**Robert C. Voigt**

**EDUCATION**

1. Ph.D. Metallurgical Engineering, University of Wisconsin-Madison
2. M.S. Metallurgical Engineering, University of Wisconsin-Madison

1976 B.S. Mechanical Engineering, University of Wisconsin-Madison

**AREAS OF SPECIALIZATION**

**Engineering Materials:** development of cast metals and alloys in support of vehicle light-weighting, improved aerospace performance, and enhanced manufacturability

**Manufacturing Process Innovation:** low emission green sand casting; heat treatment of cast alloys; machinability of high-performance casting alloys; weldability of cast irons

**Manufacturing System Development:** control of green sand molding systems; manufacturing system management for complex, custom-engineered engineering products

**ACADEMIC EXPERIENCE**

1996-present Professor, Industrial & Manufacturing Engineering Department, Penn State University

1990 – 1996 Associate Professor, Industrial & Manufacturing Engineering Dept, Penn State University

1986 - 1990 Associate Professor, Mechanical Engineering Department, University of Kansas

1981 - 1986 Assistant Professor, Mechanical Engineering Department, University of Kansas.

**LEADERSHIP POSITIONS**

2016-present **Graduate Program Coordinator, Department of Industrial & Manufacturing**

**Engineering, Penn State University**

Management of departmental graduate program admissions and degree matriculation for 200 MS and PhD currently enrolled students

2008-2012 **Engineering Co-Director, Quality and Manufacturing Management Intercollege Degree**

**Program, Penn State University**

Professional Master of Manufacturing Management degree program with joint participation of the College of Business and the College of Engineering; 25 students/yr; management of admissions, affiliated faculty, program staff, industrial advisory board and student professional experiences; direct participation and support from more than 110 companies

2010-present **Forging Industry Association Magnet Professor, Penn State University**

Coordination of Forging Industry Research and Educational Foundation support activities at Penn State University.

2000-present **Foundry Educational Foundation Key Professor, Penn State University**

Coordination of industry-supported education-based activities including laboratory and curriculum development, professional outreach and student scholarships. Annual activities include hosting of annual student/industry professional events, coordination of student internships at more than 50 companies across the US, and administering student scholarships. Since 2000, more than 170 students have been placed in internships, more than $290,000 in student scholarships have been awarded and $150,000 of Penn State Metalcasting Program support has been awarded

**PROFESSIONAL EXPERIENCE**

2005-present **Principal, AIONX Antimicrobial Technologies, Inc., Lewistown PA;** research and product

development support; investor development; co-holder of 7 pending and issued patents to AIONX

2015 **Visiting Professor, Depart. of Materials Science and Metallurgy, University of Cambridge UK;**

development of ultra-high strength steels; program support from the UK Ministry of Defense and the

US Air Force Research Laboratory

2009-2010 **Faculty Research Fellow, Air Force Research Laboratory, Munitions Directorate, Eglin Air**

**Force Base, Eglin FL;** development and testing of high performance Eglin Steel and it variants for

penetrator applications

2008 **Visiting Professor, Cooperative Research Centre for Cast Metals Manufacturing, University of**

**Queensland, Brisbane, Australia;** process control improvements for aluminum cast houses

2000 **Visiting Professor, Interdisciplinary Research Center for Materials for High Performance**

**Applications, University of Birmingham UK;** processing of high strength aluminum casting alloys

1988 – 1989 **Visiting Professor; Giesserei Institut, Aachen Technical University, Aachen, Germany**

novel spray casting of copper-base alloys

1987 **Faculty Fellow, Materials Laboratory, Structural Metals Branch, Wright-Patterson Air Force**

**Base, Faculty Research Program;** structure/property relationships for titanium aluminides in support

of the National Aerospace Plane

1983 **Faculty Fellow, Materials Div., Processing Science Section, NASA Lewis Research Laboratory;**

mechanical metallurgy of single crystal nickel-base superalloys

1978 **Metallurgist, Norsk Hydro, Karmoy Norway;** adaptive control for aluminum reduction cells, grain

refinement in continuous cast aluminum sheet

**HONORS AND AWARDS**

**Penn State University**

Lawrence J. Perez Memorial Student Advising Award, 2009

Premier Teaching Award, College of Engineering, 2001

(awarded only to past Outstanding Teaching Award Recipients)

Outstanding Teaching Award, College of Engineering, 1999

Outstanding Research Award, College of Engineering, 1998

Outstanding Advising Award, College of Engineering, 1994

Collaborative Instructional and Curricular Innovation Award, 1994

**Industrial Engineering Department**

Outstanding Faculty Award; 1996-1997, 2006-2007

**Professional**

I5 Award, Institute of Industrial and Systems Engineers, 2017

For innovation and implementation that improves businesses and organizations

Barlow Award, Steel Founders’ Society of America, 2013

For distinguished contributions to the steel casting industry

Fellow, Society of Manufacturing Engineers, 2000

Postdoctoral Award in Manufacturing Engineering, Society of Manufacturing Engineers, 1988

Dow Outstanding Young Faculty Award, American Society for Engineering Education, Midwest Section, 1987

Distinguished Service Award, Steel Founders' Society of America, 1984

3

Ralph R. Teetor Educational Award**,** Society of Automotive Engineers, 1983

**PUBLICATIONS**

Dr. Voigt has authored and co-authored 80 journal papers, 36 refereed conference proceeding, 66 other professional papers, 3 handbook chapters, and 2 patents in the areas of material development, manufacturing process innovation and manufacturing system development. Five of his papers have received best paper awards from the American Foundry Society and 2 have been selected a US contributions to the World Foundry Congress.

**Journals**

**Material Development**

Cesar Nieto-Delgado, Cannon, F. S., Paulsen, P. D., Furness, J. C., Voigt, R. C. and Pagnotti, J. R. (2014) "Bindered anthracite briquettes as fuel alternative to metallurgical coke: Full scale performance in cupola furnaces," Fuel, vol. 121, pp. 39-47.

Lindwall, G. Liu, Z.-K., Lynch, P. C., & Voigt, R. C. (2014). Thermodynamic and Kinetic Aspects of the Effect of Alloying Elements on Cementite and Carbide Formation in High-strength Steels. *Materials Science & Technology 2014.* Materials Science & Technology.

Shirwaiker, R. A., R. A. Wysk, S. Kariyawasam, R. C. Voigt, H. Carrion, H. B. Nembhard. (2013) Integrated silver-polymer-based antibacterial surface system activated by oligodynamic intophoreis - an empirical characterization study. Biomedical Micro-devices, DOI 10.1007/s10544-013-9800-x, Published online 06 Aug 2013.

Shirwaiker, R. A., R. W. Wysk, S. Kariyzwasam, H. Carrion and R. C. Voigt. (2011). Micro-scale fabrication and characterization of a silver-polymer-based electrically activated antibacterial surface. Biofabrication, 3 (10pp).  
  
Fuller, T., Wysk, R.A., Charumani, C., Kennett, M., Sebastianelli, W.J,, Abrahams, R., Shirwaiker, R.A., Voigt, R. C., and Royer P. (2010). Developing an engineered antimicrobial/prophylactic system using electrically activated bactericidal metals. Journal of Materials Science: Materials in Medicine, 21 (7), 2103-2114).  
  
Wysk, R. A., W. J. Sebastianelli, R. A. Shirwaiker, G. M. Bailey, C. Charumani, M. Kennett, A. Kaucher, R. Abrahams, T. A. Fuller, P. Royer, R. C. Voigt and P. Cohen. (2010). Prophylactic bactericidal orthopedic implants -- animal testing study. Journal of Biomedical Science and Engineering 3, 917-926.

Voigt, R., P. Lynch and T. Grenko (2009). Cast iron solidification with non-contact acoustic stimulation. International Journal of Metalcasting. (3) 4, 79-86.

Wang, Y. J. , F. S. Cannon, R. C. Voigt, S. Komarneni and J. C. Furness, "Effects of advanced oxidation on green sand properties via iron casting into green sand molds," Environmental Science and Technology, Vol. 40, pp. 3095-3101., 2006.

Ma, T., H. Yamaura, D.A. Koss and R.C. Voigt. (2003). Dry Sliding Wear Behavior of Cast SiC-reinforced Al MMCs. Material Science and Engineering, A 360:116-125.

Yamura, H., T. Ma, D.A. Koss and R.C. Voigt (2000). Effect of Casting Defects on High-Cycle Fatigue Properties of SiC/Al MMCs, AFS Transactions*,*108:349-357.

Yamaura, H., T. Ma, D.A. Koss, R.C. Voigt, and T. Kimura. (2000), The Influence of Casting Defects on the Fatigue of SiC/Al MMCs, Proceeding, FATIGUE 2000.

Voigt, R.C., C.H. Tu, J.M. Kim and M. Blair (1998). Influence of Composition and Processing Variables on Mechanical Properties of As-Cast C-Mn Steels. AFS Transactions 106:427:432.

Fang, L., K. L. Metzloff, R. C. Voigt, and C. R. Loper, Jr. (1995). Factors Affecting the Measurement of the Modulus of Elasticity of Ductile Irons. AFS Transactions 103:31-39.

Voigt, R. C. and J. Rassizadehghani. (1995). Development of High Strength Low Alloy (HSLA) Cast Steels Microalloyed With Vanadium and Nobium. AFS Transactions 103:517-528. **Best Technical Paper Award, American Foundry Society Steel Division**

Regan, R. W., R. C. Voigt, W. Paletski, and R. Massell. (1994). Chemical Characterization of Spent Molding Sands: Environmental Issues. AFS Transactions 102:749-756.

