

# **Randy Clarksean, Ph.D., P.E., CFEI, CFII**

## **Mechanical Engineer**

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### **Professional Profile**

Dr. Clarksean has over 30 years of experience as an engineer. His background is focused on failure analysis and thermal systems. Failure investigations have involved fires, explosions, turbines, boilers, alternate energy systems, individual components, complex systems, etc. He has worked on numerous aspects of the thermal performance of engineering systems (heat exchangers, HVAC, boilers, materials processing, phase change, fluid flow), instrumentation, data acquisition, fires and explosions, as well as being an integral part of product development teams. In general, Dr. Clarksean applies his knowledge of engineering fundamentals to complex systems.

### **Areas of Expertise**

Randy has experience in heat transfer, fluid flow, mass transfer (mixing), fires/explosions, and basic structural analysis. He specializes in computer systems and the analysis/design of thermal systems. Specific applications include instrumentation, turbulence, natural convection, forced convection, chemical reactions, and radiation heat transfer. Dr. Clarksean has knowledge in porous media, metal combustion, spontaneous ignition, electrochemistry, and chemical thermodynamics. Induction heating, material phase change and the thermal aspects of safety analyses are other areas of expertise this consultant has. He also has strong skills in analyzing diverse process equipment, product design, computer applications, and software development.

Specific experience includes:

- Development of analysis techniques and the analysis of complex heat exchangers (single phase fluids, two-phase transient operation of brazed plate heat exchangers)
- Design of single phase heat exchanger for ocean energy system
- Patent for phase change slurry energy storage system for peak air conditioning loads (heat transfer and heat exchanger system for collecting, storing, and releasing energy)
- Numerous failure analyses and forensic investigations for process plants, manufacturing facilities, and equipment. Industries include aerospace, nuclear, process, and manufacturing.
- Numerical simulations of thermosyphons (passive heat exchange).
- Experimental analysis of natural convection for passive cooling systems (heat exchanger for passively cooling electronic enclosures)
- Numerical and experimental modeling of heat transfer equipment (heat exchanger for DEF system – single phase system)
- Analysis of metal particulate ignition and combustion (heat transfer, fluid mechanics, and mass transfer)
- Spontaneous combustion / ignition and fires
- HVAC systems, boilers, heating equipment
- Materials handling equipment (conveyors, augers, vacuum systems)

- Basic structural analysis related to system design, facilities, product development, and experimental setups
- Development of complex computer models for the analysis of engineering systems
- Evaporative cooling and other HVAC systems
- Experimental and numerical analysis of soil heat transfer
- Accident investigations of all types and complexity
- Analysis of inductively heated casting furnaces
- Radiation heat transfer analysis for spent nuclear fuel storage
- Data acquisition system development, design, and usage
- Design process improvement and model development for process equipment
- Knowledge in safety analyses, waste canister design
- Experimental equipment design, equipment selection, test set-up design, data collection and analysis

### **Education**

Doctor of Philosophy in Mechanical Engineering, University of Utah, Salt Lake City, UT. Dissertation Topic: The Spectral-Compact Finite Difference Technique for Direct Numerical Simulation of Turbulent Flows. December 1990.

Bachelor of Science in Mechanical Engineering, South Dakota School of Mines and Technology, Rapid City, SD. December 1983, Graduated with Highest Honors.

### **Licenses / Certifications**

Registered Professional Engineer, State of Idaho, License No. 7548.  
 Certified Fire and Explosion Investigator, NAFI, No. 21180-12061i.  
 Certified Fire Investigation Instructor, NAFI, No. 21180-12061i.

### **Work History**

#### **Independent Consultant, Clarksean and Associates**

Perham, MN, October 1995 – September 2008 and May 2017 – Present

Specializing in the analysis of engineering systems and failure analysis. Heat transfer, fluid mechanics, structural analysis, in support of system design and development. Provides forensic engineering services as well as serving as expert witness for patent infringement cases.

Specialized in the analysis of engineering systems. Projects have included a U.S. Department of Defense Small Business Innovation Research (SBIR) Contract for the analysis of manufacturing process for an arresting hook. The analysis has included the development of a new modeling technique for the application of thermal spray coatings onto a substrate, cooling of the arresting hook in a packed bed, and the quenching and heat treatment of the hook (heat transfer and fluid mechanics). Other projects have included the analysis of phase change materials for electronic enclosure, design analysis of a freezing point measurement system, basic structural analysis, convective flow and heat transfer for engineering systems, and the analysis of metal solidification with internal heat generation.

