Transforming zero-carbon engines: insights from the use of hydrogen peroxide in hydrogen/ammonia combustion

Link: Zoom Meeting
Prof. Stathis Tingas

Stathis Tingas, a chartered engineer and a Fellow of the Higher Education Academy, earned his PhD in Mechanics from the National University of Athens, Greece, in 2016. He worked for over 10 years in the Greek Air Force as a military jet engine engineer officer before relocating to KAUST in 2016 for a postdoctoral position in Professor Hong Im’s group. In 2019, he transitioned to the UK after securing a faculty position as a Lecturer in Engineering and Aviation at Perth College. Since 2020, he has been a Lecturer at Edinburgh Napier University. His research portfolio includes combustion, computational biology, and mathematical epidemiology. In combustion, his interest is in high-fidelity numerical simulations, combustion engine modelling and simulation, asymptotic analysis of combustion phenomena, and model reduction.

Abstract

Aqueous hydrogen peroxide is a widely manufactured and distributed chemical compound. In its pure form, it exhibits high reactivity, making high-concentration solutions of peroxide (often termed high test peroxide) historically used as rocket propellants. However, its potential use in conventional engines, particularly with fuels like ammonia and hydrogen—currently considered candidates for decarbonizing heavy-duty engines, specifically in compression-ignition mode—remains inadequately explored. This seminar explores the addition of hydrogen peroxide to enhance combustion efficiency and reduce emissions in various simplified combustion and engine models. The discussion includes computational findings from simplified combustion models, theoretical simulations on engine performance, and detailed analyses of dual-fuel engine behavior with hydrogen peroxide injection. This comprehensive approach underscores the complexity and potential of hydrogen peroxide in advancing combustion technology towards cleaner and more efficient operations, particularly in heavy-duty applications.
Belgian Section of the Combustion Institute.

Hosted by:

• Prof. Salvatore Iavarone (salvatore.iavarone@centralesupelec.fr)
• Prof. Alessandro Parente (alessandro.parente@ulb.be)
• Prof. Ward De Paepe (ward.depaep@umons.ac.be).

Any questions may be directed to Prof. Salvatore Iavarone.