Voigt, R. C., and D. R. Bye. (1991). Microstructural Aspects of Fracture in A356. AFS Transactions 99: 33-50.

Voigt, R. C., and S. D. Holmgren. (1990). Crack Initiation and Propagation in Gray and CG Cast Irons. AFS Transactions 98: 213-225.

Voigt, R. C., and C. R. Loper, Jr. (1989). Matrix Structure Development in Ductile Cast Irons. AFS Transactions 97:595-600.

Voigt, R. C. (1989). Austempered Ductile Iron—Processing and Properties. Cast Metals 2(2): 71-93.

Pourladian, B., and R. C. Voigt. (1987). Fracture of Malleable Iron-Part I, Ferritic malleable Iron. AFS Transactions 95:515-522.

Pourladian, B., and R. C. Voigt. (1987). Fracture of Malleable Iron-Part II, Pearlitic Malleable Iron. AFS Transactions 95:681-688.

Voigt, R. C., and L. ElDoky. (1986). Crack Initiation and Propagation in As-Cast and Fully Pearlitic Ductile Cast Irons. AFS Transactions 94:637-644.

Voigt, R. C., L. ElDoky, and H. S. Chiou. (1986). Fracture of Ductile Cast Irons with Dual Matrix Structures. AFS Transactions 94:645-656.

Voigt, R. C., and L. Eldoky. (1986). Crack Initiation and Propagation in Quenched and Tempered Ductile Cast Iron. AFS Transactions 94:133-146.

Miner, R. V., R. C. Voigt, V. Gayda, and T. P. Gabb. (1986). Orientation and Temperature Dependence of Some Mechanical Properties of the Single-Crystal Nickel Base Superalloy Rene N4, Part I. Tensile Behavior. Metallurgical Transactions 17a (3): 491-496.

Voigt, R. C., R. Bendaly, J. F. Janowak, and Y. J. Park. (1985). Development of Austempered High Silicon Cast Steels. AFS Transactions 93:453-462. (Also translated into German and published in Giesserei-Praxis (1986) 11:151-159.) **American Foundry Society Best Technical Paper Award, Steel Division**

ElDoky, L. and R. C. Voigt. (1985). Fracture of Ferritic Ductile Cast Iron. AFS Transactions 93:365-362. (Also reprinted in AFS Transactions (1986) 94:621-630 without typesetting errors.)

Voigt, R. C. (1983). Microstructure Analysis of Austempered Ductile Cast Iron Using the Scanning Electron Microscope. AFS Transactions 91:253-261.

Voigt, R. C., and C. R. Loper, Jr., (1982). Secondary Graphitization in Quenched and Tempered Ductile Cast Iron. AFS Transactions90:239-257. (Also translated into German and published in Giesserei-Praxis (1983) 11:165-180).

Loper, C. R., Jr., R. C. Voigt, J. R. Yang, and G. X. Sun. (1981). Use of the Scanning Electron Microscope in Studying Growth Mechanisms in Cast Irons. AFS Transactions 89: 529-542.

**Journals**

**Manufacturing Process Innovation**

Sinlah, A., Handayani, D., Saldana, C., Voigt, R. C., Hayrynen, K., & Saoubi, R. M. (2016). Effects of microstructure and strength on wear performance in rough milling of austempered ductile iron International Journal of Cast Metals Research*, 29*(1 & 2), 62-67.

Lynch, P. C., R. C. Voigt, J. C. Furness and D. Paulsen. (2010). The effects of non-contact acoustic stimulation on the solidification behavior and microstructure of aluminum alloy A356. American Foundry Society Transactions. (118) (12pages, electronic publication).

Fox, J.T., Cannon, F.S., Voigt, R.C., Furness, J.C., Goudzwaard, J.E., Wasaba, M. and Smith, P.B. (2008) Decreased Bond Consumption by Processing Baghouse Dust through Ultrasonic-Cavitation-Settling Coupled to Advanced Oxidation”, AFS Transactions, Vol. 116, pp.539-546.

Peters, F., R. Voigt, S.Z. Ou and C. Beckermann (2007) Effect of mould expansion on pattern allowances in sand casting of steel. International Journal of Cast Metals Research, Vol. 20, No. 5. pp. 275-287.

Fox, J. T., F. S. Cannon, R. C. Voigt, J. C Furness, P. B. Smith, S. E. Lewallen and J. E. Goudzwaard, (2007) Simultaneous Sand, Clay and Coal Reclamation using Induced Particle Collision, Discretionary Settling, and Advanced Oxidation, American Foundry Society Transactions, Vol. 115, 16 pages.  
  
Milan-Segovia, N., Y. Wang, F. S. Cannon, R. C. Voigt and J. C. Furness, 2007. Comparison of Hydroxyl Radical Generation for Various Advanced Oxidation Combinations as Applied to Foundries: Ozone: Science & Engineering The Journal of the International Ozone Association, Volume 29 Issue 6 2007, pp. 461-471.

Wang, Y., H Huang, F. S. Cannon, R. C. Voigt, S. Komarneni and J. C. Furness (2007) Evaluation of volatile hydrocarbon emission characteristics of carbonaceous additives in green sand foundries. Environ. Sci Technology, Vol. 41, No. 8: pp. 2857-2963.

Wang, Y., F.S. Cannon, D. Neill, K. Crawford, R.C. Voigt, J.C. Furness Jr. and C.R. Glowacki. (2004) Effects of Advanced Oxidation Treatment on Green Sand Properties and Emissions. AFS Transactions112.

Neill, D.A., F.S. Cannon, R.C. Voigt, J.C. Furness, Jr., and R.H. Bigge. (2001) Effects of Advanced Oxidants on Green Sand System in a Black Water System. AFS Transactions109 937-955.

Okhuysen, V.F and R.C. Voigt (2001). Review of Feature Dependence on Tooling Allowance of Investment Castings, AFS Transactions109 73-86.

Okhuysen, V.F. and R.C. Voigt (2000). Effects of Wax Injection Parameters and Tree Position on Investment Casting Shrinkage, AFS Transactions*,* 108: 83-90.

Voigt, R.D., R.O. Marwanga and P.H. Cohen (1999). Machinability of gray iron – mechanics of chip formation. International Journal Cast Metals Res. 11:567-572.

Faustine, W.C., R.C. Voigt and F.E. Peters (1999). Dimensional Variability of Aluminum Castings. AFS Transactions 107: 829:838.

Marwanga, R.O., R.C. Voigt, P.H. Cohen (1999). Influence of Graphite Morphology and Matrix Structure on Chip Formation During the Formation of Gray Irons, *AFS Transactions***,** 107:595-607. [Reprinted in Modern Casting 90(5):53-57]

Okhuysen, V.F. and R.C. Voigt (1999). Heat-Treatment Effects in Tooling Allowance and Investment Casting, AFS Transactions*,* 107:25-28.

Nazareth, E.S., R.C. Voigt and F.E. Peters (1998). Dimensional Variability of production Iron Castings. AFS Transactions 106: 713-720.

Voigt, R. C., R. Regan and D.J. Schacht. (1997). Controlling Green Sand Properties with Environmentally Beneficial Phosphate Additives. AFS Transactions, 105:749-757.

Potter, L., R. Voigt, F. Peters, J. Lies, and M. Chandra. (1996). A Statistically Based Pattern Approval Process. AFS Transactions, 104.

Kauffmann, P., R.R. Regan, and R. C. Voigt. (1996). Survey of State Environmental Regulations Impacting Beneficial Use of Foundry Residuals. AFS Transactions, 104:527-538.

Peters, F., R. Velaga, and R. Voigt. (1996). Assessing the Dimensional Repeatability of Metal Casting Processes. AFS Transactions, 104:181-190.

Nyamekeye, K., S. Wei, D. Askeland, R. C. Voigt, R. Pischel, and W. Rasmussen. (1994). A Review of Permanent Mold Coatings and Their Effects on Heat Transfer in the Mold. AFS Transactions 102:869-876.

Pederson, C. and R. C. Voigt. (1993) Induction Hardening of Ductile Cast Irons. AFS Transactions 101:17-22.

Voigt, R. C. (1989). Analysis of Intercritical Heat Treatment of Cast Steels. Journal of Heat Treating 7(2): 95-105.

Voigt, R. C., and Y. H. Lee. (1989). The Hardenability of Ductile Irons. AFS Transactions 97:915-938.

Voigt, R. C., and C. R. Loper, Jr. (1986). Welding Metallurgy of Gray and Ductile Cast Irons. AFS Transactions 94:631-636.

Voigt, R. C., and C. R. Loper, Jr. (1983). A Study of HAZ Structures in Ductile Cast Irons. Welding Journal 62(5):82s-88s.

Stefanescu, D. M., C. R. Loper, Jr., R. C. Voigt, and I. G. Chen. (1982). Cooling Curve-Structure Analysis of Compacted/Vermicular Graphite Cast Irons Produced by Different Melt Treatments. AFS Transactions 90:333-348.

Stefanescu, D. M., C. R. Loper, Jr., and R. C. Voigt. (1981). The Importance of the Lanthanum/Rare Earth Ratio in the Production of Compacted Graphite Cast Iron. AFS Transactions 89: 119-130. (Also translated into Chinese and published in Chuking Quarterly (1982) 35:56-64.)