**Vice President of Failure Analysis, ARCCA, Incorporated**  
Philadelphia, PA, March 2015 – April 2017

Responsible for recruitment of experts, project management/technical lead, business development, and technical consulting. Clients include attorneys, insurance companies, and industrial companies.

**Director of the Expert Alliance, LWG Consulting, Northbrook, IL**  
Northbrook, IL, September 2013 – March 2015

Performed failure analysis investigations for insurance clients, attorneys, and industrial clients. Types of investigations included boilers, concrete silos, grain storage structures, wind turbine bearings, submarine pipelines, and the failure analysis of commercial products. Other duties included recruiting experts, managing projects, creating web content, and participating in business development activities.

**President, Kevin Kennedy Associates Inc.**  
Indianapolis, IN, September 2008 – August 2013

Responsible to the CEO and Board of Directors for all aspects of corporate operations and performance. Key focus areas include: establishment of a long range strategic plan with near and mid-term strategies for achievement; improved performance to financial goals while maintaining or improving customer satisfaction; growth, nurturing and empowerment of the executive management team to ensure the company is staffed for long term success; establishment of near-term plans and strategies to maintain growth in revenue and profitability despite the economic crisis of 2008; identification and pursuit of new markets while maintaining growth in current markets; and, strengthening of the company infrastructure to ensure that all resources are available to support our continued growth in revenue and profit. Provided consulting services as well in the areas of heat transfer and fluid mechanics related processes.

**VP of Engineering / Lead Consultant, Kevin Kennedy Associates Inc., Indianapolis, IN, November 2004 – September 2008**

Performed engineering consulting activities related to areas of expertise, worked as a Project Manager interfacing with clients on a wide range of technical issues to specify type of expertise needed on a project. Activities included interfacing with clients, managing staff, developing statements of work, writing final reports, consulting on a wide range of technical issues. Provided consulting services as well in the areas of heat transfer and fluid mechanics related processes.

**Adjunct Professor, University of Nevada – Las Vegas**  
Las Vegas, NV, May 2001 – 2007

Perform engineering research, advise graduate students, present seminars on a range of technical topics (heat transfer, fluid mechanics, analyzing thermal systems, Linux, cluster computing, thermodynamics). Research includes the analysis and development of a new casting process for nuclear fuel, development and testing of new calculation procedures (next

generation structural analysis software) for complex projectiles, systems engineering, and other topics.

**Analyst, Argonne National Laboratory Idaho Falls, ID**

September 1990 – October 1995

Heat transfer, fluid mechanics, and mass transfer. Efforts included modeling and analysis needs planning, experimental and numerical analysis of soil heat transfer, experimental analysis of natural convection for passive cooling systems, numerical simulations of thermosyphons, basic structural analysis related to system design and experimental setups, analysis of metal combustion, analysis of induction heating, radiation heat transfer analysis for spent nuclear fuel storage, development of a data acquisition system, improvements in the design process for process equipment, and model development for process equipment. Projects involved numerical and experimental modeling. Principal investigator for Laboratory Directed Research and Development (LDRD) for interfacing robotic software and telerobotic manipulator. Served on national working group related to robotic and automation applications for Department of Energy Laboratories. Other involvement includes safety analyses, waste canister design, experimental equipment design, and project management. DOE Class Q Clearance.

**Research and Teaching Assistant, University of Utah**

Salt Lake City, UT, September 1986 – September 1990

Responsible for implementing numerical models to analyze turbulent mixing of fluids and experimental and numerical investigation of mixed convection heat transfer in a porous medium between vertical concentric cylinders. Efforts included work with data acquisition systems, data analysis, and improvements to an experimental system. Teaching Assistant responsibilities included the setup and operation of undergraduate laboratories, class lectures, and grading of reports (heat transfer, gas dynamics, and power thermodynamics).

**Ballistic Analyst, Hercules Aerospace**

Magna, UT, February 1985 – September 1986

Responsible for prediction of solid propellant rocket motor performance, analysis of data, improvements in motor ignition analysis, and the support of proposal efforts. DOD Secret Clearance.

