**Flavio Dal Forno Chuahy**

dalfornochuf@ornl.gov

**Education**

 **Ph.D. Mechanical Engineering, GPA 3.89/4**

 University of Wisconsin – Madison, Madison, USA

 Graduation May 2018

 Thesis title: “A Pathway to High Efficiency IC Engines through Thermochemical Recovery and Fuel Reforming”

 **M.S Mechanical Engineering, GPA 3.87/4**

University of Wisconsin – Madison, Madison, USA

 Graduation Aug 2016

 **B.S. Mechanical Engineering, Grade 8.6/10**

Maua School of Engineering, Sao Paulo, Brazil

 Graduation Dec 2011

**Work Experiences**

**2020- Present Research Staff – Thermal Hydraulics Group – Advanced Reactor Engineering and Development Section – Oak Ridge National Laboratory**

* Managing multi-million dollar research portfolio and research proposal writing.
* Expert in multi-phase reacting and non-reacting CFD simulations.
* Conducting cutting edge computational research in engines, and electrochemical devices (electrolyzers and fuel-cells)
* Fundamental analysis of combustion processes using direct numerical simulation and large eddy simulations
* Use of machine learning and optimization algorithms.
* Multi-physics simulations focused on decarbonization of transportation, energy and building technology

**2019- 2020 Postdoctoral Researcher – Combustion and Fuel Science Group – Oak Ridge National Laboratory**

* Researcher at the National Transportation Research Center
* Conducting cutting edge experimental research in decarbonization of internal combustion engines and development of alternative fuels.

**2018- 2019 Engine Optimization Lead – Cummins Research & Technology**

* Generate technology recommendations to achieve future EPA and CARB NOx and CO2 regulations.
* Responsible for all combustion related architectural recommendations for new HD platform: Injector, combustion bowl, turbocharger, etc.
* Responsible for all experimental testing activities.
* Lead CFD activities for development of new combustion system.
* Lead collaboration with fuel systems development team for new injector development.
* Conduct GT-Power evaluations in support of program development.
* Lead collaboration with turbocharger team for new air handling systems.

**2014- 2018 Research Assistant and Ph.D. Candidate – Engine Research Center, University of Wisconsin-Madison**

* Electrochemical-Combustion combined systems research
* Explore advanced combustion regimes using single-cylinder engine experiments and detailed CFD modeling. CFD analysis and engine experiments are combined to investigate strategies to improve thermal efficiency.
* Develop and validate computational models of fuel reforming process and system level performance. Evaluate potential for thermochemical recovery of exhaust energy to drive on-board reforming reactions, enabling dual fuel advanced combustion.
* Advisor: Professor Sage L. Kokjohn, Department of Mechanical Engineering

**2012-2014 Performance and Emissions Engineer – Electro Motive Diesel (La Grange, IL, USA)**

* Conducted development of air handling, cooling and exhaust systems through the development of computational fluid dynamic (CFD) models.
* Responsible for technical leadership of TIER4 Two Stroke Engine program, dealing with the development of the aftertreatment (sizing, shape optimization, and substrate selection), development of the fuel system, optimization of injector characteristics and piston bowl design.

**Awards**

**2021** US Department of Energy Team Distinguished Achievement

**2011** Graduation paper titled “High Pressure Direct Injection in Spark Ignition Engines: Efficiency, Performance and Emissions” was awarded second place on the SAE Brasil’s student technical paper competition.

**Selected Publications**

**Journal Publications**

**2022 F. D.F. Chuahy**, CEA Finney, BC Kaul and MD Kass, “Computational exploration of bio-oil blend effects on large two-stroke marine engines”, Fuel 322 (2022).

**2021 F. D.F. Chuahy**, S. Curran, M. De-Busk, J. Storey, M. Connatser, S. Lewis, “The effects of distillation characteristics and aromatic content on low-load gasoline compression ignition performance and soot emissions in a multi-cylinder engine”, Fuel 299 (2021).

 **F. D.F. Chuahy**, S. Curran, T. Powell, J. Szybist, “Impact of fuel chemical function characteristics on spark assisted and kinetically controlled compression ignition strategies focused on multi-mode operation”, Fuel 299 (2021).

T. Powell, J. Szybist **F. D.F. Chuahy**, S. Curran, John Mengwasser, Allen Aradi and Roger Cracknell , “Octane Index Applicability over the Pressure Temperature Domain”, Energies 14 (2021), 607.

**2020 F. D.F. Chuahy**, D. Splitter, V. Boronat, S. Wagnon, “Enabling high compression ratio in boosted spark ignition engines: Thermodynamic trajectory and fuel chemistry effects on knock”, Combustion and Flame 222 (2020), 446-459.

**2019** J. Roberts, **F. D.F. Chuahy**, S.L. Kokjohn, S. Roy, “Isolation of the parametric effects of pre-blended fuel on low load gasoline compression ignition (GCI)”, Fuel 237 (2019) 522-535.

**F. D.F. Chuahy**, Tyler Strickland, N.R Walker, S.L. Kokjohn, “Effects of reformed fuel composition on soot particle size distribution in RCCI and DPI combustion”, International Journal of Engine Research, XX (2019) 1-14.

**F. D.F. Chuahy**, S.L. Kokjohn, “Solid oxide fuel cell and advanced IC engine combined cycle: A pathway to 70% efficiency”, Applied Energy 235 (2019) 391-408.