Voigt, R.C., and C. R. Loper, Jr., (1980). Tungsten Contamination During Gas Tungsten Arc Welding. Welding Journal 59(4): 99s-103s.

**Journals**

**Manufacturing System Development**

Allen, J. F., Cannon, F. S., Nieto-Delgado, C., Voigt, R. C., Fox, J. T., Lamonski, J., & Kirby, J. D. (2016). Full Scale Air Emissions Monitoring and Casting Quality Demonstration of a Hybrid Collagen-Alkali Silicate Core Binder, International Journal of Metalcasting*, 10*(2), 172-189.

Torielli, R. M., F. S. Cannon, R. C. Voigt, T. J. Considine, J. C Furness, J T. Fox, J. E. Goudzwaard, H. Huang (2014) The Environmental Performance and Cost of Innovative Technologies for Ductile Iron Foundry Production. Intl Journal of Metalcasting, Vol 8, Issue 1, pp 37-46.  
  
Fox, J.T., Cannon, F.S., Voigt, R.C., Furness, J.C., Headington, F., Coan, D., and Lewallen, S.E. (2008) Waste Green Sand to Core Sand Reclamation, Demonstration via Casting Study, with Simultaneous Clay Recovery and AO Benefits,” AFS Transactions, Vol. 116 (2008).

Yujue Wang, Fred S. Cannon, Sridhar Komarneni, Robert C. Voigt and J.C. Furness (2005). Mechanisms of Advanced oxidation Processing on Bentonite Consumption Reduction in Foundry. Environ. Sci. Technol*.,* 39 (19), 7712 -7718, 2005

Land, J.D., F.S. Cannon, R.C. Voigt and J. Goudzwaard. (2004) Perspectives on Foundry Air Emissions: A Statistical Analysis Approach. *AFS Transactions* 112.

Goudzwaard, J.E., C.M. Kurtti, J.H. Andrews, F.S. Cannon, R.C. Voigt, J.E. Firebaugh, J.C. Furness and D.L. Sipple. (2003). Foundry Emissions Effects with an Advanced Oxidation Blackwater System***.*** *AFS Transactions*111:1-22.

Glouwacki, C.R., G.R. Crandell, F.S. Cannon, J.K. Clobes, R.C. Voigt, J.C. Furness, B.A. McComb and S.M. Knight. (2003). Emissions Studies at a Test Foundry Using an Advanced Oxidation-Clear Water System.  AFS Transactions 111:436:456.

  Land, J.D., R.C. Voigt, F.S. Cannon, J.C. Furness, and J. Andrews. (2002) Performance and Control of a Green Sand System During the Installation and Operation of an Advanced Oxidation System. AFS Transactions110:117-129.

Regan, R.W., P.J. Tikalsky, R.C. Voigt, J.A. Dunkelberger. (2000) Beneficial Use of Foundry Residuals: Case Studies, Experiences and Related Issues, *AFS Transactions* 108 639-643. **Best Technical Paper Award, American Foundry Society Environmental Division**

Kauffmann, P. and R. Voigt (1999). A Comparison of the Normal and Lognormal Distributions to Analyze TCLP Results for Beneficial Use Permits. AFS Transactions 107:99-102.

Kauffmann, P.J. and R. C. Voigt (1998). Feasibility and Cast of Air Emission Control Equipment in the metalcasting Industry. AFS Transactions 106: 163 – 166.

Reagan, R.W., P.J. Tikalsky and R.C. Voigt (1998). Beneficial Use of Fine Foundry Aggregates: Three Promising Options. AFS Transactions 106:167-172.

Karve, A., R.C. Voigt and L.A. Potter. (1997). Use of Measurement Equipment for Casting Dimensional Inspection. AFS Transactions, 105:749-979.

Kauffmann, P. and R. Voigt. (1997). Empirical Study of the Impact of Casting Process Changes on VOC and Benzene Emission Levels and Factors. AFS Transactions, 105:297-303**.**

Potter, L., R. Voigt, F. Peters, J. Lies, and M. Chandra. (1996). A Statistically Based Pattern Approval Process. AFS Transactions, 104.

Kauffmann, P., R.R. Regan, and R. C. Voigt. (1996). Survey of State Environmental Regulations Impacting Beneficial Use of Foundry Residuals. AFS Transactions, 104:527-538. **Best Paper Award, American Foundry Society, Environmental Control Division**

Echard, J.B., Regan, R. W., and R. C. Voigt. (1995). Environmental Impact of Foundry Residuals: Pennsylvania Beneficial Use Approach. AFS Transactions 103:463-468. **Best Paper Award, American Foundry Society, Environmental Control Division**

Karve, A.A., M.J. Chandra and R.C. Voigt (1998). Determining Dimensional Capabilities from Short-Run Sample Casting Inspection. AFS Transactions 106:699- 703.

Peters, F. E. and R. C. Voigt. (1995). Assessing the Capabilities of Pattern Shop Measurement Systems. AFS Transactions 103:207-218.

Regan, R. W., R. C. Voigt, R. Burt, and R. Bhumgara. (1993). Use of Standard Sand Characterization Tests to Indicate the Effectiveness of Thermal Reclamation on Mixed Foundry Sand Wastes. AFS Transactions 101:565-571.

Voigt, R. C., and C. R. Loper, Jr. (1984). Austempered Ductile Iron—Process Control and Quality Assurance. Journal of Heat Treating 3(4):291-309. (Also published in Proceedings 2nd International Conference on Austempered Ductile Iron, American Society for Metals.)

**Conference Proceedings, Refereed**

**Material Development**

Lindwall, G. L., Liu, Z. K., Lynch, P. C., & Voigt, R. C. (2014). Thermodynamic and kinetic aspects of the effect of alloying elements on cementite and carbide formation in high-strength steel. Material Science and Technology 2014, Pittsburgh PA, CD-only volume.

Shirwaiker, R. A., R. W. Wysk and R. C. Voigt (2010). An electrically activated silver-based antibacterial surface system. ASME International Manufacturing Science and Engineering Conference, October 12-15, 2010, Erie PA. (27pp).

Voigt, R.C. (2001), Deformation and Fracture of Cast Irons. Proceedings, International Conference on the Science of Casting and Solidification, Brasov, Romania, pp. 369-376.

Yamaura, H., T. Ma, D.A. Koss, R.C. Voigt, and T. Kimura. (2000), The Influence of Casting Defects on the Fatigue of SiC/Al MMCs, Proceeding, FATIGUE 2000.

Kauffmann, P., J. Chandra, R. Voigt, and R. Regan. (1996). Use of Multivariate Statistical Methods to Characterize the Environmental Quality of Materials. Proceedings, INFORMS Conference, Washington, D.C.

Fang, L., K. Metzloff, R. C. Voigt, and C. R. Loper, Jr. (1995). Young’s Modulus in Graphitic Cast Irons. The U.S. Technical Communication, Proceedings of the 61st World Foundry Congress, Beijing, China: 10 pages. (Also translated into German and published in Giesserei-Praxis [1996] 7/8: 137-141)

Voigt, R. C., M. Blair, and J. Rassizadehghani. (1990). High Strength Low-Alloy Cast Steels. Proceedings of the ASME-PVP Conference, American Society of Mechanical Engineers, New York: 31: 147-154.

Voigt, R. C. (1990). Fracture of Cast Irons. Proceedings, 57th World Foundry Congress, Osaka, Japan, Paper No. 5:11 pages. **Selected as the US Technical Communication paper for 1990 World Foundry Congress**.

Bangaru, N. R., R. C. Voigt, and J. M. Svoboda. (1990). Advanced Concepts of HSLA Cast Steels. Proceedings, 1990 Electric Furnace Conference, Iron & Steel Society: 191-197.

Voigt, R. C., and J. M. Svoboda. (1989). Development and Applications of HSLA Cast Steels. Proceedings of the 8th International Conference on Offshore Mechanics and Arctic Engineering, American Society of Mechanical Engineers, New York 3:353-359.

Voigt, R. C., and J. M. Svoboda. (1989). Development and Applications of HSLA Cast Steels. Proceedings of the 8th International Conference on Offshore Mechanics and Arctic Engineering, American Society of Mechanical Engineers, New York 3:353-359.

Voigt, R. C., and Y. H. Lee. (1988). Properties and Applications of Austempered Ductile Irons. Proceedings of the 4th Cairo University Conference on Mechanical Design and Production. Current Advances in Mechanical Design and Production, Pergamon Press (1990): 29-36.

Voigt, R. C., and L. Eldoky. (1987). Microstructural Aspects of Fracture in Ductile Cast Irons. Proceedings, International Conference on Advanced Casting Technology, Advanced Casting Technology, ASM International, Metals Park, OH: 153-165.

Voigt, R. C., and L. ElDoky. (1986). Fracture of Ductile Cast Irons., Proceedings, 53rd World Foundry Congress, Prague, Czechoslovakia Paper No.17; 15 pages. **Selected as the US Official Exchange Paper for the 1986 World Foundry Congress.**

Voigt, R. C., and Y. J. Park. (1985). Austempered, High Carbon, Silicon Alloyed Cast Steel. Proceedings, 1st International Steel Foundry Congress, Steel Founders’ Society of America, Chicago, IL:137-144.

Voigt, R.C., and C.R. Loper, Jr. (1984). Austempered Ductile Cast Irons—Inference of Microstructure Control. Proceedings of the 3rd International Symposium on the Physical Metallurgy of Cast Iron. The Physical Metallurgy of Cast Iron. (1985). North Holland 34:377-384

Voigt, R. C., and C. R. Loper, Jr. (1983). Scanning Electron Microscope Study of Austempered Ductile Cast Iron. Scanning Electron Microscopy/1983/III: 1067-1077.