**Teaching Assistant, University of Minnesota**

Minneapolis, MN, September 1984 – January 1985

Responsible for undergraduate recitation, answering questions on course material, and grading exams for a machine design class.

**Research Assistant, Optimizer Control Corporation**

Minneapolis, MN, September 1984 – January 1985

Worked on development and improvement of microprocessor based control system for automobile engines: programming in assembly language, engine setup and testing, data analysis.

**Research Assistant, SD School of Mines and Technology**

Rapid City, SD, January 1984 – September 1984

Responsible for fundamental study of air and water flow through capillaries, equipment selection, test set-up design, data collection and analysis, developed data acquisition and collection software.

**Summer Engineer, Northeast Utilities**

Hartford, CT, Summer 1982, Summer 1983

Assisted on engineering projects concerned with nuclear power plant decommissioning, 10CFR Appendix J testing, and design of a steam generator wet lay-up recirculation system. NRC Clearance.

**Publications**

Nie, J. H., Hsieh, H.T., Chen, Y.T., Sun, L.J., Hopkins, D.A., and Clarksean, R., (2006) "Object-oriented finite element programming using F2003," 21<sup>st</sup> International Conference on Computers and Their Applications, pp. 320-325, edited by J. Jackson, ISBN: 1-880843-58-7, Seattle, WA, USA, March 23-25.

Sun, L., Hsieh, H.T., Chen, Y., Clarksean, R., Copple, J. and Laidler, J., (2005), "An Object-Oriented Systems Engineering Model Development for Improving Design Factors of the Spent Fuel Extraction Process," presented at Global Accomplishments in Environmental and Radioactive Waste Management: Cost Effectiveness, Risk Reduction, and Technology Implementation, February 27 – March 3, Tuscon, AZ.

Tan, T., Clarksean, R., Chen, Y., Hsieh, S., and Meyer, M., 2004, "Analyzing a Process for Casting Volatile Actinides," 6th International Topical Meeting on Nuclear Reactor Thermal Hydraulics, Operations and Safety, Nara, Japan, October 4-8.

Sun, L., Royyuru, H., Hsieh, S., Chen, Y., Clarksean, R., Vandegrift, G., Copple, J., and Laidle, J., 2004, "Development of Systems Engineering Model for Spent Fuel Extraction Process," ICAPP-04, Pittsburgh, PA USA, June 13-17.

Tan, T., Clarksean, R., Chen, Y., Hsieh, S., and Meyer, M., "Simulating the Casting Process for Melt Casting a Metallic Fuel Pin," 12th International Conference on Nuclear Engineering (ICONE), Arlington, Virginia (Washington, D.C.), USA April 25-29, 2004.

Tan, T., Clarksean, R., Chen, Y., Hsieh, S., and Meyer, M., "Simulating the Induction Heating Process in an Induction Skull Melter for Casting Metallic Fuel," 12th International Conference on Nuclear Engineering (ICONE), Arlington, Virginia (Washington, D.C.), USA April 25-29, 2004

Tan, T., Clarksean, R., Chen, Y., Hsieh, S., and Meyer, M, 2004, "Numerical Simulation of an Induction Heating Process in an Induction Skull Melting Furnace," ICHMT International Symposium on Advances in Computational Heat Transfer, April 19-24, Norway.

Tan, T., Clarksean, R., Chen, Y., Pepper, D., and Meyer, M., 2003, "Simulation and Analysis for Melt Casting a Metallic Fuel Pin Incorporating Volatile Actinides" International Mechanical Engineering Congress and Exposition, Washington, D.C., November 16-21.

Royyuru, H., Sun, L., Chen, Y., Hsieh, S., Clarksean, R., Pepper, D., Vandegrift, G., Copple, J., and Laidle, J., 2003, "Development of Systems Engineering Model For UREX Process," International Mechanical Engineering Congress and Exposition, Washington, D.C., November 16-21.

Royyuru, H., Sun, L., Chen, Y., Hsieh, S., Clarksean, R., Pepper, D., Vandegrift, G., Copple, J., and Laidle, J., 2003, "Development of Systems Engineering Model For UREX Process," AccApp'03: Accelerator Applications in a Nuclear Renaissance, San Diego, CA, June 1-5.

Clarksean, R., and Torkelson, J., 2003, "Development of a PCM Tube Energy Storage System," presented at Phase Change Material and Slurry Scientific Conference and Business Forum, Yverdon-les-Bains, Switzerland, April 23-25.

