



# Exponent®

Engineering & Scientific Consulting

## Peter Lillo, Ph.D., P.E., CFEI, CVFI

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## Professional Profile

Dr. Lillo is a mechanical engineer who specializes in failure analysis and the assessment of issues involving vehicles, engines, machines, fires, explosions, or any combination of those topics. His professional background is in mechanical engineering, automotive technology, and the thermal sciences. Dr. Lillo often investigates the root cause of failures, as well as claims of defect and issues involving automobiles, trucks, buses, tractors, ATV's, and other types of vehicles or machinery. Dr. Lillo obtained his Ph.D. in the fields of thermal sciences and combustion. He has experience investigating the cause, origin and progression of fires, explosions, and other thermal events in a variety of environments including residential and commercial structures, vehicles, and machinery. As an expert in both vehicles and fire, he often analyzes complex vehicle fire incidents or issues.

Dr. Lillo is trained in the field of automotive repair and he practiced as a master certified technician. He is also a professional mechanical engineer. He has diagnosed the cause of thousands of vehicle failures and issues and has been solving automotive problems for more than twenty years. He has expertise in the fields of engines, fuel systems, emissions control devices, automatic and manual transmissions, brakes, steering and suspension systems, HVAC systems, electrical and computer systems, driveability, among others. His experiences include working with many different types of light and heavy-duty vehicles, tractors, as well as engines in both mobile and stationary applications. He has performed smog related inspections and repairs in the state of California. He often analyzes records and data to gain an understanding of real-world failure modes, failure rates, repairs, and their outcomes, as well as to assess vehicle or machine performance and trends. He has extensive experience inspecting and testing vehicles and their components. He consults on best practices, standard of care, warranty issues, preventative maintenance, or other topics in the field of vehicle service and repair. He frequently investigates and determines the root cause of vehicle and engine failures and issues.

Dr. Lillo also carries out work relating to combustion, fluid flow, thermodynamic, heat transfer processes, mechanical engineering, and product safety. For example, he performs engineering analysis of power producing devices such as engines and turbines, as well as appliances, gas utilities and pipelines, consumer devices, hydraulic and pneumatic systems, boilers, heating/cooling systems, and combustion emissions issues such as carbon monoxide poisoning incidents. He conducts proactive work, such as product evaluations and testing, as well as reactive work, such as failure analysis and product recall investigations. Dr. Lillo has extensive experience designing and performing scientific tests, measurements, and research. He has published peer-reviewed articles on the topics of engines, combustion strategies, fuel sprays, ignition processes and mechanical and optical diagnostics.

Prior to joining Exponent, Dr. Lillo completed his A.S. (De Anza College) in Automotive and Engine Technologies, and then B.S. (U.C. Berkeley), M.S and Ph.D. (University of Michigan - Ann Arbor) in Mechanical Engineering. While at the University of Michigan, he used advanced laser based optical diagnostics to study flame, airflow and fuel spray development inside automotive engines. He has also worked in combustion laboratories at both Sandia National Laboratories and UC Berkeley.

## Academic Credentials & Professional Honors

Ph.D., Mechanical Engineering, University of Michigan, Ann Arbor, 2016

M.S., Mechanical Engineering, University of Michigan, Ann Arbor, 2013

B.S., Mechanical Engineering, University of California, Berkeley, 2010

A.S., Automotive Chassis Systems, De Anza College, 2005

A.S., Automotive Engine Performance, De Anza College, 2005

A.S., Engine Machining and Service, De Anza College, 2005

Graduate Research Fellowship, National Science Foundation, 2011-2014

Alternate Member: Technical Committee on Automotive and Marine Service Stations (AUV-AAA), NFPA 30A Code for Motor Fuel Dispensing Facilities and Repair Garages, National Fire Protection Association, 2018-present

Alternate Member: Technical Committee on Internal Combustion Engines (INT-AAA), NFPA 37 Standard for the Installation and Use of Stationary Engines and Gas Turbines, National Fire Protection Association, 2017-present

## Licenses and Certifications

ASE Master Certified Automotive Technician

Certified Fire and Explosion Investigator (CFEI)

Certified Vehicle Fire Investigator (CVFI)

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

## Prior Experience

Graduate Student Researcher, Quantitative Laser Diagnostics Laboratory, University of Michigan, 2011-2016

Combustion Research Intern, Sandia National Laboratories, 2010-2011

Student Researcher, Combustion Analysis Laboratory, University of California, Berkeley, 2008-2010

Master Automotive Technician, Dirks Automotive and Transmission Repair, Oroville, CA, 2006-2007

Master Automotive Technician, J.P. Automotive, San Jose, CA, 2002-2006

## Professional Affiliations

National Fire Protection Agency

The Combustion Institute

Society of Automotive Engineers

## Publications

Kazmouz SJ, Haworth DC, Lillo PM, Sick V. Extension of a thickened flame model to highly stratified combustion—Application to a spark-ignition engine. *Combustion and Flame*, 236, 111798, 2022.

Kazmouz, Samuel J., Daniel C. Haworth, Peter Lillo, and Volker Sick. Large-eddy simulations of a stratified-charge direct-injection spark-ignition engine: Comparison with experiment and analysis of cycle-to-cycle variations. *Proceedings of the Combustion Institute*, 2020.

Lillo PM, Zhuang H, Sick V. Topological development of homogeneous-charge and spray-guided stratified-charge flames in an internal combustion engine. *International Journal of Engine Research* 2017; 1468087417727192.

Lillo PM. Topological development of homogeneous-charge and stratified-charge flames in an internal combustion engine. Ph.D. dissertation., University of Michigan, 2016.

Chen H, Lillo PM, Sick V. Single-shot 3D imaging of fuel injection in a spark-ignited direct-injected gasoline engine. *International Journal of Engine Research* in press.

Lillo PM, Greene ML, Sick V. Plenoptic single-shot 3D imaging of in-cylinder fuel spray geometry. *Zeitschrift für Physikalische Chemie (Journal of Physical Chemistry)*, 2015.

Lillo PM, et al. Diesel spray ignition detection and spatial/temporal correction. No. 2012-01-1239. SAE Technical Paper, 2012.

Polonowski CJ, Mueller CJ, Gehrke CR, Bazyn T, Martin GC, Lillo PM. An experimental investigation of low-soot and soot-free combustion strategies in a heavy-duty, single-cylinder, direct-injection, optical diesel engine. (No. 2011-01-1812). SAE Technical Paper, 2011.

## Peer Reviews

Combustion Institute

Society of Automotive Engineers