**Conference Proceedings, Refereed**

**Manufacturing Process Innovation**

Lynch, P. C., R. C. Voigt, J. C. Furness and D. Paulsen (2007) Ultrasonic-assisted solidification and feeding of aluminum alloy A356. Proceedings, Aluminum Cast House Technology Conference, Sydney, Australia:8 pages

Frank, M.C., I.J. Petrick, E.A. Lehtihet and R.C. Voigt (2003). Impact of Tooling Design and Set-Up on the Variability of Production P/M Components. Proceedings,World Congress on Powder Metallurgy and Particulate Materials, Orlando FL.

Karve, A., and R.C. Voigt. (2000). Characterizing the Dimensional Variability of Production Die Castings, Proceedings, 20th International Die Casting Congress and Exposition, North American Die Casting Association, Cleveland, OH, 183-194.

Peters, F., and R. Voigt. (1998). Experiments on the Dimensional Changes of Steel Castings During Solidification. Proceedings, Modeling of Casting, Welding and Advanced Solidification Processes VII, TMS, pp. 1217-1223.

Peters, F. E., and R. C. Voigt. (1994). Dimensional Capabilities of Steel Castings. Proceedings, Near-Net-Shape Manufacturing Conference. ASM International, Metals Park, OH: 17-25.

Voigt, R. C., Y. H. Lee, and C. H. Tu. (1991). Use of Hardenability Data to Determine Alloy Requirements for Austempered Ductile Iron. Proceedings of the 1991 World Conference on Austempered Ductile Iron, American Foundrymen’s Society, Des Plaines, IL: 479-515.

Loper, C. R., Jr., and R. C. Voigt. (1985). Cast Iron Welding Metallurgy and Weld Microstructures, Symposium on the Metallography and Interpretation of Weld Microstructures, Metallurgy and interpretation of Weld Microstructures, ASM International, Metals Park, OH: 331-368.

Voigt, R. C., and C. R. Loper, Jr. (1981). Gas-Tungsten Arc Welding of High Purity Aluminum for Aluminum-Stabilized Composite Superconductors. Advances in Cryogenic Engineering Materials 26:227-234.

Voigt, R. C. and C. R. Loper, Jr. (1979). GTA Welding and Heat Treating of High Purity Aluminum. Welding Journal 58(1):20-25.

**Conference Proceedings, Refereed**

**Manufacturing System Development**

Torielli, R. M., R. A. Abrahams, R. W. Smillie and R. C. Voigt (2010). Using lean methodologies for economically and environmentally sustainable foundries. (2010). Proceedings, 69th World Foundry Congress, Hangzhou China, October 2010, 32 pages.

Voigt, R. C., P. H. Cohen and R. M. Torielli (2008) "Machining of ductile irons - influence of casting dimensional variability on tool life variation" Proceedings, 2008 Keith Millis Symposium on Ductile Cast Iron, Las Vegas, October 2010 (12 pp).  
  
Karnezos, T., R. C. Voigt and G. Dispensa (2008). Improved annealing furnace control for fuel efficiency and cycle time reduction. Proceedings, AIST Steel Properties & Application Conference, Pittsburgh PA, September 2008 (12 pp).

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Shirwaiker, R. A., R. C. Voigt and R. A Wysk. (2010). Design of an electrically activated silver-based antibacterial surface system. Proceedings, 2010 Industrial Engineering Research Conference, A. Johnson and J. Miller eds. (12 pp).

Frank, M.C., Petrick, I.J., Lehtihet, A., and Voigt, R., “Impact of Tooling Design and Set-Up on the Variability of Production P/M Components,”Proceedings of the World Congress on Powder Metallurgy and Particulate Materials, 2002

Kauffman, P.J. and R.C. Voigt. (1997). A Two Stage Model for Assessing the Conceptual Feasibility of a New Environmental Product, Proceedings, 18th American Society of Engineering Management Conference, October 23-26, 8 pp.

Karve. A. and R. C. Voigt. (1997). Managing Dimensional Data for Effective Dimensional Control in the Die Casting Plant, Transactions 1997 NADCA Conference, North American Die Casting Association, Rosemont, IL, 9pp.

**Invited Papers/Presentations**

**Material Development**

Lynch, P. C., R. C. Voigt, R. Monroe, K. Murphy, R. A. Abrahams (2013) "Low Temperature Impact Toughness of High Strength Cast Steels," Proceedings, 67th Steel Founders' Society of America Technical & Operating Conference, 11-14 December, Chicago IL, 31 pages. (paper and presentation)

Lynch, P. C., R. C. Voigt, and C. J. Saldana. (2012). High strength steels tempered at low temperatures. Proceedings, Steel Founders' Society of America Technical & Operating Conference, Chicago IL, December 2012. (25 pp). (paper and presentation)

P. C. Lynch, R. A. Abrahams and R. C. Voigt. (2011). Recent developments in high strength cast steels. Proceedings, Steel Founders' Society of America Technical and Operating Conference, Chicago IL, 8-10 December 2011. (12 pp). (paper and presentation)

Abrahams, R. A., P. C. Lynch and R. C. Voigt. (2010). "Composition and processing of ultra-high strength low-alloy steels for investment casting" 57th Annual Technical Conference on Investment Casting, Investment Casting Institute, Dearborn MI, October, 2010. (18pp). (paper and presentation)  
  
Abrahams, R. A. and R. C. Voigt. (2009). Processing and composition of high strength cast steels. Proceedings, Steel Founders' Society of America Technical and Operating Conference, Chicago IL, 12-14 December 2009. (29 pp). (paper and presentation)  
  
Abrahams, R. A. and R. C. Voigt. (2009). High performance investment cast 17-4 stainless steel and Beyond. Proceedings, 56th Annual Technical Conference on Investment Casting, Investment Casting Institute, Indianapolis IN, October 2009. (24pp). (paper and presentation)

Abrahams, R. A. and R. C. Voigt (2008) Physical Metallurgy and Processing of Cb7Cu. Proceedings, Steel Founders’ Society of America T&) Conference, Chicago IL: 20 pages. (paper and presentation)

Voigt, R. C., and F. E. Peters. (1992). Dimensional Tolerances and Shrinkage Allowances for Steel Castings. Proceedings, SFSA T&O Conference, Steel Founders’ Society of America, Des Plaines, IL:10 pages. (paper and presentation)

\*Tu, C-H, R. C. Voigt, and R. Rosmait. (1992). Influence of Composition on the Properties of As-Cast Steels. Proceedings, SFSA T&O Conference, Steel Founders’ Society of America, Des Plaines, IL: 15 pages. (paper and presentation)

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Voigt, R. C., J. Rassizadehghani, and R. Gattau. (1988). The Development of High Strength Low Alloy (HSLA) Cast Steels. Proceedings, SFSA T&O Conference, Steel Founders’ Society of America, Des Plaines, IL: 32 pages. (paper and presentation)

Rassizadehghani, J., and R. C. Voigt. (1987). Intercritical Heat Treatment of C-Mn and 8630 Type Cast Steels. Research Report No. 101. Steel Founders’ Society of America, Des Plaines, IL: 33 pages. (paper and presentation)

Voigt, R. C., J. Rassizadehghani, and R. Gattu. (1987). Initial Investigation of Microalloyed Cast Steel. Proceeding, SFSA T&O Conference, Steel Founders’ Society of America, Des Plaines, IL: 33pages. (paper and presentation)

Voigt, R. C., H. Dhane, and L. ElDoky. (1986). Microstructural Aspects of Fracture in Austempered Ductile Irons. Proceedings of the 2nd International Conference on Austempered Ductile Iron, American Foundrymen’s Society, Des Plaines, IL:327-335. (paper and presentation)

Rassizadehghani, J. and R. C. Voigt. (1986). Intercritical Heat Treatment of Cast Steel. Proceeding, SFSA T&O Conference Steel Founders’ Society of America, Des Plaines, IL: 35 pages (paper and presentation)

Voigt, R. C. (1984). Austempered Iron Vies With Steel. American Metal Market, Metalworking News, Foundry Special Issue: 11A, 14A. (paper)

**Invited Papers/Presentations**

**Material Development**

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Voigt, R., R. Torielli and P. C. Cohen. (2009). Ductile iron machinability takes on new dimension. Modern Casting, ( 99) 1, pp.37-40. (paper)

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Halbe, S., and R. Voigt. (2002) Dimensional Capabilities of Aluminum Castings, The Crucible. July/August, pp. 6-9. (paper)

Varkey, V. K. and R. C. Voigt. (2001). Evaluation of Heat Treatment Practices in Steel Foundries. Proceedings, Steel Founders’ Society of America, T&O Conference, Chicago, IL, 1.6-1-1.6-29. (paper and presentation)

Bertoletti, J. P., and R. C. Voigt. (2000). Strategies for the Production of Thin-Wall Steel Castings, Proceedings, Steel Founders' Society of America, Steel Society of America, Barrington, IL, 5.7-1,5.7-25. (paper and presentation)

Bertoletti, J. P., A. Kaley, S. C. Ricotta, and R. C. Voigt. (1999). Thin Wall Steel Castings; Experimental and Fill Simulation Results. Proceedings, Steel Founders’ Society of America Technical and Operating Conference. 3.8-1-3.8-19. (paper and presentation)

