

RICHARD J. SCHREIBER, P.E.
Mechanical Engineer

Mr. Richard Schreiber has over 27 years of mechanical engineering experience in the fields of failure analysis, process plant equipment, thermal systems, combustion, heat transfer, fluid mechanics and energy systems. Mr. Schreiber specializes in the analysis of mechanical equipment, appliances, and devices that are involved in complex accidents, losses, fires, and explosions.

SPECIALIZED PROFESSIONAL COMPETENCE

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| ■ Mechanical failure analysis | ■ Fuel science |
| ■ Incident investigation | ■ Fire origin and cause investigation |
| ■ Combustion | ■ Explosion origin and cause investigation |
| ■ Applied heat transfer | ■ Combustion |
| ■ Fluid mechanics | ■ Thermal systems instrumentation |
| ■ Energy systems engineering | ■ Laboratory and full-scale field testing |
| ■ Forensic photography | ■ Patent evaluation |

EQUIPMENT

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|-----------------------------------|-------------------------|
| ■ Machinery and process equipment | ■ Ovens |
| ■ Industrial furnaces | ■ Fans, pumps and seals |
| ■ Gas furnaces and water heaters | ■ Piping and valves |
| ■ Burners | ■ HVAC |
| ■ Firetube and watertube boilers | ■ Oil field equipment |
| ■ Heat exchangers | ■ Machine guarding |

INDUSTRIES

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|--------------------|---------------------|
| ■ Power generation | ■ Natural gas |
| ■ Appliance | ■ Metals processing |
| ■ Manufacturing | ■ Petrochemical |
| ■ Chemical process | ■ Paper |

RECENT WORK

Failure analysis – Mechanical and electro-mechanical equipment, including appliances, industrial boilers, materials handling, float valves, pumps, pressure regulators, food machinery, milling machinery, chillers, paper machines, oven doors, truck tire rims, cooling water piping, ammonia cylinders, feed mills, hydro plants, airport transportation, insulation, water tanks and welding equipment.

Fire and explosion accident investigation – Evaluation of failures of equipment, devices and appliances that accidents, fires and explosions. Including gas furnaces, heaters, ranges, water heaters, water tanks, deep fat fryers, copper smelters, industrial boilers, pump seals, refineries, forklifts, air filter units, tanks, vessels and oil wells.

Accident reconstruction – Evaluation of accidents involving building explosions, chemical process plant fires and explosions, personal injuries, rocket fuel chemical storage magazines, buried gas pipelines and the underground migration of combustible gas.

Thermal systems instrumentation and testing – Testing of the thermal performance of water heaters, residential furnaces and ammonia chillers.

EARLIER WORK

Earlier work in combustion research and development included flame propagation and stabilization, flame modifications to reduce emissions, and optimized burner/heat exchanger systems. In the area of energy systems engineering, experience has included pilot-scale coal-fired utility boiler design, testing burners for advanced fired-heaters for oil refineries, high-efficiency residential and commercial furnaces and water heaters, fuel piping and delivery systems, and engineering and economic analyses for fossil utility boilers. In the fields of applied heat transfer and fluid mechanics, experience has included the evaluation and design of high-efficiency heat exchangers for industrial aluminum melters and residential and commercial furnaces and appliances.

EDUCATION AND PROFESSIONAL BACKGROUND

- M.S. (Mechanical Engineering), University of California, Irvine (1973)
- B.S. (Mechanical Engineering), University of California, Irvine (1972)
- Registered Professional Engineer, Mechanical, California No. M20112, Nevada No. 014786
- Private Investigator, California License No. PI 21596
- Certified Fire and Explosion Investigator, National Association of Fire Investigators, Number 5045-1274.
- Office of the California State Fire Marshall, State Fire Training, Investigation 1B-Techniques of Fire Investigation.
- BATC Refinery Process Safety Orientation.
- Investigation of Gas and Electric Appliance Fires, 16-hour Course, Fire Findings Laboratories.
- Mechanical Seal Maintenance Training Seminar, 32-hour course, John Crane Co.
- Six Patents Granted in the Field of Applied Heat Transfer and Combustion Technology
- Member:
 - American Society of Mechanical Engineers
 - National Association of Fire Investigators
 - California Conference of Arson Investigators
 - National Fire Protection Association

SELECTED REPORTS, PUBLICATIONS, AND INVITED LECTURES

Engineering Investigation and Analysis of the Explosion in the Humberto Vidal Building, San Juan, Puerto Rico, Expert Report (with K. J. Clark, et al.) (March 1999).