Clarksean, R., 2003, "Development of a PCM Slurry and Examination of Particle Statistics," presented at Phase Change Material and Slurry Scientific Conference and Business Forum, Yverdon-les-Bains, Switzerland, April 23-25.

Clarksean, R., and Lorentz, B., 2003, "Experimental Testing of a PCM Slurry System to Shift Peak Air-Conditioning Loads," presented at Phase Change Material and Slurry Scientific Conference and Business Forum, Yverdon-les-Bains, Switzerland, April 23-25.

Wu, X., Clarksean, R., Chen, Y., Pepper, D., and Meyer, M.K., 2002, "An Analysis of the Melt Casting of Metallic Fuel Pins," International Mechanical Engineering Congress and Exposition, New Orleans, November 17-22.

McCreery, G.E., Condie, K.E., Clarksean, R. and McEligot, D.M., 2002, "Convective processes in spent nuclear fuel canisters," 12th International Heat Transfer Conference, Grenoble, France, 18-23 August 2002.

Clarksean, R., Crepeau, J., and McEligot, D. 2002, "Computational Modeling of the Fluid Flow in a Representative Spent Nuclear Fuel Canister," ANS Summer Meeting, Hollywood, Florida, June 9-13.

Sun, L., Chen, Y., Clarksean, R., and Laidler, J., 2002, "The Development of a Systems Engineering Model for the D.O.E. Advanced Accelerator Applications Program," International Congress on Advanced Nuclear Power Plants, embedded topical meeting at the ANS Summer Meeting, Hollywood, Florida, June 9-13.

Wu, X., Clarksean, R., and Chen, Y., 2002, "Design and Analysis for Melt Casting Metallic Fuel Pins Incorporating Volatile Actinides," International Congress on Advanced Nuclear Power Plants, embedded topical meeting at the ANS Summer Meeting, Hollywood, Florida, June 9-13.

Al-Hallaj, S., Lateef, A., Selman, J.R., and Clarksean, R., 2002, "A 10-hr Prototype Lithium-Ion Battery System for Electric/Hybrid Vehicle Applications," presented at the ECS annual meeting in Philadelphia, PA, May 15.

Clarksean, R., and Torkelson, J., 2002, "The Application of a Genetic Algorithm to Develop a Compact Thermal Model," THERMES 2002, Thermal Challenges in Next Generation Electronic Systems, edited by Y.K. Joshi and S.V. Garimella, Millpress, Rotterdam, Netherlands, pgs. 283-290.

McCreery, G.E., McEligot, D.M., Condie, K.G., Crepeau, J.C., Clarksean, R., Guezenec, Y. and Brodkey, R.S., "Visualization of Forced and Natural Convection in Fuel Storage Canisters" Global 99 International Conference on Future Nuclear Systems at Jackson, WY, August, 1999.

Clarksean, R., Chen, Y., and Marongiu, M., "An Analysis of Heat Flux Limits for Electronic Components on a Finned Substrate Containing a PCM," InterPACK'99, Maui, Hawaii, June 13-19, 1999.

Clarksean, R., Chen, Y., "The Use of Phase Change Materials for Electronic Cooling Applications: Design Issues and Example," InterPACK'99, Maui, Hawaii, June 13-19, 1999.

Clarksean, R., Bateman, K., and C. Solbrig, "Comparison of A FIDAP Model and Semi-Analytic Model of Uranium Combustion to Experimental Data," Sixth International Conference on Nuclear Energy (ICONE-6), San Diego, May, 1998.

Clarksean, R., and Marongiu, M., "Using Finned PCM Heat Exchangers on Electronic Enclosures," 1998 AIAA/ASME Joint Thermophysics and Heat Transfer Conference, Albuquerque, New Mexico, June 1998.

Marongiu, M.J., and Clarksean, R., "Thermal Management of Battery Compartments of Outdoor Telecommunication Cabinets Using Phase Change Materials," 19th International Telecommunications Energy Conference, Melbourne, Australia, October 1997.

Marongiu, M.J., Clarksean, R., Kusha, B. and Watwe, A., "Passive Thermal Management of Outdoor Enclosures Using PCM and Enhanced Natural Convection," 19th International Telecommunications Energy Conference, Melbourne, Australia, October 1997.