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Voigt, R. C., J. Kim and V. L. Richards. (1997). Opportunities for Thin-Wall Castings, Proceedings, Steel Founders’ Society of America, T&O Conference, Des Plaines, IL, 4.6-1-4.6-25. (paper and presentation)

Karve, A., K. Padmanabhan, and R.C. Voigt. (1997). Factors Influencing the Dimensional Variability of Investment Castings. Proceedings of the Investment Casting Institute, pp. 3:1-3:14. (paper and presentation)

Peters, F., R. Voigt, and M. Blair. (1996). Dimensional Repeatability of Investment Castings. Proceedings, 9th World Conference on Investment Casting, San Francisco, CA: 22, 1-10. (paper and presentation)

Faustine, W., N. Vanikar, and R. Voigt. (1996). Feature and Geometric Variability of Production Steel Castings. Proceedings, SFSA T&O Conference, Chicago, 3.3, 1-15. (paper and presentation)

Voigt, R., N. Vanikar, and A. Karve. (1996). Statistical Analysis of Steel Casting Feature Variability for Dimensional Tolerance Setting. Proceedings, SFSA T&O Conference, Chicago, 3.4, 1-22. (paper and presentation)

Peters, F. E., R. C. Voigt, L. A. Potter, and E. C. DeMeter. (1995). Dimensional Repeatability of Steel Castings: An Update. Proceedings, SFSA T&O Conference, Steel Founders’ Society of America, Des Plaines, IL: 4.2-1-15. (paper and presentation)

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Vaupel, W. L., E. C. DeMeter, F. E. Peters, and R. C. Voigt. (1995). Geometric Variability of Production. Steel Castings. Proceedings, SFSA T&O Conference, Steel Founders’ Society of America, Des Plaines, IL: 4.1 1-27. (paper and presentation)

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**Invited Papers/Presentations**

**Material Development**

Torielli, R., Cannon, F. S., Voigt, R. C. , Considine, T., Furness, J., Fox, J., Goudzwaard, J., & Huang, H. (2014). "Reining in Costs, Controlling Emissions." Modern Casting*.* American Foundry Society, Vol.3, pp. 39-53. (paper)

Voigt, R. C., Hitchings, J. Okhuysen, V. F. (2013) Metal Filtration Strategies for Ferrous Investment Castings, Proceedings, 60th Investment Casting Institute Technical Conference, 6-8 October, Pittsburgh PA, 27 pages. (paper and presentation)

V. Okhuysen, P. Tosta, L. Potter, F. Peters, P. Lynch, R. Voigt. (2012). Assessment of measurement systems for the dimensional inspection of investment castings. Proceedings, 59th Investment Casting Institute Technical Conference, Memphis, TN, October, 2012. (31 pp). (paper and presentation)

Karnezos, T. and R. Voigt. (2010). Lower your heat treatment cycle times. Modern Casting (100) 3. 47-49. (paper)  
  
Karnezos, T. and R. C. Voigt. (2009). Improved heat treatment process control with non-contact load temperature sensing. Proceedings, Steel Founders' Society of America Technical and Operating Conference, Chicago IL, 12-14 December 2009. (19 pp). (paper and presentation)

Voigt, R. C., P. H. Cohen and R. M. Torielli (2008) Machining of Ductile Irons – Influence of Casting Dimensional Variability on Tool Life Variation. Proceedings, 2008 Kith Millis Symposium on Ductile Cast Iron, Las Vegas, NV: 12 pages. (paper and presentation)

Karnezos, T., R. C. Voigt and G. Dispensa (2008) Improved annealing furnace control for fuel efficiency and cycle time reduction, Proceedings, AIME Conference, Pittsburgh PA.

Voigt, R. C., N.P. Deskevich and A.J. Wollenburg. (2004) Heat Treatment Procedure Qualification For Carbon and Low Alloy and High Alloy Steel Castings. Proceedings, Steel Founders’ Society of America T&O Conference, Chicago IL: 37 pages. (paper and presentation)

Clobes, J. K., R.C. Voigt, F. S. Cannon, Y. Wang, N. Milan-Segovia and J.C. Furness Jr. (2004) Update on the Use of Advanced Oxidation Processes to Control VOC Emissions in Green Sand Iron Foundries. Proceedings, AFS Environmental Health and Safety Conference, August 15-17, Indianapolis IN, 13 pages.

Okhuysen, V.F. and R.C. Voigt. (2003) Dimensional Prediction and Control of Investment Castings. Proceedings,51st Investment Casting Institute Technical Conference, Cleveland, OH: 23:1 to 23:37. (paper and presentation)

Kochar, V.M., R.C. Voigt and M.V. Deo. (2003) Effective Pattern Allowance Prediction for Steel Castings. Proceedings, Steel Founders’ Society of America,T&O Conference, Chicago, IL: 5.3-1 to 5.5-32. (paper and presentation)

Deskevich, N.P., A.J. Wollenburg and R.C. Voigt. (2003) Perspectives on Heat Treatment Procedure Qualification for Steel Castings. Procedure Qualification for Steel Proceedings, Castings. Proceedings, Steel Founders’ Society of America, T&O Conference, Chicago, IL: 2.3-1 to 2.3-26. (paper and presentation)

Cohen, P. and R. Voigt. (2003). Observations on the Machinability of Ductile Irons). Proceedings, 2003 Keith Millis World Symposium on Ductile Cast Iron: 183-184 (electronic paper and presentation)

Voigt, R. C., N. Ivey, S. Halbe. (2001). Dimensional Control of Steel Castings. Steel Founders’ Society of America, T&O Conference, Chicago, IL, 5.5-1-5.5-20 (paper and presentation)

Voigt, R. C., R. Monroe, G. Dispensa, C. Monroe, and F. E. Peters. (2000). Pattern Allowances--Predicting Casting Dimensions from Tool Dimensions, Proceedings, Steel Founders' Society of America, Steel Founders' Society of America, Barrington, IL, 5.8-1-5.8-18. (paper and presentation)

Andrews, J., R. Bigge, F. S. Cannon, G. R. Crandell, J. C. Furness, Jr., M. Redmann, and R. C. Voigt. (2000). Advanced Oxidants Offer Opportunities to Improve Mold Properties, Emissions. Modern Casting, 90(9):40-43. (paper)

Cannon, F.S., J.C. Furness, Jr., and R.C. Voigt. (2000). Economical Use of Advanced Oxidation Systems for Green Sand Emission Reductions, Proceedings, AFS Environmental, Health and Safety Conference, Orlando, FL, 317-332. (paper and presentation)

Padmanahan, K., R. Voigt, and V. Okhuysen. (1998). Dimensional Control of Investment Castings. Proceedings, Investment Casting Institute, Orlando, FL, pp. 16:1-16:13. (paper and presentation)

Okhuysen, V., K. Padmanabhan, and R. Voigt. (1998). Tooling Allowance Practices in the Investment Casting Industry. Proceedings, Investment Casting Institute, Orlando, FL, pp.1:1:20. (Reprinted in Incast, 1999). (paper and presentation)

Voigt, R. C., N. Ivey and F. E. Peters. (1997). Development of Dimensional Tolerances for Steel Castings, Proceedings, Steel Founders' Society of America T&O Conference, Steel Founders' Society of America, Barrington, IL, Nov. 6-8, 1997, pp. 4.5-1 to 4.5-27. (paper and presentation)

Regan, R., and R. Voigt. (1996). Beneficial Use of Foundry Solid Wastes: Working with Regulators. Proceedings, 28th Mid-Atlantic Solid Waste Conference. (paper and presentation)

Karve, A., L. Potter, and R. Voigt. (1996). Selection and Use of Steel Dimensional Inspection Equipment Based on Measurement System Analysis Studies. Proceedings, SFSA T&O Conference, Chicago, IL 3.6, 1-16. (paper and presentation)

Peters, F., and R. Voigt. (1996). Pattern Allowance Prediction. Proceedings, SFSA T&O Conference, Chicago, 3.6, 1-15. (paper and presentation)

Peters, F. E., and R. C. Voigt. (1996). How to Determine Measurement Variability in the Patternshop, Modern Casting. Modern Casting, 86(3), 58-60. (paper)

Regan, R., and R. C. Voigt. (1994). Introduction of Environmental Considerations Into a Traditional Manufacturing Curriculum: Metal Casting. Proceedings, ASEE Middle Atlantic Section Fall Meeting. Hofstra University, Hempstead, NY: 6 pages. (paper and presentation)

Vaupel, W., E. C. DeMeter, F. E. Peters, and R. C. Voigt. (1994). The Implications of Tolerance System Interpretation of Past and Present Dimensional Variability Studies. Proceedings, SFSA T&O Conference, Steel Founders’ Society of America, Des Plaines, IL: 13 pages. (paper and presentation)

Peters, F. E., and R. C. Voigt. (1993). Casting Inspection Strategies for Determining Dimensional Variability. Proceedings, SFSA T&O Conference, Steel Founders’ Society of America, Des Plaines, IL:20 pages. (paper and presentation)

Ruud, C. O., P. H. Cohen, S. Joshi, E. A. Lehtihet, L. B. Raiman, R. C. Voigt, and R. Graetzer. (1992). The Principles of Science and Mathematics Reflected in Manufacturing Processes. Frontiers in Engineering Education, American Society for Engineering Education, New York: 775-781. (paper)

Voigt, R. C. (1991). Penn State Cast Metals Program. The Crucible, Non-Ferrous Founders’ Society of America, Des Plaines, IL: 5-7. (paper)

**Handbook Chapters**

Trace (Minor) Elements in Cast Iron, ASM Handbook, Vol 1A Cast Iron Science and Technology (2017). ASM International, Metals Park OH, pp. 177-181

Patterns and Patternmaking, Chapter, ASM Handbook Volume 15 ‘Casting’ (2008). ASM International, Materials Park, OH, pp. 488-496.

