



Scott G. Davis, Ph.D., P.E., CFEI
President – Principal Engineer

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Professional Profile

Dr. Scott Davis is the President at GexCon US. He specializes in mechanical and aerospace engineering, and the engineering analysis and testing of combustion, thermal, and fluid processes. Dr. Davis is responsible for fire and explosion related consulting activities, which include post-incident investigative work as well as performing risk assessments and safety studies for offshore oil & gas installations, petrochemical facilities, and various other industries. These studies include explosion risk assessment, blast and venting analysis, assessment of combustible dust explosions and ignition, toxic and flammable gas releases and dispersion, hydrogen safety, ventilation, detector placement, and carbon monoxide dispersion with the assistance of the world-leading FLACS software developed by GexCon.

Dr. Davis applies his expertise to the investigation, prevention, and risk assessment of fires, explosions, and dispersion hazards such as flammable vapors and carbon monoxide exposures. He was the lead investigator on numerous incidents, including chemical and industrial facilities, industrial combustion equipment, gas and vapor explosions, water hammer, boiling liquid expanding vapor explosions, and residential and commercial fires. Industrial and residential equipment and systems analyzed included boilers and steam piping, furnaces, HVAC equipment, regulators, meters, piping, thermal oxidizers, thermal fluid heaters, industrial turbines, dust handling and manufacturing equipment, electrical equipment, appliances and their associated controls and safety devices. Dr. Davis has also investigated numerous equipment and system failures associated with the formation, migration, and detection of carbon monoxide. He also works with companies addressing the technical aspects of product recalls as well as interacting with the Consumer Product Safety Commission (CPSC). He serves on the committee responsible for NFPA 720 *Standard for the Installation of Carbon Monoxide (CO) Detection and Warning Equipment* and has served on that for NFPA 921 *Guide for Fire and Explosion Investigations*.

Prior to joining GexCon, Dr. Davis's research focused on heat and flow processes in fires, chemically reacting flows, flame dynamics, and combustion phenomena in high-pressure burners and reactors. He has recently developed a comprehensive detailed kinetic model to understand and predict the high temperature formation and destruction of carbon monoxide and hydrogen in practical combustion systems. Dr. Davis also performed extensive tests and analyses on the ignition and combustion characteristics of liquid hydrocarbon based fuels (i.e., gasoline, diesel, biodiesel, ethanol blended fuels), flammability and ignitability of thermally degraded materials, self-heating of materials and failures of electrical connectors. Dr. Davis's prior research also involved designing and building a high-pressure fuel delivery system for analyzing the combustion of various gaseous and liquid hydrocarbons.

Dr. Davis is currently on the review committee for the Combustion Institute and continues to perform independent peer reviews of publications in *Combustion and Flame*, *Combustion Theory and Modelling*, and *Combustion Science and Technology*.

Academic Credentials and Professional Honors

- Ph.D., Mechanical and Aerospace Engineering, Princeton University, 1998
- M.S., Mechanical and Aerospace Engineering, Princeton University, 1994
- B.S., Aerospace Engineering, Pennsylvania State University, 1992
- B.A., French, Pennsylvania State University, 1992

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Principal Member: Technical Committee on Carbon Monoxide Detection, NFPA 720 *Standard for the Installation of Carbon Monoxide (CO) Detection and Warning Equipment*, National Fire Protection Association

Best Paper and Presentation at the 43rd AIChE Loss Prevention Symposium, Tampa, FL (2009)

Excellence Award at the SAE 2006 & 2008 World Congress & Exhibition

National Science Foundation and North Atlantic Treaty Organization International Post-Doctoral Fellowship, CNRS Marseille, France; Air Force Research In Aircraft Propulsion Technology Fellowship, Princeton University 1992–1997; Tau Beta Pi, National Engineering Honor Society

Licenses and Certifications

Registered Professional Engineer, California, # 34526

Certified Fire and Explosion Investigator (CFEI) in accordance with the National Association of Fire Investigators National Certification Board per NFPA 921 Section 13.6.4.2