Clarksean, R., and Marongiu, M., "A Modeling Technique to Analyze the Application of Thermal Spray Coatings," 1997 National Heat Transfer Conference, Baltimore, Maryland, August 1997.

Clarksean, R., Crepeau, J.C., Mueller, P., Gifford, S. Harris, P., and Batty, J. "The Role of Numerical Modeling and Experiments in the Design of A Freezing Point Measurement System," 1997 National Heat Transfer Conference, Baltimore, Maryland, August 1997.

Marongiu, M.J., and Clarksean, R., "Thermal Management of Electronics Enclosures Under Unsteady Heating/Cooling Conditions using Phase Change Materials (PCM)," 1997 National Heat Transfer Conference, Baltimore, Maryland, August 1997.

Bateman, K.J., and Clarksean, R., "An Analysis of Conjugate Heat Transfer from a Graphite Crucible," 1997 National Heat Transfer Conference, Baltimore, Maryland, August 1997.

Marongiu, M.J., and Clarksean, R., "Thermal Management Of Electronics Enclosures Under Unsteady Heating/Cooling Conditions Using Phase Change Materials (PCM)," 32nd Intersociety Energy Conversion Engineering Conference, Honolulu, Hawaii, July 1997.

Crepeau, J.C., and Clarksean, R., "Similarity Solutions of Natural Convection with Internal Heat Generation," ASME Journal of Heat Transfer, vol. 119, February 1997.

Clarksean, R. and Solbrig, C.W., "A Simplified Thermal Analysis of an Inductively Heated Casting Furnace," 1995 ASME International Congress and Exposition, San Francisco, California, November 12-17, ASME Heat Transfer Division, Vol. 317-1, pp. 433-441.

Clarksean, R., and Zahn, T., "Safety Assessment of Spent Fuel Storage at RSWF," DOE Spent Nuclear Fuel Conference, Salt Lake City, Utah, American Nuclear Society, December 1994.

Clarksean, R., and Solbrig, C., "Minimization of the Effect of Errors in Approximate Radiation View Factors," Sixth International Topical Meeting on Nuclear Reactor Thermal Hydraulics (NURETH 6), Grenoble, France, October 5-8, 1993, and Special Topical Issue of Nuclear Engineering and Design, vol. 149, pgs. 431-440, 1994.

Clarksean, R., "Experimental Analysis of Natural Convection Within a Thermosyphon," 3rd World Conference on Experimental Heat Transfer, Fluid Mechanics, and Thermodynamics, Honolulu, Hawaii, October 31 - November 5, 1993.

Clarksean, R., and Phillips, G., "A Parametric Study of Heat Transfer Within a Planar Thermosyphon," 1993 National Heat Transfer Conference, Atlanta, Georgia, August 8-11, 1993.

Solbrig, C., and Clarksean, R., "Determination of the Shape of a Plutonium Deposit From a Leaking Crucible," The Second International Conference on Nuclear Energy ICONE-2, San Francisco, California, March 21-24, 1993.

Clarksean, R. and Ma, Kwan-Liu, "Direct Numerical Simulation and Visualization of a Three Dimensional Planar Mixing Layer, 10th AIAA Computational Fluid Dynamics Conference, Honolulu, Hawaii, June 24-27, 1991 (technical note presented in an Open Forum Session).

Clarksean, R. "Direct Numerical Simulation of Plane Jets Using the Spectral-Compact Finite Difference Technique," prepared for the AIAA Region VI Student Conference, Sacramento, California, April 25-28, 1990, and the National Student Conference, Reno, Nevada, January 7-9, 1991, paper AIAA-91-0197.

Clarksean, R. and P. McMurtry, "A Discussion of the Compact Finite Difference Technique for Solving the Incompressible Navier-Stokes Equation," 21st AIAA Fluid Dynamics, Plasmadynamics, and Lasers Conference, Seattle, Washington, June 1990.

Clarksean, R., R. Golightly, and R. Boehm, "A Numerical and Experimental Investigation of Mixed Convection in a Porous Medium Between Vertical Concentric Cylinders," 1990 International Heat Transfer Conference, Jerusalem, Israeli.

Clarksean, R., N. Kwendakwema, and R. Boehm, "A Study of Mixed Convection in a Porous Medium Between Vertical Concentric Cylinders," presented at the 1988 National Heat Transfer Conference, Houston, Texas, Volume 2 of the proceedings.