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**Patents**

US 2014028633 Ex Vivo Antimicrobial Devices and Methods, September 25, 2014; Thomas A. Fuller,

Richard Wysk, Wayne J. Sebastianelli, Paul H. Cohen, Robert C. Voigt

US 20110108232 A1 Binder Material, filed - May 12, 2011, [Frederick Scott Cannon](https://www.google.com/search?tbo=p&tbm=pts&hl=en&q=ininventor:%22Frederick+Scott+Cannon%22), [John T. Fox](https://www.google.com/search?tbo=p&tbm=pts&hl=en&q=ininventor:%22John+T.+Fox%22), [He](https://www.google.com/search?tbo=p&tbm=pts&hl=en&q=ininventor:%22He+Huang%22)

[Huang](https://www.google.com/search?tbo=p&tbm=pts&hl=en&q=ininventor:%22He+Huang%22), [Robert C. Voigt](https://www.google.com/search?tbo=p&tbm=pts&hl=en&q=ininventor:%22Robert+C.+Voigt%22), [James C. Furness](https://www.google.com/search?tbo=p&tbm=pts&hl=en&q=ininventor:%22James+C.+Furness%22), [Paul D. Paulsen](https://www.google.com/search?tbo=p&tbm=pts&hl=en&q=ininventor:%22Paul+D.+Paulsen%22), [Gregory Sanders](https://www.google.com/search?tbo=p&tbm=pts&hl=en&q=ininventor:%22Gregory+Sanders%22), [Matthew Robert](https://www.google.com/search?tbo=p&tbm=pts&hl=en&q=ininventor:%22Matthew+Robert+Lumadue%22)

[Lumadue](https://www.google.com/search?tbo=p&tbm=pts&hl=en&q=ininventor:%22Matthew+Robert+Lumadue%22), [Allura Marie Jiles](https://www.google.com/search?tbo=p&tbm=pts&hl=en&q=ininventor:%22Allura+Marie+Jiles%22), [Paul Jonathan Munson](https://www.google.com/search?tbo=p&tbm=pts&hl=en&q=ininventor:%22Paul+Jonathan+Munson%22), [Sridhar Komarneni](https://www.google.com/search?tbo=p&tbm=pts&hl=en&q=ininventor:%22Sridhar+Komarneni%22), [Nicole Robitaille](https://www.google.com/search?tbo=p&tbm=pts&hl=en&q=ininventor:%22Nicole+Robitaille+Brown%22)

[Brown](https://www.google.com/search?tbo=p&tbm=pts&hl=en&q=ininventor:%22Nicole+Robitaille+Brown%22), [James A. Devenne, Jr.](https://www.google.com/search?tbo=p&tbm=pts&hl=en&q=ininventor:%22James+A.+Devenne,+JR.%22)

**RESEARCH IMPACT**

Broader direct research contributions in the areas material development, manufacturing process innovation and manufacturing system development, that go beyond published papers, are described here in narrative form. They reflect additional research contributions to deploy science and technology in industry.

**Material Development**

Comprehensive studies on the machinability of austempered ductile irons (ADI) have led to the development to first US published standards for the drilling, turning and milling of ADI (Cast Iron Handbook, ASM International, 2017)

Understanding of low temperature tempered cast steels, in partnership with the Air Force Research Laboratory and the Steel Founders’ Society of America, had led to the development and use of Cast Eglin Steel (CES) and next generation, stage-1 tempered steels for ballistic penetration and force protection applications by the US military. (2011-present)

ArgentumCidalElectric Inc, (now AIONX Inc. <http://aionx.com> ) has grown from a Penn State-affiliated start-up company (with T. Fuller, R. Wysk, P. Cohen) to a small business currently valued at over $4M. AINOX has 15 issued and pending patents in the US and other countries (2005-present)

**Manufacturing Process Innovation**

On-going research on clay activation science and processing had led to the development of energy-content control strategies for sand mulling in green sand foundries (collaborators: Furness-Newburge Inc., Neenah Foundry Company) Two Penn State hosted research symposia have been held to rapidly disseminate early research results prior to research publication. At the present time, 10 US companies are working cooperatively to both implement and further develop energy-based mulling strategies in cooperation with Penn State researchers. This work, still in pre-publication, (R. Torielli, PhD. expected 2018)

Collaborative research on the science and control of advanced oxidation processing of green sand systems, in partnership with F. Cannon-Penn State University and J. Furness-Furness Newburge Inc., has led to the development and use of full-scale advanced oxidation systems at more than 30 foundries in the US and across the world. Currently more than 15% of the US production of cast irons is produced in foundries using advanced oxidation systems with both annual cost savings and emissions reductions. (2000-present)

**Manufacturing System Development**

Collaborative field research (Penn State, University of Wisconsin-Madison, and Texas A&M; 2009-present) has developed and is adapting more than 10 manufacturing support tools currently in use at oil and gas equipment manufacturing facilities. Penn State researchers have developed 4 manufacturing and remanufacturing software support tools and 5 Penn State MS students have been hired by NOV upon graduation. The consortia research program has been recognized by the Institute of Industrial and Systems Engineers (IISE) as its ‘I5’ award winner for 2017.

Field research studies by Penn State researchers at metalcasting companies across the US have led to a fundamental understanding of casting dimensional control and the development of statistical based standards for casting dimensional capabilities. These findings have let to the development of the current US dimensional tolerance specifications for steel castings published by the Steel Founders Society of America (1994) and modified dimensional tolerance specifications published the Investment Casting Institute (1996) Both standards are used daily by foundries and casting customers across the world.

**RESEARCH CONTRACTS AND GRANTS**

Research funding ($10.3M direct funding) is described for both stand-alone research efforts and for consortia research efforts. Consortia research activities include the direct collaboration of university and industry partners supported by government, industry trade association, and company funding. In many cases, the direct funding subcontracted amount to Penn State indicated below represents only a fraction of the total research effort .

**Consortia Research Projects**

National Oilwell Varco Manufacturing System Development

Consortium Scope: 2010-present Co-PI, sub-contracts through the University of Wisconsin-Madison

Consortium Funding: National Oilwell Varco, $3,200,000

Consortium Partners: University of Wisconsin-Madison, Texas A&M, National Oilwell Varco

Complex, Custom Engineered Manufacturing System Development, Principal Investigator, University of Wisconsin Madison, 7/1/16-6/30-20, $600,000

Being Responsive in a Complex Custom Engineered Manufacturing Environment: Strategies, Methods and Tools, Principal Investigator, University of Wisconsin-Madison, 9/1/11-6/30/17, $310,000

High Performance Cast Steels for Ballistic Performance and Force Protection

Consortium Scope: 2009-2016; subcontracts through various organizations

Consortium Funding: AFRML, Army Research Lab, $3.2M; in-kind contributions from industry

Consortium Partners: 5 universities, 17 industry partners, 1 industry trade association; member of

consortium technical committee

Casting and Advanced Steel Technology," Steel Founders' Society of America, Principal Investigator, Steel Founders’ Society of America, 7/1/2012-1/31/2016, $138,000.

Castings for Improved Defense Readiness Program, Principal Investigator, Advanced Technology Incorporated, $170,000 Principal Investigator (100%) 3/2/2010-9/30/2012, $170,000.

Casting for Improved Defense Readiness, Advanced Technology Institute, Principal Investigator, 4/9/2007-10/31-2009, $157,545

Impact Toughness Study of ES-1 Steel, Science Applications International Corporation, Principal Investigator, 4/1/2009-9/30/2009, $30,000.

DARPA Advanced Vehicle Make and iFAB Foundry Programs

Penn State Applied Research Laboratory

Consortium Scope: 2011-2014; with Penn State as a sub-contractor and a tier-2 subcontractor

Consortium Funding: Defense Advanced Research Projects Agency, $7,300,000

Consortium Partners: 14 universities, 11 industry partners; 13 Penn State researchers

Instant Foundry Through Adaptive Bits (iFAB Foundry), DARPA, 2012- 1024, $98,000.

Component Context and Manufacturing Model Library (C2M2L-2), DARPA, investigator, 2012-2013, $34,000.

Component Context and Manufacturing Model Library (C2M2L-1), DARPA, investigator, 2011- 2012, $50,000.

Development of Novel Organic - Inorganic Core Binder Systems

Consortium Scope: 2007-2014, Penn State as the prime contractor for all projects

Consortium Funding: government and industrial funding sources, $2,561,180

Consortium Partners: 4 industry partners, 5 Penn State faculty

A Novel Foundry Fuel Source Utilizing Biomass Co-products as Binders and Fuel, USDA National Institute of Food and Agriculture, Co-Principal Investigator (10%) 1/1/2011-12/31/2015, $894,507.

Less Energy, More Jobs: HMAC-L Foundry Low-VOC Cores, Ben Franklin Technology Center of Northeastern PA, Co-Principal Investigator (30%) 2/16/2012-12/31/2013, $36,750.

ARRA: NSF-CMMI-MPM-GOALI: Novel Low-Polluting Collagen-Alkali Silicate Bindered Cores for Foundries, National Science Foundation, Co-Principal (10%) 8/15/2009-7/31/2012, $337,673.

