



Kian Golbaghi

Date of birth: 30/08/1996 | **Phone number:** (+358) 0294498425 (Work) | **Email address:**

Kian.golbaghi@uwasa.fi

EDUCATION AND TRAINING

01/09/2025 – CURRENT Vaasa, Finland
DOCTOR OF SCIENCE IN ENERGY TECHNOLOGY University of Vaasa

As emphasized by several global and national programs, there is an urgent need to transition to clean energy, particularly in the transportation sector. Despite significant advancements in electric and fuel cell technologies, combustion engines remain essential for certain applications, including marine and off-road industries, necessitating the development of flexible, multi-fuel engine solutions to mitigate environmental impact and ensure fuel security.

The contemporary research roadmap primarily focuses on the new, ultra-efficient Reactivity-Controlled Compression Ignition (RCCI) combustion concept. This work focuses on resolving some of the final but critical issues of the concept, which, when resolved, will pave the way for flexible adoption of green hydrogen or ammonia into existing biogas streams. The research problem lies on both the methodological and phenomenological sides. In the first context, the work aims to tackle the immense calibration problem of multi-fuel operation by developing fast predictive simulation methods. Powered by advanced 0D/1D simulation techniques, the primary objectives include developing a predictive zonal model with minimized tuning parameters and advanced physics-based features to cover a wide range of combustion phenomena.

Particular attention will be paid to identifying the H₂-blended RCCI regimes affected by oil films and hot-source pre-ignition, as well as any possible links to knock or other abnormal combustion. To help comprehend the limitations in H₂-based multi-fuel engines and identify potential pre-ignition scenarios, a combination of reduced-order techniques will be applied. By gaining a better understanding of pre-ignition phenomena, we will eventually be able to develop more reliable system-level models, thereby deepening our understanding of clean multi-fuel solutions.

The research involves validating and optimizing multi-fuel solutions through experimental data evaluation and investigating various fuel blends (particularly carbon-free fuels such as hydrogen and ammonia) to optimize performance, emissions, and fuel costs across different applications. Ultimately, this research seeks to establish a versatile and robust system-level simulation framework based on the multi-zone model (MZM), contributing to the engine industry and combustion simulation field.

Thesis Optimizing Multi-Fuel RCCI Solutions for Sustainable Clean Marine Propulsion

PUBLICATIONS

2026
[From case-specific to general tuning: A structured, system-level framework for scalable RCCI simulation](#)

Authors: Kian Golbaghi, Hamidreza Maleki Almani, Alireza Kakoei, Ben Smulter, Jari Hyvönen, Amin Andwari, Maciej Mikulski | **Journal Name:** Energy Conversion and Management | **Volume, Issue and Pages:** Volume 361, 2026, 121622