Residential Electric Fireplaces--Review of the State-of-the-Art, EPRI Final Report TR-108013 (April 1997).

Estimating the Total Cost of Cycling Operations at the Los Angeles Department of Water and Power Haynes Generating Station Unit 5, Presented at the EPRI Fossil Plant Maintenance Conference, Baltimore, Maryland (with S.A. Lefton) (July 1996).

Estimating the Total Cost of Cycling to Optimize Power Plant Costs, Life and Reliability, Presented at the ASME Pressure Vessel and Piping Conference, Montreal, Canada (with S.A. Lefton) (July 1996).

Estimating the Total Cost of Cycling a Fossil Power Plant, EPRI Final Report (December 1995).

Underground Electrical Cable Failure; Report to Continental Insurance Company (December 1994).

Cycling Cost Assessment Project, Presented at the 1994 EPRI Fossil Plant Cycling Conference, New Orleans, Louisiana (October 1994).

Investigation of a Poultry Feed Mill Accident, Report to Chubb Insurance Company (May 1994).

Assessment of Residential Fireplaces, APTECH Report AES 93031888-5 (May 1993).

Assessment of Residential Ultrasonic Dishwashers, EPRI Final Report RP 2597-34 (December 1992).

End-Use Technologies Desk Book, EPRI RP 2034-35, Multimedia Software Product (December 1992).

Federal Energy Conservation Standards for Consumer Products, EPRI RP2934-38 (October 1991).

Assessment of Residential Microwave Dryer, APTECH Report AES 89081092-6-1, Rev. 1, EPRI Final Report RP 2034-35 (February 1990).

Assessment of Line Voltage Thermostats, APTECH Report AES 8901994-2-1, Rev. 1, EPRI Final Report RP 2034-29 (July 1989).

Effect of Rerating Five Illinois Power Company Fossil Power Plants (with S.A. Lefton) (June 1988).

Advanced Refinery Process Heater, 14th Energy Technology Conference and Exposition, Washington, D.C. (with A. Minden) (April 1987).

Catalytic Radiant Tube, 1986 International Gas Research Conference, Toronto, Canada (with J. Lannutti) (September 1986).

Advanced Burner Development Program, First Workshop for the GRI Center for Advanced Materials, Pennsylvania State University (May 1986).

Catalytic Radiant Tube for Industrial Process Heating Applications, 1986 Symposium on Industrial Combustion Technologies, Chicago, Illinois (with J. Lannutti) (April 1986).

Radiant Burners for Application in a Gas-Fired Immersed Ceramic Tube Aluminum Melting Furnace, Babcock & Wilcox Company, Alzeta Report 85-712-121 (November 1985).

Cost-Effectiveness of Radiant Burners to Reduce NO_x Emissions From Three Chevron/El Segundo Refinery Heaters, Chevron USA, Inc., Alzeta Report 85-711-118 (October 1985).

An Engineering Feasibility Study of Retrofitting a Refinery Heater with Radiant Burners, ESSO Petroleum Canada, Alzeta Report 84-611-109 (August 1984).

Industrial Applications of the Radiant Ceramic Fiber Burner, 1983 International Gas Research Conference, London, England (June 1983).

Infrared and Catalytic Burner Technology Assessment, Gas Research Institute, Report GRI-80/0019 (with J. Kesselring and W. Krill) (February 1981).

Economic Study of Coal-Oil Mixture Light-Off Fuel for the Cumberland Steam Plant, Tennessee Valley Authority, Second International Symposium on Coal-Oil Mixture Combustion, Danvers, Massachusetts (November 1979).

Environmental Control Technologies for a Northern California Coal-Fired Power Plant, Acurex, Final Report 79-325, California Energy Commission (June 1979).

Refinery Heater Screening Study, Environmental Protection Agency, Report EPA-450/3-79-007 (with S. Ayraud) (March 1979).