HMAC Lawrenceville Foundry Collagen Bindered Cores, Ben Franklin Technology Center of Northeastern PA, Co-Principal Investigator (15%), $36,250.  
  
Moving to Sustainability: Improving and Valuing Materials Flow of the Metal Casting Industry

National Science Foundation, Co-Principal Investigator (20%) 9/15/2005-8/31/2010, $1,247,250

Collagen Binder Development for Innovative Coremaking Machine, Harrison Machine Company LLC, Co-Principal Investigator (15%) 3/1/2009-6/30/2009, $25,000.  
  
Characterization of Volatiles that are Thermally Decomposed from Core Binders and Green Sand via TGA-MS, Curie-Point Pyrolysis-GC-FID, and TGA-Capture-GC-FID

University of Northern Iowa, Co-Principal Investigator, (10%) 5/1/2007-10/31/2008, $20,000.

Science and Process Control of Advance Oxidation Green Sand Molding Systems

Consortium Scope: 1998-2008, Penn State as the prime contractor for all projects

Consortium Funding: government and industrial sources, $1,414,171

Consortium Partners: 9 industry partners, 1 industry trade association,4 Penn State faculty

Diminished Materials Use and Air Pollutants in Foundries Via an Integrated Advanced Oxidation Process: Characterization of Materials and Pollutants at the Nano-Scale, Environmental Protection Agency, Co-Principal Investigator (20%) 3/8/2002-3/6/2005, $325,000.

Reducing Foundry Emissions and Green Sand Waste via Integrated Advance Oxidation-Underwater Plasma Processing, Victaulic Company of America, Co-Principal Investigator (50%), 4/1/2000-10/31/2004, $265,000.

GOALI: Fundamentals of a Novel Advanced Oxidation Process for Foundries that Improves Green Sand Performance and Diminishes Air Emissions, National Science Foundation, Co-Principal Investigator (30%), 7/15/2000-6/30/2003, $250,000.

Non-Incineration Treatment to Reduce Benzene and VOC Emissions from Green Sand Molding Systems, US Department of Energy, Co-Principal Investigator (50%), 10/30/1998-10/29/2001, $549,171.

Green Sand Systems for the Foundry Industry, Neenah Foundry Co., Co-Principal Investigator (50%), 3/1/1998-6/30/1999, $25,000.

Control of Ferrous Heat Treatment Operations

Consortium Scope: 1999-2008, Penn State as the prime contractor for all projects

Consortium Funding: government and industrial sources, $422, 232

Consortium Partners: 14 industry partners, 1 industry trade association, 2 faculty

Annealing Heat Treatment Optimization at CARTECH, Carpenter Technology Corporation, Principal Investigator, 8/16/2007-12/31/2008, $35,199.

Heat Treatment Procedure Qualification for Steel Castings, US Department of Energy, Principal Investigator, 9/30/1999-6/30/2004, $387,033.

Metalcasting Science and Technology Deployment in Pennsylvania Foundries

Consortium Scope: 1993-2003, Penn State as the prime contractor for all projects, $489,533

Consortium Funding: government and industrial sources,

Consortium Partners: 78 industry partners, 1 industry trade association, 4 Penn State faculty

Pennsylvania Metalcasting Industries of the Future, COP Department of Environmental Protection, Co-Principal Investigator (50%), 4/18/2002-9/30/2003, $29,750.

Process Improvement for Kulp Foundry, Ben Franklin Technology Center of Northeastern PA, Principal Investigator, 3/10/1999-6/30/99, $27,304.

Metal Casting Center of Excellence, Ben Franklin Technology Center of Central & Northern Pennsylvania Inc., Principal Investigator (50%), 9/1/1994-8/31/1995, $18,000.

ETI – Addressing Technical and Institutional Barriers for Beneficially Revising Foundry Residuals, US Environmental Agency, Co-Principal Investigator (50%), 10/1/1995-9/30/1998, $191,151.

Metalcasting Best Practices, COP Department of Environmental Protection, Co-Principal Investigator (65%), 10/9/2002-5/31/2005, $182,832.

Metalcasting Center of Excellence, Principal Investigator, various companies, various dates, 1993-94, $50,410.

Dimensional Assessment and Control of Metalcasting Processes

Consortium Scope: 1997-2005, Penn State as the prime contractor for all projects

Consortium Funding: government and industrial funding sources, $2,648,519

Consortium Partners: 82 industry partners, 3 industry trade associations, 3 Penn State faculty

Integrated Dimensional Engineering for Short-Run Castings, Advanced Technology Institute, Principal Investigator, 1/2/2001-6/22/2005, $474,500.

Dimensional Capabilities of Metal Castings, Advanced Technology Institute, Principal Investigator (80%), 11/10/1994-12/31/2000, $1,092,985.

Metal Cast Center, Steel Founders’ Society of America, Principal Investigator, 9/15/1996-9/14/1998, $15,000.

Matching Funds for Metal Cast Center, ESCO Corporation, Principal Investigator, 9/1/1996-8/31/1997, $4,000.

DOE Metal Cast Center Support, Varicast, Principal Investigator, 7/1/1996-6/3/1997, $4,000.

Matching Funds for the DOE Metal Cast Center, Steel Founders’ Society of America, Principal Investigator, 6/1/1996-5/31/1997, $11,000.

Matching Funds for the DOE Metal Cast Center, Steel Founders’ Society of America, Principal Investigator, 6/1/1996-5/31/1997, $1,300.

Matching Funds for the DOE Metal Cast Center, Steel Founders’ Society of America, Principal Investigator, 8/1/1995-/31/1996, $16,932.

Matching Funds for the DOE Metal Cast Center, Steel Founders’ Society of America, Principal Investigator, 6/1/1996-5/31/1997, $1,300.

Matching Funds for the DOE Metal Cast Center, Steel Founders’ Society of America, Principal Investigator, 8/1/1995-7/31/1996, $13,232.

Thin Section Steel Castings, US Department of Energy, Principal Investigator, 10/1/1997-12-31/2001, $333,111.

Casting Dimensional Control and Fatigue Life Prediction for Permanent Mold Casting Dies, US Department of Energy, Principal Investigator (60%), 10/1/93-5/31/1997, $686,329.

Property and Processing Improvements in Cast Steel Alloys

Consortium Scope: 1986-1995, Penn State and the University of Kansas as the prime contractors

Consortium Funding: government and industrial funding sources, $183,204

Consortium Partners: 14 industry partners, Steel Founders’ Society of America

Cast Steel Research Activities, Steel Founders’ Society of America, Principal Investigator, 2/28/1994-2/27/1995, $8,691

12/9/1991-12/8/1992, $3,413

8/22/1991-8/21/1992, $5,000

6/13/1991-6/12/992, $5,000

5/31/1991-5/30/1992, $5,000

Metal Casting, Various Companies, Principal Investigator, 12/31/1991-12/31/1992.

Steel Founders’ Society of America, $10,000

Foundry Companies, $9,800

Intercritical Heat Treatment, Steel Founders’ Society of America, Principal Investigator, 1984-1986, $30,000. (University of Kansas)

Intercritical Heat Treatment of Cast Steel, Rockwell International, Principal Investigator, 1984, $4,000. (University of Kansas)

Microalloyed Cast Steel, Steel Founders’ Society of America, Principal Investigator, 1987-1989, $97,000. (University of Kansas)

Microalloyed Cast Steel, KU General Research Fund, $6,000 Principal Investigator (100%) 1986-1987. (University of Kansas)

**Other Research Projects**

Development of 50 ksi Yield Strength Weldable Cast Steels, Steel Founders’ Society of America, 2017-2018, $98,783.

Evaluation and Testing of Silver Activated Biocidal Surfaces, Ben Franklin Technology Partners, Commonwealth of Pennsylvania, 2014-2015, $14,474.

Cost-effective Processing Routes for Austempered Ductile Iron," Applied Process Inc. Principal Investigator, 9/15/2015-6/30/2016, $19,870.

Hot Isostatic Pressing (HIP) of Aluminum Casting Alloy E357, Sikorsky Aircraft Corporation, Principal Investigator, 19/15/2014-8/7/2015, $10,000.

Adapting Anthracite, Bituminous and Lignite Coal to Green Sand Iron Foundries, Consortium for Premium Carbon Products from Coal, Penn State University, Investigator (10%), 2005-2006, $140,000.

Cost-effective Processing Routes for Austempered Ductile Iron," Applied Process Inc. Co-Principal Investigator (30%) , 1/1/2013-5/31/201, $110,849.

Design, Manufacturing Process Development and Statistical Analysis of an Electrically Stimulated Silver-based Continual Antibacterial System for Prevention of Nosocomial Infections," Penn State Clinical and Translational Sciences Institute, $50,000 — Investigator (10%) 2009-2011.

Academic Research Service Order, ArgentumCidalElectric Inc. (now AIONX), Principal Investigator, 7/1/2014-6/30/2015, $13,568.

Billet Induction Heating – Research Grant, Forging Industry Education & Research Foundation, 2007-2008, $20,000.

Ward Foundry Replace Coke & Reclaim BH Dust & Sand, Ben Franklin Technology Center of Northeastern PA, Co-Principal Investigator (10%), 4/16/2009-2/28/2011, $150,000.