Fire Cause and Origin Investigation Training (1A), California Office of State Fire Marshal

Hazardous Waste Operations and Emergency Training, in accordance with OSHA 29 CFR 1910.120

Confined Space Entry Training, in accordance with OSHA 29 CFR 1910.146

PADI Rescue Diver Certification, CMAS (World Underwater Federation) Level III Diver

Languages

French (Fluent)

Publications and Conference Proceedings

Gavelli, F, Davis, SG, Hansen, OR. Evaluating the Potential for Overpressures from the Ignition of an LNG Vapor Cloud during Offloading, *Journal of Loss Prevention in the Process Industries*, 24(6): 908-915, 2011

Gavelli, F., Davis, SG, Ichard, M. & Hansen, OR, CFD simulation of gas dispersion from large-scale toxic chemical releases in complex environments, 14th Mary Kay O'Connor Process Safety Center International Symposium, 2011: 132-148

Bratteteig, A., Hansen, OR, Gavelli, F & Davis, SG (2011). Using CFD to analyze gas detector placement in process facilities. 2011 Mary Kay O'Connor Process Safety Center, International Symposium, College Station, Texas, 25-27 October 2011: 735-753.

Hansen, OR, Gavelli, F, Davis, SG & Middha, P, Equivalent cloud methods used for explosion risk and consequence studies, 14th Mary Kay O'Connor Process Safety Center International Symposium, 2011:78-106

Davis, SG, Hansen, OR, Rogstadkjernet, L, Bratteteig, A, Berthelsen, I, Davidsen, T.& Holm, J., Benefits of risk-based design through probabilistic consequence modeling, 7th Global Congress on Process Safety, American Institute of Chemical Engineers Spring National Meeting, Chicago, IL 2011.

Gavelli, F, Davis, S.G., Hinze, P. & Hansen, O.R., CFD modeling of hydrogen releases and explosions, 7th Global Congress on Process Safety, American Institute of Chemical Engineers Spring National Meeting, Chicago, IL 2011.

Hansen, OR, Davis, SG, Mannan, MS. Assessing the Credibility of Major Incidents during a Process Hazards Analysis. Proceedings, 2010 Mary Kay O'Connor Process Safety Center International Symposium, College Station, TX.

Davis, SG, Hinze, PC, Hansen, OR, van Wingerden, K. Does Your Facility Have a Dust Problem: Methods for Evaluating Dust Explosion Hazards. Proceedings, 2010 Mary Kay O'Connor Process Safety Center International Symposium, College Station, TX.

Gavelli, F, Davis, SG, Hansen, OR. Evaluating the Potential for Overpressures from the Ignition of an LNG Vapor Cloud during Offloading. Proceedings, 2010 Mary Kay O'Connor Process Safety Center International Symposium, College Station, TX.

Davis, SG, Engel, D, Gavelli, F, Hinze, PC, Hansen, OR. Advanced Methods for Determining the Origin of Vapor Cloud Explosions. Case Study: 2006 Danvers Explosion Investigation. Proceedings, International Symposium on Fire Investigation Science and Technology, Hyattsville, MD, 2010.

Gavelli, F, Davis, SG, Hansen, OR. A Modern Tool for the Investigation of Indoor Flammable Gas Migration. Proceedings, International Symposium on Fire Investigation Science and Technology, Hyattsville, MD, 2010.

Davis, SG, Hinze, PC, Hansen, OR, van Wingerden, K. Investigation Techniques used to Determine the Massive Vapor Cloud Explosion at the Buncefield Fuel Depot. Proceedings, International Symposium on Fire Investigation Science and Technology, Hyattsville, MD, 2010.

Hansen, OR and Davis, SG. Vapor Cloud Explosion Mechanisms and Mitigation. Proceedings, 3rd World Conference on Safety of Oil and Gas Industry (WCOGI 2010), Beijing, China, Sept. 26-27, 2010.

