



Combustion

Science & Engineering, Inc.

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LEO D. ESKIN, Ph.D.

Leo D. Eskin, Ph.D., serves as President and COO of LPP Combustion, LLC. Leo is also a Principal Engineer and the Director of Advanced Energy Systems at Combustion Science & Engineering, Inc. Before joining LPP and CSE, Leo was the Co-founder, President and CEO of Tech, Inc., a Washington, DC-based, low-voltage construction firm which he led to an annual volume in excess of \$15 million. Earlier in his career, Leo was co-founder of Enter Software, a company now owned by GE, that developed the GateCycle™ software program for designing and optimizing power-generating plants, including both gas turbines and coal-fired facilities. Leo holds B.S. and M.S. Degrees in Mechanical Engineering from Virginia Tech, and he holds a Doctorate in Mechanical Engineering with a Minor in Electrical Engineering from Stanford University. Leo has extensive contacts in power plants throughout the world and hands-on turbine testing and operations experience.

EDUCATION:

Ph.D., Mechanical Engineering (Minor in Electrical Engineering), Stanford University, Stanford, CA, 1994.
M.S., Mechanical Engineering, Virginia Polytechnic Institute and State University, Blacksburg, VA, 1981.
B.S., Mechanical Engineering, Magna Cum Laude, Virginia Polytechnic Institute and State University, Blacksburg, VA, 1980.

PROFESSIONAL EXPERIENCE

**President and Chief Operating Officer,
Chief Technology Officer,**
LPP Combustion, LLC, Columbia, MD

January 2007 to present
July 2004 – December 2006

- Commercializing a novel lean, premixed, prevaporized (LPP) combustion technology. The technology has widespread applicability, allowing a broad range of liquid fuels, including biofuels, to be burned in dry, low-emissions (DLE) combustion hardware designed for use with natural gas, reducing pollutant emissions by 80% or more. Commercial demonstrations have been performed with a Capstone C30 gas turbine burning LPP Gas derived from ethanol, biodiesel, naphtha, and natural gas condensates. An enhanced configuration for the traditional Integrated Gasification Combined Cycle (IGCC) system has also been patented in the United States, Australia and China, with additional international patents pending.

Principal Engineer and Director of Advanced Energy Systems,
Combustion Science & Engineering, Columbia, MD

July 2004 to present

- Perform systems analyses and computational fluid dynamic (CFD) simulations for the power and energy industries. Provide design and modeling assistance for Integrated Gasification Combined Cycle (IGCC) plant vendors. Perform gas turbine performance and failure analyses and Hydrogen detonation analyses. Provide engineering support for litigation cases.

President and Founder, Cogent Science, LLC, Darnestown, MD

September 2001 to present

- Founded engineering software development and consulting firm, specializing in thermodynamics and energy systems. Current focus on machine learning, artificial intelligence, data analytics and mobile computing as applied to engineering systems. Past projects include numerical modeling of gas turbine combined-cycle, fossil, and

nuclear power plants, including steam turbine and nuclear reactor modeling. Implemented a high-moisture steam turbine component model using the Baily, Booth, Cotton, Miller formalism and developed a GE boiling water nuclear reactor component model. Member of the development team for Cantera, an open-source, object-oriented software package for problems involving chemically-reacting flows. Software development experience with Objective-C, iOS/OS X, Octave, Python, R, XML, C, Pascal, FORTRAN, Assembly Language, UNIX, Linux, and Microsoft Windows.

President, Chief Executive Officer and Co-founder, Tech, Inc., Reston, VA

July 1995 – June 2004

- Co-founded design/build systems integration and installation firm, specializing in security/access control, CCTV, sound and telecommunications infrastructure, and life safety systems. Led a team of twenty-five engineers and project managers, and as many as two hundred and fifty technicians. Successfully completed over 125 major projects with a total contract value in excess of \$70 million, and a maximum project size in excess of \$10 million.

Director of Applications Engineering and Owner, Enter Software, Menlo Park, CA

October 1991 – July 1995

- Project Director for EfficiencyMap, a real-time data acquisition and performance modeling system for combined-cycle gas turbine power plants. Designed, developed, configured and installed the EfficiencyMap and GateCycle software programs in plants throughout the United States and the United Kingdom. Founding developer of GateCycle power plant heat balance code, used to design combined-cycle, fossil, and nuclear power plants.

