Mitigating Gasoline Particulate Emissions: Challenges and Best Practices, a
modeling and control perspective

Workshop

1-3 pm (EDT)
October 4th, 2020

Organizers: Simona Onori* and Mark Hoffman**
*Assistant Professor, Energy Resources Engineering, Stanford University
**Assistant Professor, Mechanical Engineering, Auburn University

Scope

Impending particulate emissions regulations have placed emphasis on the number of particles emitted from gasoline engines, creating an imposing challenge for manufacturers who utilize direct injection combustion strategies. While substantial work remains in the in-cylinder prevention of gasoline particulates, the immediate need remains their removal from current exhaust streams. Filtration of gasoline particulates creates unique challenges due to the inherent nature of spark ignited engine operation. This workshop outlines and addresses the fundamental modeling and control challenges of filtering gasoline particulates, provides best practices for experimental particulate investigations, introduces the audience to the unique challenges of physically modeling gasoline particulate filters, and speaks toward the impact of particulate filtration on engine control.

Speakers

*Harikesh Arunachalam · harunachalam@rivian.com, Battery Algorithm Engineer, Rivian Automotive LLC
*Mark Hoffman · mah0142@auburn.edu, Assistant Professor, Auburn University
*Ameya Joshi · joshia@corning.com, Director, Emerging Technologies & Regulations Environmental Technologies, Corning Inc.
*Svyatoslav (Slava) Korneev · svyatoslav.korneev@gmail.com, Research Scientist at PARC, a Xerox Company
*Simona Onori · sonori@stanford.edu, Assistant Professor, Stanford University
*Gabriele Pozzato · gpozzato@stanford.edu, Postdoctoral Fellow, Stanford University
## Agenda

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<td>Ameya Joshi</td>
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## Reading Material

Biographies

Harikesh Arunachalam received the B.E. degree in mechanical engineering from the Birla Institute of Technology and Science, Pilani, India, in 2010, the M.S. degree in mechanical engineering from the University of California, San Diego, CA, USA, in 2011, and the Ph.D. degree in automotive engineering from Clemson University, SC, USA, in 2017. He is currently working as a battery algorithm engineer at Rivian Automotive LLC, Irvine, CA, USA. His job duties involve development of on-board application layer software components for ensuring safe and reliable performance of the high voltage battery pack. He is also a reviewer for various projects funded by the U.S. Environmental Technologies division. He provides credible technical guidance to engage regulators, customers and other automotive suppliers on the direction of emissions regulations globally and their impact on future technology choices. His previous roles at Corning include Technology Manager for Japan and Korea and Research Manager for the Modeling & Simulation group. Ameya currently serves as an associate editor for the SAE Journal of Engines and as Publishing Editor for the journal Emission Control Science and Technology. He is also a reviewer for various projects funded by the U.S. Department of Energy’s Vehicle Technologies Office through the Annual Merit Review. He received his Ph.D. from the University of Delaware in Mechanical Engineering.

Dr. Mark Hoffman is an assistant professor of mechanical engineering at Auburn University where he teaches thermodynamics, heat transfer, and advanced powertrain systems. He has 18 years of expertise in kinetically controlled combustion, multi-fuel combustion, in-cylinder heat transfer, thermal barrier coatings, catalytic emission systems, particulate emissions characterization, waste heat recovery, and fuel-efficient vehicle platooning. Prior to his employment with Auburn, Hoffman was a research assistant professor at Clemson University’s Department of Automotive Engineering where he also served as director for Clemson’s Automotive Engineering Certificate program. Dr. Hoffman received his B.S. in Mechanical Engineering from Union College and both his M.S. and Ph.D. in mechanical engineering from the University of Michigan.

Svyatoslav Korneev’s research interests focus on multiscale analytical and numerical methods for solid and fluid mechanics. Currently, he is working on developing a new upscaling technique that carries the important micro-scale information up to the macro-scale level in a computationally efficient fashion. This research can potentially result in an accurate reduced-order system of equations that model the process of advanced additive manufacturing. Svyatoslav’s career in computational physics started in 2012 as a Ph.D. student in the Institute for Spectroscopy at the Russian Academy of Sciences. His program was focused on the theory of dark solitons and dispersive shock waves in Bose–Einstein Condensate (BEC) and nonlinear optics. After defending his Ph.D. thesis, he held a few postdoctoral positions. In November 2017, he joined Stanford University as a physical science research scientist.

Simona Onori is an Assistant Professor at Stanford University in Energy Resources Engineering where she also holds a courtesy appointment in EE and directs the Stanford Energy Control Lab (onorilab.stanford.edu). Prior to Stanford, she was an Assistant Professor at Clemson University International Center for Automotive Research. Simona Onori received her Laurea Degree, summa cum laude in Electrical and Computer Engineering from University of Rome ‘Tor Vergata’. Her M.S. in Electrical Engineering from the University of New Mexico, and her Ph.D. in Control Engineering from University of Rome ‘Tor Vergata’. Her research is in sustainable transportation, emission reduction systems, clean energy and secondary life battery. She serves as the Editor-in-Chief of the SAE International Journal of Electrified Vehicles since 2020 and she is a Distinguished Lecturer of the IEEE Vehicular Technology Society for the 2020/22 term. She is the recipient of the 2019 Board of Trustees Award for Excellence, Clemson University, 2018 Global Innovation Contest Award, LG Chem, 2018 SAE Ralph R. Teetor Educational Award, 2017 NSF CAREER award.

Gabriele Pozzato was born in Vicenza, Italy, on October 31st, 1991. He received his Bachelor's degree in Information Engineering from Università di Padova and his Master of Science (cum laude) in Automation and Control Engineering from Politecnico di Milano. He was a visiting scholar at the Clemson University International Center for Automotive Research (CU-ICAR), South Carolina (USA), from January to November 2016. He received his Ph.D. in Information Technology from the Politecnico di Milano in 2020, defending a thesis on the optimization, modeling, and control of vehicles' powertrain. During his doctoral studies, he was an academic guest at the ETH Zürich and the Leibniz Universität Hannover. After the doctoral degree, he was project manager at Robert Bosch S.p.A., Sensortec division. He currently holds a post-doc position at the School of Earth, Energy & Environmental Sciences, Stanford University.