**2018 F. D.F. Chuahy**, J. Olk, D. DelVescovo, S.L. Kokjohn, “Auto-ignition integral engine size scaling method for kinetically controlled combustion”, International Journal of Engine Research, XX (2018) 1-21.

**F. D.F. Chuahy**, S.L. Kokjohn, “System and second law analysis of the effects of reformed fuel composition on “single” fuel RCCI combustion”, SAE International Journal of Engines 22(6):861-878, 2018.

**2017 F. D.F. Chuahy**, S.L. Kokjohn, High efficiency dual-fuel combustion through thermochemical recovery and diesel reforming, Applied Energy, 195 (2017) 503-522.

 **F. D.F. Chuahy**, S.L. Kokjohn, Effects of the direct-injected fuel’s physical and chemical properties on dual-fuel combustion, Fuel 207 (2017) 729-740.

 **F. D.F. Chuahy**, S.L. Kokjohn, Effects of reformed fuel composition in “single” fuel RCCI combustion, Applied Energy, 208 (2017) 1-11.

**2016** Y. Ra, **F. Chuahy**, S. Kokjohn, Development and validation of a reduced reaction mechanism with a focus on diesel fuel/syngas co-oxidation, Fuel, 185 (2016) 663-683.

**Conference Proceedings**

**2021** G. Jatana**, F. D.F. Chuahy**, J.Szybist, “The effect of spark-plug heat dispersal range, intake temperature , and exhaust valve opening timing on cold-start emissions and cycle-to-cycle variability”, SAE Powertrain Fuel and Lubricants 2021.

**F. D.F. Chuahy**, D. Splitter, M. Wissink, V. Boronat, “EGR Dilution and Fuel Property Effects on High-Efficiency Spark-Ignition Flames”, SAE World Congress 2021.

D. Splitter, V. Boronat, S. Neupane, **F. D.F. Chuahy,** W. Partridge, “In situ laser induced florescence measurements of fuel dilution from low load to stochastic pre ignition prone conditions”, SAE World Congress 2021.

**2020** V. Boronat, D. Splitter, **F. D.F. Chuahy** “Achieving diesel-like efficiency in a high stroke-to-bore ratio DISI engine under stoichiometric operation”, SAE World Congress 2020.

**F. D.F. Chuahy**, D. Splitter, V. Boronat, S. Wagnon, “Pressure-temperature effects on knock with iso-octane and propane at various compression ratios and intake temperatures”, Central States Combustion Institute Meeting, June 2020

**2018 F. D.F. Chuahy**, S.L. Kokjohn, “System and second law analysis of the effects of reformed fuel composition on “single” fuel RCCI combustion”, SAE World Congress 2018.

 **F .D.F. Chuahy**, J. Olk, S.L Kokjohn, “Reformed fuel substitution for transient peak soot reduction”, SAE World Congress 2018.

**F. D.F. Chuahy**, Tyler Strickland, N.R Walker, S.L. Kokjohn, “Effects of reformed fuel composition in DPI combustion particulate morphology”, Central States Combustion Institute Meeting, Minneapolis, MN, May 2018.

**2017** **F. D.F. Chuahy**, S.L. Kokjohn, “Single fuel RCCI combustion using reformed fuel”, Proceedings of the 10th U.S. National Combustion Meeting, Washington D.C, MD, April 2017

**2015** **F. D.F. Chuahy**, F., Ra, Y., Kokjohn, S.,"Effects of the direct-injected fuel physical properties under Early and Late Reactivity Controlled Compression Ignition Combustion”, ILASS Americas, North Carolina, May 2015

 **F. D.F. Chuahy**, F., Ra, Y., Kokjohn, S.,"Effects of the direct-injected fuel physical properties under Early and Late Reactivity Controlled Compression Ignition Combustion”, 25th International Multidimensional Engine Modeling User's Group Meeting, Detroit, MI, April 2015

 Walker, N. R., **Chuahy, F.,** and Reitz, R. D., "Comparison of Diesel Pilot Ignition (DPI) and Reactivity Controlled Compression Ignition (RCCI) in a Heavy-Duty Engine", ASME Internal Combustion Engine Division Fall Technical Conference, Houston, Texas, November 2015, ICEF2015-1128

**Invited Presentations**

Participated in an invited panel at the 2018 ComVec on the topic of disruptive IC engine technologies. September 12th, 2018.

**Patents**

 “Engines using Supercritical Syngas”, US 2019/0323459 Al, issued in 2020.

 “Ducted Combustion Shield”, provisional patent application filed in 2019.

 “Hybrid fluid power/ waste heat recovery system for transportation application”, provisional patent application filed in 2020.

**Professional Services**

**2014-Present** Peer-review for Society of Automotive Engineers, International Journal of Engine Research, American Society of Mechanical Engineers and International Journal of Hydrogen Energy.

**2019-Present** Member of SAE combustion committee and session organizer.

**Software Skills**

 **Operating Systems:** Windows, Unix/Linux.

 **Computer Languages:** FORTRAN, Matlab, Python.

 **Scientific Applications:** Matlab, KIVA, StarCCM+, FLUENT, Converge, EES, Cantera, GT-Power, Labview, ChemkinPRO, Sculptor, Ensight, ModeFRONTIER.

 **CAD:** Solidworks, NX, SpaceClaim.

**Languages** Portuguese: Native English: Fluent Spanish: Intermediary