Partner and Co-founder, Cogent Software, Menlo Park, CA

October 1989 – July 1995

- Developed scientific plotting software package (ProPLOT) used within Stanford University and various academic and research institutions worldwide.

Member of Technical Staff, Bell Telephone Laboratories, Indianapolis, IN

September 1981 – August 1982

- Worked with the Home Lab group in Indianapolis, IN and led the development and production of an emergency alert system water detector and transmitter.

ADDITIONAL PROFESSIONAL ACTIVITIES:

- Trustee, Saint Anselm's Abbey School, Washington, DC, 2011 to present,
- ASME PTC 47 Integrated Gasification Combined Cycle Codes and Standards Committee Member, 2008 to present
- Registered Communications Distribution Designer (RCDD), 2000 to present,
Network Transport Systems (NTS) Specialist, 2003 to present,
Building Industry Consulting Services International (BICSI).
- Emergency Coordinator for the Stanford University Amateur Radio Emergency Service (SUARES), Stanford University, 1994-1995. Established the Stanford area section of a VHF/UHF-based San Francisco Bay Area inter-hospital packet radio communications system. Assisted with communications for the World Cup Soccer events held at Stanford University. Licensed Amateur Extra Class Amateur Radio Operator.

PROFESSIONAL MEMBERSHIPS:

Member, American Society of Mechanical Engineers (ASME)

Member, American Association for the Advancement of Science (AAAS)

Member, Tau Beta Pi Engineering Honor Society

Member, Pi Tau Sigma Honorary Mechanical Engineering Fraternity

Member, Building Industry Consulting Services International (BICSI)

COMMUNITY MEMBERSHIPS:

Member, Alumni Board of Directors, Saint Anselm's Abbey School, Washington, DC
Member, Kennedy Center for the Performing Arts, Washington, DC
Member, Corcoran Gallery of Art, Washington, DC

PATENTS:

Ramotowski, M.J, Joklik, R., Fuller, C., Eskin, L., Gokulakrishnan, P, Gaines, G., Roby, R.J. and Klassen, M.S.,
“Method and Apparatus for Conditioning Liquid Hydrocarbon Fuels”, US Patent No. 8,702,420, Issued April 22,
2014

Eskin, L.D., Roby, R.J., Klassen, M.S. and Ramotowski, M.J., “Integrated System and Method for Production and
Vaporization of Liquid Hydrocarbon Fuels for Combustion”, US Patent No. 8,529,646, Issued September 10,
2013

Eskin, L.D., Roby, R.J., Klassen, M.S. and Ramotowski, M.J., “Integrated System and Method for Production and
Vaporization of Liquid Hydrocarbon Fuels for Combustion”, Australia Patent No. 2007258113, Issued June 6,
2013

Eskin, L.D., Roby, R.J., Klassen, M.S. and Ramotowski, M.J., “Integrated System and Method for Production and
Vaporization of Liquid Hydrocarbon Fuels for Combustion”, China Patent No. ZL 200780015985.3, Issued
March 13, 2013

Roby, R. J., Klassen, M. S., Eskin, L., Holton, M., and Straus, A., “Smoke Alarm Detector”, U.S. Patent No. D545,229,
Issued June 26, 2007

PUBLICATIONS AND PRESENTATIONS:

Holton, M., Klassen, M., Eskin, L., Joklik, R., Roby, R., “Low Emissions, Renewable, Dispatchable Power Generation
Using Ethanol/Natural Gas Blends,” ASME 2014 Power Conference, Baltimore, MD, Power2014-32114.

Roby, R., Holton, M., Eskin, L., Klassen, M., Joklik, R., Broemmelsiek, C., “Low-Emission Microgrid Power Fueled by
Bakken Flare Gas,” ASME 2014 Power Conference, Baltimore, MD, Power2014-32115.

Eskin, L.D, Holton, M.M, Turner, B.A., Joklik, R.J., Klassen, M.S. and Roby, R.J., “Long-Term Demonstration of a
Lean, Premixed, Prevaporized (LPP) System for Gas Turbines,” ASME 2012 Power Conference, ICONE20-
POWER2012, July 30 – August 3, 2012, Anaheim, California,

Eskin, L., Klassen, M., Roby, R., Joklik, R., Holton, M., “Low-Emissions Renewable Power Generation Using Liquid
Fuels,” ASME/JSME Thermal Engineering Joint Conference AJTEC 2011.