Davis, SG, Engel, D, Hansen, OR. Case study summary of dryer explosion and venting design. Process Safety Progress, 29, pp. 345-348, 2010.

Davis, SG, Hinze, PC, Hansen, OR, van Wingerden, K., 2005 Buncefield Vapor Cloud Explosion: Unraveling the Mystery of the Blast. Interflame 2010, Nottingham, UK.

Hansen, OR, Hinze, PC, Engel, D, Davis SG. Using CFD for blast wave predictions. Journal of Loss Prevention in the Process Industries, 23, pp. 885-906, 2010. Also in, Proceedings, 2009 Mary Kay O'Connor Process Safety Center International Symposium, College Station, TX.

Hansen, OR, Gavelli, F, Ichard, M, Davis, SG. Validation of FLACS Against Experimental Data Sets from the Model Evaluation Database for LNG Vapor Dispersion. Journal of Loss Prevention in the Process Industries, 23, pp. 857-877, 2010.

Davis, SG, Engel, D, Hansen, OR. Dust or Gas Explosion: Case Study of Dryer Explosion and Design Venting. 6th Global Congress on Process Safety, American Institute of Chemical Engineers Spring National Meeting, San Antonio, TX, 2010.

Gavelli, F, Davis, SG, Hansen, OR, A Unified Model for LNG Pool Spread and Vapor Dispersion: Is Wind Scooping Really A Factor?, AIChE Spring National Meeting, San Antonio, TX, 2010.

Gavelli, F, Davis, SG, Hansen, OR, Ichard, M, CFD Simulation of Vapor Dispersion from LNG Jetting and Flashing Releases, AIChE Spring National Meeting, San Antonio, TX, 2010.

Davis, SG, Hansen, OR. New investigation findings on the 2006 Danvers, MA Explosion. *Journal of Loss Prevention in the Process Industries*, 23, pp. 194-210, 2009.

Hansen, OR, Ichard, M, Davis, SG. Validation of FLACS for vapor dispersion from LNG spills: Model evaluation protocol. *Proceedings, 2009 Mary Kay O'Connor Process Safety Center International Symposium*, College Station, TX.

Davis SG, Hansen, OR. Lessons Learned from the 2006 Facility Explosion in Danvers, MA. *Proceedings, 43rd Annual Loss Prevention Symposium*, American Institute of Chemical Engineers Spring National Meeting, Tampa, FL, 2009.

Davis SG, Kelley S, Somandepalli V. Hot surface ignition of performance fuels. *Fire Technology*, Vol. 46, No.2, pp. 363-374, 2010.

Somandepalli V, Kelley S, Davis SG. Hot surface ignition of ethanol-blended fuels and biodiesel. *SAE Paper 2008-01-0402*, SAE World Congress, April, 2008.

Davis SG, Wise J, Engel D, Somandepalli V. Crimp connector failures: Quantifying copper oxide layer growth. *Proceedings, International Symposium on Fire Investigation Science and Technology*, Cincinnati, OH, 2008.

Davis SG, Ibarreta A, Kessel A, Ellison A. Flammability of nylon used as insulation in electrical connectors. *Proceedings, International Symposium on Fire Investigation Science and Technology*, Cincinnati, OH, 2008.

Davis SG. Explosion hazards during fuel transition in combustion equipment. *Proceedings, 41st Annual Loss Prevention Symposium*, American Institute of Chemical Engineers Spring National Meeting, Houston, TX, 2007.

Davis SG, Somandepalli V. Hot surface ignition of gasoline, E85, diesel and E-diesel. *Proceedings, 10th Topical Conference on Energy Processes*, American Institute of Chemical Engineers Spring National Meeting, Houston, TX, 2007.

Davis SG, Clevenger J, Ibarreta A. Flammability of electrical crimp connectors subjected to heating. *Proceedings, Fire and Materials 10th International Conference*, 2007.

Sivaramakrishnan R, Comandini A, Tranter RS, Brezinsky K, Davis SG, Wang H. Combustion of CO/H₂ mixtures at elevated pressures. *Proceedings, Combustion Institute*, Vol. 31, pp. 429–437, 2007.

