

ORIGIN AND CAUSE ENGINEERING

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FRANK K. HSU, PH.D., P.E., C.F.E.I.

SUMMARY:

Strong background in combustion/fire, fire/explosion investigation, combustion/fire modeling, heat transfer, mass transfer, fluid mechanics, fire protection engineering, human behavior in fire, manufacturing, engineering materials, hydraulics, laser diagnostics, component testing, laboratory experiment.

Dr. Frank Hsu is a licensed Professional Engineer in the State of California and a nationally recognized Certified Fire and Explosion Investigator. His areas of specialties include: investigation and analysis of fire, explosion, water loss, product defects, as well as human injury incidents.

EDUCATION:

Ph.D., University of California – Berkeley (December, 2000)

MSME, University of Houston – University Park, Houston, Texas (August, 1994)

BSME, National Central University, Chung-Li, Taiwan (June, 1986)

PROFESSIONAL LICENSE AND CERTIFICATE:

Mechanical Engineer – State of California (M31306)

Certified Fire and Explosion Investigator – National Association of Fire Investigators (10750-5075)

COMMITTEES:

Training Committee Member, California Conference of Arson Investigators (2007 – 2008)

Member, Society of Fire Protection Engineers (SFPE) **Human Behavior Task Group** (1999 – 2003)

Alternate Member, **NFPA 130: Standard for Fixed Guideway Transit and Passenger Rail Systems** (2000 – 2001)

PROFESSIONAL EXPERIENCE:

ORIGIN AND CAUSE ENGINEERING, L.L.C. (02/07 – PRESENT)

President and Senior Engineer

Areas of consulting: fires/explosions investigation/assessment/analysis/testing, failure analysis, product defects, fire protection system analysis/testing, life safety, expert witness, and code compliance analysis. Fire Science research.

UNIVERSITY OF CALIFORNIA AT BERKELEY (11/02 – 12/08)

Visiting Scholar

Fuel Cell (MEMS project) – chemical reaction analysis and design of reformer and fuel cell

THERMAL SCIENCE AND TECHNOLOGY (04/02 – 01/07; NAME CHANGED TO ORIGIN AND CAUSE ENGINEERING, L.L.C.)

Principal and Mechanical Engineer

Areas of consulting: expert witness, failure analysis, product defects, life safety, fires/explosions investigation/assessment/analysis/testing, mechanical system failures, design and construction evaluations and code compliance analysis.

Fire Science research.

PACIFIC RIM INVESTIGATIVE SERVICES GROUP, INC. (02/04 – 12/06)

Director of Forensic Engineering Division

Areas of consulting: expert witness, failure analysis, product defects, life safety, fires/explosions investigation/assessment/analysis/testing, mechanical system failures, design and construction evaluations and code compliance analysis.

Fire Science research.

Soot damage investigation for the California Department of Insurance

PROFESSIONAL ENGINEERING SERVICES (08/02 – 01/04)

Senior Mechanical Engineer

Areas of consulting: expert witness, failure analysis, product defects, life safety, fires/explosions investigation/assessment/analysis/testing, mechanical system failures, design and construction evaluations and code compliance analysis.

UNIFIED INVESTIGATION & SCIENCES, Inc., Richmond, CA (10/01 – 07/02)

Director of Research

Forensic engineering; fire/explosion investigation

FIRE CAUSE ANALYSIS, Richmond, CA (12/96 – 09/01)

Chief Mechanical Engineer (starting as Research Associate)

Forensic engineering; fire/explosion investigations; expert witness; building code, fire code, mechanical & plumbing code compliance consulting; building materials fire performance research and testing; fire protection, HVAC, plumbing system failure analysis; fire risk assessment

Key contributions:

- Sprinkler system failure analysis and testing for CPSC (Tyco dry pendent sprinkler F960/F965). Processed and analyzed test data from multiple testing agencies, and identified the time dependent failure modes of GB and Omega fire sprinklers, which led to the largest fire sprinkler recall in US history
- Explosion (gas, dust and BLEVE- Boiling Liquid Expanding Vapor Explosion) investigation, assessment, analysis and testing
- Performed San Francisco public transit - Muni coaches fire investigations
- Fire load and fire risk analyses for fixed rail road vehicles – Siemens, Metrolink and Caltrain

MECHANICAL ENGINEERING DEPARTMENT, UNIVERSITY OF CALIFORNIA – BERKELEY, Berkeley, California (1/95 – 99)

Research Assistant

Chemical Vapor Deposition research; Laser diagnosis of combustion processes; Suction probe measurement of NO_x and major combustion products; Flow reactor studies utilizing Sandia National Laboratories' simulation codes - Premixed flame, Opposed flow flame, and Opposed jet flame

MECHANICAL ENGINEERING DEPARTMENT, UNIVERSITY OF HOUSTON, Houston, Texas (1/92 – 8/94)