Joklik, R., Eskin, L., Klassen, M., Roby, R., Holton, M. and Mallinson, T., “Low Emissions Power Generation Using
Natural Gas Condensates” Proceedings of ASME Turbo Expo 2011 GT2011-46674, June 6-10, 2011, Vancouver,
Canada.

Eskin, L., Klassen, M., Roby, R., Joklik, R., Holton, M., “Low-Emissions Renewable Power Generation Using Liquid
Biofuels,” ASME-JSME Thermal Engineering Joint Conference AJTEC2011, Honolulu, HI, AJTEC2011-44615.

Eskin, L.D., Roby, R.J., Klassen, M.S., Joklik, R.G., Holton, M.M., “Natural-Gas-Level Emissions when Burning
Naphtha (Without Water Injection) in a Commercial Gas Turbine using the LPP Technology, Creating a ‘Clean

Power' Alternative for an Integrated Gasification Combined Cycle (IGCC) Polygen Plant," 27th Annual International Pittsburgh Coal Conference 2010, PCC 2010, Vol. 3, 2113-2129, 2010.

Gokulakrishnan, P., Ramotowski, M. J., Gaines, G., Fuller, C., Joklik, R., Eskin, L. D., Klassen, M. S. and Roby, R. J. (2008), "A Novel Low NO_x Lean, Premixed, and Prevaporized Combustion System for Liquid Fuels", Journal of Engineering for Gas Turbines and Power, Vol. 130, pp. 051501:1-7.

Ramotowski, M.J., Roby, R.J., Eskin, L.D., and Klassen, M.S., "Fuel Flexibility for Dry Low Emission Gas Turbines – Cleanly Burning Biofuels, Coal Liquids and Petroleum Fuels", presented at PowerGen International, New Orleans, Louisiana, December 2007.

Eskin, L.D., Roby, R.J., Klassen, M.S., and Ramotowski, M.J., "A Novel Approach for 'Clean' Power Generation Using Coal Liquids and the LPP Combustion Process in an Integrated Gasification Combined Cycle (IGCC) System", presented at the 24th Annual International Pittsburgh Coal Conference, Johannesburg, South Africa, September 2007.

Roby, R.J., Klassen, M.S., Eskin, L.D., Ramotowski, M.J., and Gaines, G.C, "Development of a System for Lean, Prevaporized, Premixed Combustion", presented at the 36th Turbomachinery Symposium, Houston, Texas, September 2007.

Gokulakrishnan, P., Ramotowski, M.J., Gaines, G., Fuller, C., Joklik, R., Eskin, L.D., Klassen, M.S., and Roby, R.J., "Experimental Study of NO_x Formation in Lean, Premixed, Prevaporized Combustion of Fuel Oils at Elevated Pressures", paper GT2007-27552, presented at the ASME Turbo Expo 2007: Power for Land, Sea and Air, Montreal, Canada, May 2007.

Roby, R.J., Klassen, M.S., Eskin, L.D., and Ramotowski, M.J., "LPP Combustion – How to Burn Liquid Fuels as Cleanly as Natural Gas", presented at Electric Power 2007, Chicago, Illinois, May 2007.

Eskin, L.D., "The Electrical Boundary Layer and Current Transfer between a Thermal Plasma and a Plane Electrode", Doctor of Philosophy Dissertation, Mechanical Engineering Department, Stanford University, Stanford, CA, September 1993.

Mahan, J.R. and L.D. Eskin, "The Radiation Distribution Factor – Its Calculation Using Monte-Carlo and an Example of Its Application", First U.K. National Heat Transfer Conference, Yorkshire, England, July 4-6, 1984, pp. 1001-1012.

Self, S. A., and L. D. Eskin. "The boundary layer between electrodes and a thermal plasma" Plasma Science, IEEE Transactions on 11, no. 4 (1983): 279-285.

Eskin, L.D., "Application of the Monte Carlo Method to the Transient Thermal Modeling of a Diffuse-Specular Radiometer Cavity", Master of Science Thesis, Mechanical Engineering Department, Virginia Polytechnic Institute and State University, Blacksburg, VA, August 1981.

Mahan, J.R. and L.D. Eskin, "Application of Monte Carlo Techniques to Transient Thermal Modeling of Cavity Radiometers having Diffuse-Specular Surfaces", 4th American Meteorological Society Conference on Atmospheric Radiation, Toronto, Ontario, Canada, June 16-18, 1981, pp. 181-186.