Davis SG, Chavez D, Kytömaa H. Hot surface ignition of flammable and combustible liquids. *SAE Paper 2006-01-1014*, SAE Transactions—*Journal of Fuels and Lubricants*, 2006.

Davis SG, Joshi A, Wang H, Egolfopoulos FN. An optimized kinetic model of H₂/CO combustion. *Proceedings, Combustion Institute*, Vol. 30, pp. 1283–1292, 2005.

Dong Y, Holley AT, Andac MG, Egolfopoulos FN, Davis SG, Middha P, Wang H. Premixed extinction of H₂/air flames: Chemical kinetics and molecular diffusion effects. *Combustion and Flame* 2005; 142:374–387.

Davis SG, Diamond A, Gans W, Hinze, PC, Kytömaa H. Don't judge a crimp by its cover. *Connector Specifier* 2004; 20(10).

Davis SG, Mhadeshwar AB, Vlachos DG, Wang H. A new method to response surface development for detailed gas-phase and surface reaction kinetic model development and optimization. *International Journal of Chemical Kinetics* 2003; 36:94.

Davis SG, Searby G. The use of counterflow flames for the evaluation of burning velocities and stretch effects in hydrogen/air mixtures. *Combustion Science and Technology* 2002; 174:93–110.

Davis SG, Quinard J, Searby G. Determination of Markstein numbers in counterflow, premixed laminar flames. *Combustion and Flame*, Vol. 130, pp. 112–122, 2002.

Davis SG, Quinard J, Searby G. Markstein numbers in counterflow, methane–and propane–air flames: A computational study. *Combustion and Flame* 2002; 130:123–136.

Davis SG, Quinard J, Searby G. A numerical investigation of stretch effects in counterflow, premixed laminar flames. *Combustion Theory and Modelling* 2001; 5:353–362.

Qin Z, Lissianski VV, Huixing Y, Gardiner WC, Davis SG, Wang H. Combustion chemistry of propane: A case study of detailed reaction mechanism optimization. *Proceedings, Combustion Institute*, Vol. 28, pp. 1663, 2001.

Davis SG, Law CK, Wang H. Propyne pyrolysis in a flow reactor: An experimental, RRKM, and detailed kinetic modeling study. *Journal of Physical Chemistry A* 1999; 103:5889–5899.

Davis SG, Law CK, Wang H. Propene pyrolysis and oxidation kinetics in a flow reactor and laminar flames. *Combustion and Flame* 1999; 119:375–399.

Davis SG, Law CK. Determination of and fuel structure effects on laminar flame speeds of C₁ to C₈ hydrocarbons. *Combustion Science and Technology* 1998; 140:427.

Davis SG, Law CK. Laminar flame speeds and oxidation kinetics of iso-octane/air and n-heptane/air flames. *Proceedings, Combustion Institute*, Vol. 27, pp. 521, 1998.

Davis SG, Wang H, Law CK. An experimental and detailed kinetic modeling study of propyne oxidation in flames and in a flow reactor. *Proceedings, Combustion Institute*, Vol. 27, pp. 305, 1998.

Davis SG, Wang H, Brezinsky K, Law CK. Laminar burning speeds and oxidation kinetics of benzene/air and toluene/air flames. *Proceedings, Combustion Institute*, Vol. 26, pp. 1025, 1996.

Selected Presentations and Courses

Gavelli, F, Davis, SG, Gas Explosion Hazards for LNG Facilities, an Advanced Course. Doha, Qatar, Oct. 4-5, 2011.

Davis, SG, Naturally it was the Gas: Fire Scene and Causation Analysis in the Presence of Gas Fire Appliances. DRI Fire and Casualty Seminar, Chicago, IL, Nov. 4-5, 2010.

Davis, SG, Gavelli, FG, Hansen, OR, van Wingerden, K, Rogstadkjernet, L. Gas Explosion Hazards on Offshore Facilities, an Advanced Course. College Station, TX, Aug. 30-31, 2010 & May 15-16, 2011.