Research Assistant & Teaching Assistant

Laser-based velocity and diameter measurement technique for spray & maintain and trouble shooting laboratory for thermal-fluids class

LEAD-YEAR ENTERPRISE, Taipei, Taiwan (11/90 – 7/91)

Engineer

Developed power supply heat transfer design guide line

AERO INDUSTRY DEVELOPMENT CENTER, Taichung, Taiwan (11/86 – 11/90)

Project Engineer

Coordinate multiple departments to perform turbofan engine TFE1042 hydraulic control system design, analysis and testing, and chemical milling manufacturing technology development and transfer

JOURNAL REVIEWER:

International Journal of Heat and Mass Transfer; Experimental Heat Transfer; Journal of Colloid and Interface Science; Journal of Fire Technology; Separation Science and Technology

FOREIGN LANGUAGES:

Mandarin, Taiwanese

ACTIVITIES:

American Society of Mechanical Engineers, Society of Fire Protection Engineers, National Fire Protection Association, International Association of Arson Investigators, National Association of Fire Investigators

PUBLICATIONS:

- Ming-tsang Lee, Ralph Greif, Costas P. Grigoropoulos, Hyung Gyu Park and **Frank K. Hsu**, "Transport in packed-bed and wall-coated steam-methanol reformers," *Journal of Power Sources*, Volume 166, Issue 1, 30 March 2007, Pages 194-201
- **Hsu, F. K.**, Brogdon, L. and Byron, Douglas, "Soot vs. Ash Damage: A Scientific Analysis," *California Adjusters' Almanac*, Vol. 14, 2005, pp. 61-64
- Park, H., Lee, M, **Hsu, F. K.**, Grigoropoulos, C., Greif, R. and Lin, C., "Transport in a Methanol Steam Reformer as the Fuel Processor for Fuel Cell Systems," 2004 ASME International Mechanical Engineering Congress and RD&D Expo, Nov, 13-19, 2004, Anaheim, CA
- **Hsu, Frank K.** (committee member), *Engineering Guide – Human Behavior in Fire*, 2003, Society of Fire Protection Engineers
- **Hsu, Frank K.** and Greif, R., "Stagnation Flow Thermophoretic Deposition with Variable Particle Concentration in the Mainstream," *International Journal of Heat and Mass Transfer*, V. 45 I. 6, March 2002, pp. 1229-1235
- **Hsu, Frank K.**, "A Study of Occupants' Behavior in Industrial/Commercial Fire Incidents – Case Study," 2nd International Symposium on Human Behaviour in Fire, 2001, Boston
- Brown, B., Zicherman, J. and **Hsu, F. K.**, "An Experimental Study of Materials Exposed to Electrical Resistance Heating as Potential Causes of Fires," 7th International Fire and Materials Conference, 2001, San Francisco
- Mongia, R., Tomita, E., **Hsu, F. K.**, Talbot, L., and Dibble, R., "Use of an Optical Probe for Time-Resolved in-situ Measurement of Local Air-to-Fuel Ratio and Extent of Fuel Mixing with Applications to Low NO_x Emissions in Premixed Gas Turbines," 26th Symposium (International) on Combustion, 1996, pp. 2749-2755
- Mongia, R., Tomita, E., **Hsu, F. K.**, Talbot, L., and Dibble, R., "Use of an Optical Probe for Time-Resolved in-situ Measurement of Local Air-to-Fuel Ratio and Extent of Fuel Mixing in Lean Premixed Combustors," WSS/CI 96S-024, 1996, Phoenix.
- Mongia, R., Tomita, E., **Hsu, F. K.**, Talbot, L., and Dibble, R., "Optical Probe for in-situ Measurement of Air-to-Fuel Ratio in Low Emission Engines," AIAA 96-0174, 34th Aerospace Sciences Meeting & Exhibit, 1996, Reno,
- **Hsu, F. K.**, Mongia, R. K., Dibble, R. W., and Talbot, L., "Measurement of Local Air-to-Fuel Ratio and Extent of Fuel Mixing by Rayleigh Scattering with Application to Low NO_x Burners," WSS/CI 95F-211, 1995, Stanford.

INVITED LECTURES, SPEECHES AND INTERVIEWS:

- "Synthetic Decking Materials Fires and Arc Mapping", CCAI Roundtable, Chico, California, June 1, 2012
- "Floor Furnace Fires," California Conference of Arson Investigators, San Luis Obispo, California, July 18, 2006
- "Forensic Investigation on Second London Bombing", WBZ News Radio 1030, Boston, MA, July 22, 2005
- "Forensic Experts Tracking The Bomb Blasts", CBS5 – San Francisco, CA, July 8, 2005
- "Application of Engineering Principles in Fire Investigation and Prevention – Case Study," School of Engineering, San Francisco State University, San Francisco, CA, February 23, 2004
- "Fire Safety and Fire Investigation," Alameda County Fire Prevention Officers Meeting, August 1, 2002