## **ARTICLES**

Clarksean, R., "Is Spontaneous Ignition Myth or True Science?" Construction Claims Magazine, Fall 2016.

Clarksean, R., "Arson Myths: Debunked by Science," The Insurance Research Letter (IRL), August 2016, ISSN #2165-2740, Vol. 19 No. 8.

Clarksean, R., "Troubleshooting Thermocouple Failures in High-Temperature Applications". Industrial Heating: The International Journal of Thermal Processing. Vol. LXXXIV No. 6, pgs. 34-36. June 2016.

Marongiu, M.J., and Clarksean, R., "Thermal Management of Outdoor Enclosures Using Phase Change Materials," Electronics Cooling, January 1998.

Clarksean, R., and Marongiu, M., "Putting Analysis to the Test," Desktop Engineering, October 1997.

## **Presentations**

Clarksean, R., 2022, "Investigation Lithium-Ion Battery Fires," July, CEERISK Consulting LTD., Webinar.

Clarksean, R. and Alyah, M., 2020, "Forensic Engineering: Turbine Blade Failure," July 8, CEERisk Consulting LTD. Webinar.

Clarksean, R. and Alyah, M., 2019, "Forensic Engineering: Investigating Machinery Breakdown," March 21, CEERisk Consulting LTD. Webinar.

Clarksean, R. 2016, "Debunking Arson Myths," Presented at PSSI Conference, Tukwila, WA. October 14.

Clarksean, R. 2015, "Selecting an Expert," Presented at Sentry Insurance, Stevens Point, WI, February 10.

Clarksean, R. 2014, (Panel), "Litigating Complex Mechanical System Failures," Presented at the 2014 CLM Product Liability & ADR Conference, Columbus, Ohio, June 13.

Clarksean, R., 2014, "Engineering Design & Product Liability Failure Investigations," LWG Webinar, Illinois, January 31.

Clarksean, R., with attorney, 2014, "Subrogation of Products Liability Claims Against Foreign Manufacturers," LWG Consulting Webinar, April 24.

Clarksean, R., 2014, "Agricultural Risks – Illegal, Obvious, and Scary!" NAMIC Annual Meeting, Indianapolis, IN, July 15.

Clarksean, R., 2014, "Spontaneous Ignition: A myth? Or true science at work?" Illinois NASP Chapter meeting, Illinois, May 1.

Clarksean, R., 2014, "Expert Tips and Traps in Accident Investigations," LWG Consulting Webinar, October 17.

Clarksean, R., 2014, "Boiler and Pressure Vessel Loss Investigations," LWG Consulting Webinar, December 5.

Clarksean, R., Tan, T., Chen, Y., Meyer, M.K., 2003, "Modeling Fill and Solidification of an Injection Casting Process," FIDAP Users' Group Meeting, Evanston, Illinois, June 10-11.

Tan, T., Clarksean, R., Chen, Y., Hseih, H.T., and Pepper, D., 2003, "Numerically Simulating the Solidification Process of a Melt Casing Metallic Fuel Pin Mold Using FIDAP," 2003 ANS Student Conference, April 2-5, Berkeley, California.

Royyuru, H.P., Sun, L., Chen, Y., Hseih, H.T., Clarksean, R.L., and Pepper, D., 2003 "Development of an Optimization Systems Engineering Model for Spent Fuel Extraction Process," 2003 ANS Student Conference, April 2-5, Berkeley, California.

Clarksean, R., and Chen, Y., 2002, "Calculating an Induction Heating Field with FIDAP," FIDAP Users' Group Meeting, Evanston, Illinois, June.

Clarksean, R., Chen, Y., and Horner, M., 2002, "An Analysis of Injection Casting into Chill Molds," FIDAP Users' Group Meeting, Evanston, Illinois, June.

"Examination of Casting Furnace Designs for Inclusion of Am in Metallic Fuel," Y. Chen, R. Clarksean, and X. Wu, November 20, 2001, presented at the ANL Transmuter Fuel Development Workshop, Idaho Falls, ID.

"Design and Analysis for Melt Casting Metallic Fuel Pins Incorporating Volatile Actinides," Xiaolong Wu, Randy Clarksean, Yitung Chen, and Darrell Pepper, presented at the American Nuclear Society (ANS) Conference in Reno, Nevada, November 10-12, 2001.