Design, Manufacturing Process Development and Statistical Analysis of an Electrically Stimulated Silver-based Continual Antibacterial System for Prevention of Nosocomial Infections," Penn State Clinical and Translational Sciences Institute, Investigator (10%), 2009-2011, $50,000.

Pill Crushing Tests, First Wave Technologies Inc., Principal Investigator, 7/1/2009-11/30/2009, $4,469.

Magnetic Pulse Welding Technology, Dana Corporation, Principal Investigator, 6/15/2004-2/25/2005, $24,411.

Ductile Irons with Improved Machinability, Aluminum Pechiney, Co-Principal Investigator, 8/1/2002-7/31/2003, $50,000.

Machining of Ductile Iron - Grant, Durabar, Inc.,1994-1995, $9,000.

Dimensional Producibility of High Precision Sintered Components, Investigator (15%), 1999-2003, $160,000.

Aluminum Metal-Matrix Composites - Grant, Hitachi Metals Lltd. (50%, with D. Koss), 1997-1999, $93,000.

Aluminum Casting Research Project, Specialty Metal Products Co., Inc., Principal Investigator, 5/9/1994-5/8/1995, $840.

Center for Advanced Gear Manufacturing Technologies, Ford Motor Co., Principal Investigator, 9/1/1992-8/31/1993 and 9/1/1993-8/31/1994, $100,000.

Production of Precisions Austempered Ductile Iron (ADI) Gears, Ford Motor Compay, Principal Investigator, 12/9/1991-12/8/1992, $50,000

Investment Casting of Steel, CMI-Quaker Alloy Inc. Principal Investigator, 8/26/1992-8/25/1993, $8,000.

**Instructional Development and Laboratory Equipment Grants**

Superfinishing of Printed Metallic Parts for High Performance Naval Systems (equipment award; co-PI), Defense University Research Instrumentation Award, 2018, $535,000.

Enriching Engineering Education Using Peer-based Gamification of Challenging Course Concepts - In-Class Implementation," Penn State College of Engineering, Penn State, $50,000.00. Co-principal Investigator (20%), 2016-2017.

Undergraduate Faculty Enhancement Using Manufacturing as a Vehicle, National Science Foundation, Co-Principal Investigator (20%), 4/15/1993-9/30/1995, $305,526.

Foundry Research - Educational Grant, Buck Co., 2011, $7,800.

Welding Laboratory Equipment, Lincoln Electric Co., 2000, $46,000.

Software Gifts, Society of Manufacturing Engineers (SME), 1991-1992, $12,822

**WORKSHOPS/SYMPOSIA ORGANIZED**

Pennsylvania Foundry Association/Penn State Metalcasting Annual Conference,

each year from 2000-present

Conference co-organizer and presenter

Advanced Oxidation Green Sand Control Symposium-III, Mankato MN, Oct 2018

Organizer and presenter

Advanced Oxidation Green Sand Control Symposium-II, Neenah WI, January 2014

Organizer and presenter

Advanced Oxidation Green Sand Control Symposium-I, Neenah WI, April 2013

Organizer and presenter

Eglin Steel Workshop, Army Research Laboratory, Aberdeen Proving Ground MD, Oct 2011

Workshop Co-organizer and presenter

**GRADUATE STUDENT ADVISING**

**Doctoral Students Advised/ Co-Advised**

**Current Doctoral Students**

R. Toriellii C. Chimate A. Anand

**Past Doctoral Students (current position)**

D. Handayani, 2017 Assistant Professor, Industrial Engineering, California Polytechnic-Pomona

P. Lynch, 2015 Associate Professor of Industrial Engineering, Penn State University –Behrend

R. Abrahams, 2010 Air Force Materials Lab, Eglin AFB

J. Fox, 2009 (co-advised) Assistant Professor, Lehigh University

V. Kochar, 2006 Global Product Line Vice President, GE

M. Deo, 2005 Vice President, Power Systems, Cummins India, Ltd.

J. Clobes 2005 Senior Engineer, BMPC- Bettis

R. Marwanga, 1998 Dean, Faculty of Information Technology, Strathmore University

V Okhuysen, 1998 Professor, California Polytechnic – Pomona

A. Karve, 1998 Director, Asia & Middle East, Morgan Advanced Materials

P. Kauffmann, 1997 Executive Director, American Society for Engineering Management, Professor

Emeritus, East Carolina University

F. Peters, 1995 Associate Professor, Iowa State University

D. Poethe, 1993 Program Manager, Bechtel Marine Propulsion Corp.

C. H. Tu, 1993 Department Head, Mechanical Engineering Department, Taiwan

J. Rassizadehghani, 1990 Professor of Mechanical Engineering, University of Tehran

Y. H. Lee, 1987 unknown

L. ElDoky, 1985 unknown

**Masters Students Advised/Co-Advised**

A. Slavin, 2021

A. Mahmood, 2021

A. Vayaraghavan, 2021

R. Barnes, 2020

C. Snyder, 2020

T. Abichandani, 2020

A. Joglehar, 2018

A. Deshmane, 2017

S. Agrawal, 2017

A. Anand, 2017

G. Kumar, 2016

N. Rajarammohan, 2016

A. Pathak, 2015

C. Cash, 2015

D. Wang, 2015

J. Allen, 2014 (co-advised)

V. Singh, 2014

M. Kominami, 2013

C. Pizano , 2013 –

T. Cheeran, 2013–

P. Tosta, 2012-

K. Singh, 2012 -

M. Green, 2009 -

T Karnezos, 2009

G. Belot, 2009

T. Grenko, 2008

G. Herzing, 2008

P. Lynch, 2007

M. Freyer, 2006

G. Macht, 2006

K. Hobart 2005

L. Amelinckx, 2005

A. Khanolkar, 2005

R. Aronstam, 2004

N. Deskovich, 2004

H. Bhide, 2003

G. Herzing, 2003

V. Varkey, 2003

K. Umapathy, 2003

S. Halbe, 2002

a. Correa, ??

J. Land, 2002

J Bertoletti, 2001

M. Sherwin, 2001

A. Hannigan, 2000

S. Ricotta, 1999

A. Kaley, 1999

N. Ivey, 1999

R. Malone, 1999

K. Padbadabhan, 1998

T. Sunday, 1998

R. Burt, 1998

A. Karve, 1998

E. Nazareth, 1997

N. Vanikar, 1997

B. Johnson, 1997

W. Faustine, 1997

M. Marino, 1996

L. Potter, 1996

S. Aranthanaman, 1996

R. Malone, 1996

V. Okhuysen, 1995

V. DelBrugge, 1996

R. Velaga, 1996

J. Ristey, 1995

D. Schacht, 1995

W. Vaupel, 1995

S. Gross, 1994

C. Pederson 1993

T. Ebert, 1992

D. Bye, 1991

W. Wang, 1990

C. H. Tu, 1990

F. Orth, 1989

R. Gattu, 1988

S. Holmgren, 1988

D. Zachariah, 1988

R. Gattu, 1988

J. Rassizadehghani, 1987

H. ishbin, 1986

H. Dhanne, 1985

A. Correa, 1985

C. Miller, 1985

R. Bendaly, 1985

V. Hernandez, 1984

B. Pourlaidian, 1983

H. S Chiou, 1982

**SERVICE**

**Penn State Service** (past 5 years)

University

Faculty Rights and Responsibilities Committee, 2016-2019

College of Engineering

West Campus Building Committee, 2019 - present

P&T Committee; 2017

Distinguished Professor Selection Committee; 2015

AD14 Review Committees; 2016, 2019 (chair)

Department

Executive Committee; numerous times

P&T Committee; 2015, 2016

Distinguished Professor Selection Committee, 2016

**Professional Service**

U.S. Delegate, International Committee of Foundry Technical Associations (CIATF) Committee on the Heat Treatment of Castings, 1990 -1998

Invited Participant: White House Office of Science & Technology Workshop, U.S. Metal

Casting Technical Priorities & Strategies, Washington DC, October 1994

Journal Peer Review

Acta Materialia

ASME Journal of Metals and Technology

ASM Journal of Heat Transfer

Science and Processing of Cast Irons

International Journal of Metalcasting

International Journal of Cast Metals Research

American Foundry Society Transactions

Metallurgical Transactions

Welding Journal

Handbook Peer Review

Metals Handbook, ASM International

**Professional Society Membership and Service**

American Foundry Society

Elected member: Ductile Iron Research Committee, Steel Research Committee, Sand Quality Committee, Air Quality Technical Committee

Faculty Advisor, Penn State Student Chapter, 1991 – present

ASM International

American Welding Society

Investment Casting Institute

Elected member: Technical Committee, University Relations Committee

International Journal of Cast Metals Research

Editorial Board

International Journal of Metalcasting

IJMC Advisory & Board of Review

Pennsylvania Foundry Association

Society of Manufacturing Engineers

Steel Founders’ Society of America

Air Force Research Lab/Army Research Lab Cast Steel Technical Advisory Committee, member, 2012-2015

**Consulting** (past 10 years)

Andritz Inc., Muncy PA, 2016-2020

Penn State Applied Research Laboratory, 2013-2016

Strato Inc. New Brunswick NJ, 2014-2016

PRL Inc, Lebanon PA, 2015

AJAX, Sayre PA, 2013

Spring City Electrical Corp, Spring City PA, 2012

**Community Service Leadership Positions**

Lay Worship Leader, Evangelical Lutheran Church in America, 2013-present; lead Sunday worship services at small ELCA churches across central Pennsylvania; 8/yr

President, Grace Lutheran Church Council, State College PA,1998-2000