissimilar Metals” August 2008
- **D.R. Foster**; Nano-scale Science and Engineering Center, The Ohio State University, “Microlaser Welding of Polypropylene Nanocomposites” August 2006
- **D.R. Foster**; Summer Research Opportunities Program, Committee for Institutional Cooperation, “Hybrid Laser Welding of Polymers” August 2005