"Development of a System Engineering Model of the Chemical Separations Process," Lijian Sun, Yitung Chen, Randy Clarksean, and Darrell Pepper, presented at the American Nuclear Society (ANS) Conference in Reno, Nevada, November 10-12, 2001.

"Improvement, Automation, and Modernization of AMUSE Code for the Chemical Separations Process," Sridhar Munaga, Yitung Chen, Randy Clarksean, and Darrell Pepper, presented at the American Nuclear Society (ANS) Conference in Reno, Nevada, November 10-12, 2001.

"A Discussion on the Use of Phase Change Material Slurries for HVAC Applications," presented October 23, 2001 at the Industrial Technology Research Institute (ITRI), Energy Research Laboratory, Hsinchu, Taiwan.

Clarksean, R. and Boehm, R., "Use of PCM Slurry to Decrease Peak Air Conditioning Loads," presented at ENERGEX 2000 (International Energy Foundation) Las Vegas, Nevada, July 23-28, 2000.

"Phase Change Materials: Thermal Energy Storage and Applications," a one-day seminar presented April 19, 2000 at the Industrial Technology Research Institute (ITRI), Energy Research Laboratory, Hsinchu, Taiwan.

"Issues Related to the Thermal Management of Battery Systems: Emphasis on Phase Change Materials (PCMs)," an invited presentation at the 4th Chicago Battery Workshop, Materials, Thermal-Electrochemical Characterization and Modeling of Lithium Cells and Batteries, Sponsored by the U.S. Army Research Office and National Science Foundation, April 13-14, 2000, Illinois Institute of Technology, Chicago, Illinois.

"The Use of Phase Change Materials for Engineering Applications," an invited presentation for Aviation Industries of China, Department of International Cooperation and Trade, Beijing, China, November 1998.

"The Use of Phase Change Materials for Engineering Applications," and invited presentation at the Industrial Technology Research Institute, Energy and Resources Laboratory, Chutung Hsinchu, Taiwan, December 1998.

"The Role of Numerical Modeling and Experiments in the Design of A Freezing Point Measurement System," an invited presentation for the Department of Aerospace Engineering and Engineering Mechanics at Iowa State University, April 1998.

"An Examination of Modeling Phase Change Processes," an invited presentation for the Department of Mechanical Engineering Department at the University of Nevada at Las Vegas, February 1998.

### **Honors and Awards**

Outstanding Recent Graduate award for a graduate of the South Dakota School of Mines and Technology, Rapid City, South Dakota, February 1993.

First Place in American Institute of Aeronautics and Astronautics' National Graduate Student Paper Contest, Reno, Nevada, January 1991 (judging based on oral and written communication skills exhibited for a technical paper).

Outstanding Teaching Assistant of the Year 1988-'89, Department of Mechanical Engineering, University of Utah.

### **Grants / Funding**

SBIR Grant, Investigation of Arresting Hook Manufacture (~1996); \$60,000.

State of California Energy Department Grant, Investigation of a PCM Slurry Peak Shifting System, ~\$75,000.

## **Patent**

“PCM (Phase Change Material) System and Method for Shifting Peak Electrical Load,” United States Patent 7,096,929, August 29, 2006. Inventor: Randy Clarksean.

## **Other**

### *Teaching Experience*

- *Adjunct Instructor for Minnesota State Community and Technical College and Central Lakes Community College:* Taught Introduction to Physics, Chemistry, Mechanics of Materials, Statics – classroom lectures and laboratory. Taught Computer Maintenance and Repair and Computer Programming – Visual Basic.
- *Adjunct Professor University of Nevada at Las Vegas:* Performed research and advised graduate students on their thesis/dissertation research. Edited writing, guided research, performed computational analyses. Provide regular seminars to graduate students on computers, engineering, and the analysis of physical systems.
- *Adjunct Professor University of Idaho – Idaho Falls:* Taught graduate class in Turbulence and led Professional Engineer Licensing Exam Review class. Responsibilities included preparing lectures, preparing and working homework examples, grading reports and homework, and answering student questions.
- *Teaching Assistant University of Utah:* Setup and developed laboratory experiments for undergraduate students, prepared and led lectures on running experiments, computer programming, and data analysis. Activities also included grading reports and answering student questions.