Hansen, OR, Ichard, M, Davis, SG. Validation of FLACS for vapor dispersion from LNG spills: Model evaluation protocol. 2009 Mary Kay O'Connor Process Safety Center International Symposium, College Station, TX.

Davis, SG, Hansen, OR. Investigation findings from the 2006 Danvers explosion. Danvers' community public meeting, May 27, 2009.

Sivaramakrishnan R, Comandini A, Tranter RS, Brezinsky K, Davis SG, Wang H. CO oxidation at high pressures – experiments and modeling. Technical Meeting of the Central States Section of The Combustion Institute, Case Western Reserve University, NASA Glenn Research Center, Cleveland, OH, 2006.

Joshi AV, Davis SG, Wang H Multi-channel chemically activated reactions: Comparison of Troe's modified strong collision model and exact solution of the master equation by Monte Carlo method. Spring Technical Meeting of the Western States Section of the Combustion Institute, University of California, Davis, 2004.

Joshi AV, Davis SG, Wang H. Ab-initio study of the $C_6H_5O + H$ reaction: Viability of the $CO + C_5H_6$ channel. Fall Technical Meeting of the Eastern States Section of the Combustion Institute, University Park, PA, 2003.

Davis SG, Joshi AV, Wang H, Egolfopoulos FN. A comprehensive and optimized kinetic model of H_2/CO combustion. 3rd Joint Meeting of the U.S. Sections of the Combustion Institute, Chicago, IL, 2003.

Davis SG, Joshi AV, Wang H, Egolfopoulos FN. Experimental and numerical studies of flame extinction: validation of chemical kinetics. 3rd Joint Meeting of the U.S. Sections of the Combustion Institute, Chicago, IL, 2003.

Davis SG, Searby, G. The use of counterflow flames for the evaluation of burning velocities and stretch effects in hydrogen/air mixtures. 2nd Mediterranean Combustion Symposium, Sharm El-Sheikh, Egypt, 2002.

Davis SG, Wang H, Tsang W. A theoretical study of the reactions on the C_2H_3O potential energy surfaces: Kinetics of $C_2H_2 + OH$ products and the unimolecular dissociation of the vinoxy radical. 5th International Conference on Chemical Kinetics, Gaithersburg, MD, 2001.

Davis SG, Wang H. Development of a detailed chemical kinetic reaction mechanism of propane oxidation at high temperature. Fall Technical Meeting, the Western States Section of the Combustion Institute, Irvine, CA, 1999.

Davis SG, Law CK, Wang H. A theoretical study of the chemically activated reactions on the C_3H_5 potential energy surface. Joint Meeting of the US Sections of the Combustion Institute, Washington, D.C., 1999.

Davis SG, Law CK, Wang H. The pyrolysis and oxidation of propene in a flow reactor. Joint Meeting of the U.S. Sections of the Combustion Institute, Washington, D.C., 1999.

Prior Experience

Senior Managing Engineer in Exponent's Thermal Science Practice, Exponent – Failure Analysis Associates, Boston, MA (2002-2008)

Postdoctoral Fellow, Mechanical Engineering, University of Delaware in collaboration with IRPHE – Laboratoire de Combustion, Marseille, France (2000–2002)

Postdoctoral Fellow, National Science Foundation (NSF)-NATO/CNES, IRPHE – Laboratoire de Combustion, Marseille, France (1998–2000)

Graduate Research Assistant, Mechanical Engineering, Princeton University (1992–1998)

Peer Reviewer

Review Committee for the International Symposium on Combustion

Reviewer for Combustion and Flame, Combustion Theory and Modelling, and Combustion Science and Technology

Professional affiliations

National Fire Protection Association—NFPA (member)

Combustion Institute (member)

Society of Fire Protection Engineers—SFPE (member)

National Association of Fire Investigators—NAFI (member)

American Institute of Chemical Engineers (member)

International Association of Arson Investigators (Member)