Feasibility Study of SO_x Removal by Dry Limestone-Based Sorbents, Electric Power Research Institute, Project 982-2, Final Report (May 1977).

Evaluation of Molten Scrubbing for Fine Particulate Control, Environmental Protection Technology Series, Report EPA-600/1-77-067 (with G.G. Poe) (March 1977).

Boiler Modification Cost Survey for Sulfur Oxides Control, Environmental Protection Technology Series, Report EPA-650/2-74-123 (November 1974).

ADDITIONAL INFORMATION

For more information regarding APTECH's personnel and services, please contact our Corporate Headquarters in Sunnyvale, California (USA) at (408) 745-7000 or visit our website (<http://www.aptecheng.com>).

PREVIOUS CASES OF RICHARD J. SCHREIBER, P.E. APTECH ENGINEERING SERVICES, INC.

Category	Subject	Detail	Issue
Appliance	Deep fat fryer	Restaurant, gas	Control failure & fire
Appliance	Dehumidifier, pool area	Compressor failures	Refrigerant contamination
Appliance	Furnace	Residential, gas	Design defect/fires
Appliance	Furnace, floor	Residential, gas	Fire & fatality
Appliance	Furnace, wall	Motel, gas	CO poisoning
Appliance	Furnace, wall-mounted	Motel, gas	CO poisoning
Appliance	Grill & vent ducts	Restaurant, gas	Fire
Appliance	Heater, pool	Heat exchanger fouling	Flame rollout
Appliance	Heater, room	Residential, gas	Fire
Appliance	Kettle, bagel	Restaurant, gas	Fire
Appliance	Oven	Door	Burn injury
Appliance	Oven, electric	Candle wax softening	Fire
Appliance	Range	Residential, gas	Grease fire
Appliance	Range / oven	Residential, gas	CO poisoning
Appliance	Shower valve	Scald guard	Water scalding
Appliance	Water heater	Mobile home, gas	Fire
Appliance	Water heater	Residential, gas	CO poisoning
Container	Ammonia	Blueprint shop	Failure & explosion
Infrastructure	Cable	Electrical	Arcing failure & fire
Infrastructure	Cable & switchgear	Electrical	Arcing & explosion
Infrastructure	Chair	Hospital office	Injury
Infrastructure	Electrical distribution	Baseboard	Shock & injury
Infrastructure	Floor	Linoleum tile	Slip & fall
Infrastructure	House wiring	Wire damaged by nail	Electrical short & fire
Infrastructure	Mobile home	LP gas piping	Leak, fire & fatality
Infrastructure	Pipe, natural gas	Excavation damage	Explosion
Infrastructure	Piping	Pipe coupling	Disconnection
Infrastructure	Piping	Abandoned gas main	Explosion
Infrastructure	Switchgear	Electrical	Arcing & injury
Infrastructure	Underground piping	Propane	Leak & explosion
Infrastructure	Wiring	Electrical	Arcing & fire
Infrastructure	Wiring	Electrical	Arcing & fire
Machinery	Air handling unit	Bag filters	Filters sucked into fan
Machinery	Arc welding	Electrode on solvent can	Explosion
Machinery	Asphalt mix plant	Aggregate drying drum	Explosion
Machinery	Asphalt refinery	Pump seal	Seal failure & fire
Machinery	Boiler, hydronic	Level control failure	Overheating & house fire
Machinery	Boiler, package firetube	Gas valve fouled	Raw gas explosion
Machinery	Boiler, package firetube	Gas control system failure	Raw gas explosion
Machinery	Boiler, utility	Shutdown errors	Raw gas explosion