### *Complex Numerical Models*

Three-dimensional analysis of heat treat, quenching, and surface coating of arresting hook; direct numerical simulation of mixing within a jet (details of flow and mixing on small scale); detailed model of flow into spent fuel storage canister (3D); analysis of flow, heat transfer, and solidification of molten metal into casting tubes; analysis and development of a model for heat transfer within an induction heating casting furnace; detailed analysis of induction heating for thermal analysis of crucible region for next generation furnace; coupled heat transfer, mass transfer, and fluid flow for the self ignition of uranium (highly coupled system); numerous heat transfer, fluid flow, and phase change (melting or solidification) analyses; and analysis of electronic cooling applications.

### *Computer Skills*

- Proficient/expert in the use of general-purpose finite element heat transfer and fluid mechanics codes. General skills for the use of structural analysis software packages.
- Worked on numerous computing hardware (workstations, PCs, clusters, main frames, super computers) and operating systems (UNIX, Linux, Windows, and main frame OSs).
- Programming: Fortran (95, 90 and 77), Pascal, Basic/Visual Basic, C (general programming only) and Assembly Language. Most programming has been centered on numerical analysis. Other programming and scripting in Perl, awk, sed, and basic database work.
- Software Personally Developed: Large computationally intensive engineering software (heat transfer, 3D flow, developed new numerical algorithms); basic database query and scripting;

modification of existing large legacy codes; numerous software modules for existing codes to enhance their capabilities

- Software Development Oversight: Development of next generation structural analysis software for Army Research Lab via an object oriented development process; development of chemical reaction / system process software for reprocessing of spent nuclear fuel; modification and customization of commercially available contact management software; development and modification of VOIP phone system software; examining the development of a specialty engineering software tool for a client that relies on commercially available software and custom software tools as well.

### **Continuing Education /Additional Training**

- NAFEMS Training Class - Metal Materials Modeling: Creep, July 2020.
- CFEI and CFII training from NAFI held in Pittsburgh, PA, March 2020 (5 yr recertification).
- CFEI and CFII training from NAFI held in Seattle, WA, March 2016.
- SEAK Training classes, two workshops: Expert Witness Report Writing & Deposition Skills, April 2011.
- Fortran 90 Workshop, Lahey Computer Systems, Reno, Nevada, November 10-12, 1998.
- Unix Workshop, Technology Exchange Company, Dallas, Texas, March 2-5, 1993.
- Electrochemical Engineering Workshop, Case Western Reserve University, Cleveland, Ohio, May 20-24, 1991.
- USI Supercomputing Workshop for the IBM 3090, University of Utah, March 1-2, 1990.
- Fluid Mechanics Measurement Short Course, University of Minnesota, June 20-24, 1988.
- Participant in San Diego Supercomputer Center's Summer Institute, sponsored by the National Science Foundation, August 10-21, 1987.
- University of Texas at Austin Engineering Institute on Finite Element Analysis in Fluid Mechanics and Heat Transfer, July 14-18, 1986, and August 12-17, 1991.

### **Civic/Community Service and Volunteerism**

#### *Professional:*

- Idaho Section of the American Society of Mechanical Engineers (ASME) - Board of Directors (1995/96'), Chair (1994/95), Vice Chair (1993/94) for the Idaho Section of the ASME. Symposium Chair - 31st Annual Idaho Section Symposium "Innovation: Competing in the Marketplace," May 1994.
- Member ASME K-20 Committee on Computational Heat Transfer (~1990s). Other activities include technical session chair, paper reviewer for national conferences, and proposal reviewer for National Science Foundation.
- ASTM E20 Committee.
- Member of the South Dakota School of Mines and Technology Mechanical Engineering Department Advisory Board, South Dakota School of Mines and Technology, (~2012 to present.).

#### *Civic/Community:*

- Mayor – New York Mills, Minnesota, 2003 to 2006
- President - New York Mills Civic and Commerce Association, 1999 to 2001

- New York Mills Public Library Board Member, 1998 to 2006
- Member and President - Viking Library System Board of Directors, 1999 to 2006
- Board Member NW Links Governance Council, 2000 to 2006
- New York Mills ISD 533 Technology Committee Member, 1999 to 1999
- New York Mills ISD 533 Systems Accountability Reporting Advisory Committee Member, 1999 to 1999

### **Professional Affiliations**

- Member of the American Society of Mechanical Engineers
- ASTM E20 Committee
- Minnesota Society of Professional Engineers.