Category	Subject	Detail	Issue
Machinery	Boiler, utility	Condenser tubing	Chemical attack
Machinery	Boiler, watertube	Insulation cladding	Warping
Machinery	Boiler, watertube	Flame safety system failure	Raw gas explosion
Machinery	Bulk plant, gasoline	Tank overfilling	Spill & fire
Machinery	Cable winder	Fiber optic cable	Detached spool & injury
Machinery	Chamber, environ. test	Computer hard drives	Performance dispute
Machinery	Chemical plant	Ammonium nitrate fertilizer	Detonation
Machinery	Chemical plant	Rocket fuel oxidizer	Fire & explosion
Machinery	Chiller	Expansion tank	Explosion & injury
Machinery	Chiller, ammonia	Refrigerated warehouse	Structure failure & leak
Machinery	Chiller, ammonia	Refrigerated warehouse	Performance testing
Machinery	Coal processing plant	Drying vessel	Operation defect
Machinery	Concrete truck	Pinch point	Arm injury
Machinery	Copper smelter	Flash converting furnace	Explosion
Machinery	Copper smelter	Sulfuric acid plant	Tube failures
Machinery	Dicing machine	Walnut	Hand injury
Machinery	Diesel engine	Valve and seat	Wear & fracture
Machinery	Dryer, printing plant	Natural gas-fired	Explosion & building fire
Machinery	Electrical generator	Absence of lube oil	Bearing failure
Machinery	Elevator	Apartment building	Fire
Machinery	Feed mill, poultry	Gate valve	Malfunction
Machinery	Filter, multi-cartridge	Vitamin dust	Fire
Machinery	Forklift	Warehouse	Fire
Machinery	Fuel nozzle, aircraft	Separation from hose	Fire & burn injury
Machinery	Generator	Coal-fired power plant	Bolt failure and melt-down
Machinery	Heat exchanger	Ethylene autorefrigeration	Fracture and fire
Machinery	Laser cutting machine	Control electronics	Reliability
Machinery	Material handling	Baghouse and conveyors	Design and installation
Machinery	Material handling	Forklift & conveyors	Design defect
Machinery	Metal recycling	Conveyor support structure	Collapse
Machinery	Milling machine	Metal	Hand injury
Machinery	Model electric vehicle	Debris on electric bus panels	Fire
Machinery	Motors	Electrical	Overheating & failures
Machinery	Oil refinery	Hydrogen piping & valve	Fire & injury
Machinery	Oil refinery	Valve in isocracker unit	Fire
Machinery	Oil well	Well killing	Explosion & fire
Machinery	Oil well	Shaker tank vehicle	Fire
Machinery	Paper machine	Pinch point	Arm injury
Machinery	Process plant	NF3 distillation column / reboiler	Explosion
Machinery	Pump	Electronic mfg. fluid	Patent infringement
Machinery	Pump	Submersible well	Bearing failure
Machinery	Pump	Submersible well	Lead contamination
Machinery	Railroad	Tank car	Derailment & toxic spill
Machinery	Railroad (airport)	Driverless transit vehicle	Brake failure

Category	Subject	Detail	Issue
Machinery	Rooftop cooling unit	Shipping damage	Performance testing after shipping damage
Machinery	Solar power plant	Heat transfer fluid tank	Explosion & fire
Machinery	Steel mill	Ammonia scrubber	Explosion & fatalities
Machinery	Transformer	Hydro power plant	Fire
Machinery	Truck	Fuel line & electrical harness	Electrical short & fire
Machinery	Turbine, gas	Improper tuning	Flashback & burner damage
Machinery	Vessel	Soy oil	Flavor spoilage
Machinery	Vessel, blending	Mechanical seal water leak	Explosion
Machinery	Vessel, natural gas	Closure failure	Gas release & explosion
Machinery	Vessel, pressure	Hydraulic oil	Explosion
Machinery	Water tank	Natural gas in well water	Explosion
Machinery	Water tank	Level control valve	Overflow & mudslide
Machinery	Wheel	Truck tire mounting	Injury
Machinery	Wine storage tank	Confined space entry	Asphyxiation by nitrogen
Structure	Apartment	Natural gas from appliance	Fire & fatality
Structure	Row house	Fireworks	Explosion
Structure	Storage magazine	Rocket fuel chemicals	Fire & explosion
Structure	Three-story masonry	Gas piping or appliances	Gas release & explosion
Tool/device	Engine dolly	Weld failure	Hand injury
Tool/device	Gas pressure regulator	Rubber diaphragm	Failure & apartment expl.
Tool/device	Hook	Lighting fixture	Fixture damage
Tool/device	Stairs	Portable	Personal injury
Tool/device	Therapeutic oxygen	Pressure regulator	Fire, failure, odor