

PhD position at the University of Orléans

in Mechanical engineering (Fluid mechanics and Energetics)

Experimental Analysis of Highly Diluted Hydrogen Combustion. Application to Heavy Mobility

Europe has outlined its plan to pursue its ecological transition, known as the "Green Deal," through the implementation of a series of political initiatives. Several technologies support this transition: electric propulsion powered by batteries or fuel cells, and internal combustion engines running on hydrogen.

The industrial chair DELHYCE ("DEsign of Low emission and efficient Hydrogen Internal Combustion Engines"), led by the PRISME laboratory, Stellantis, and Renault Trucks, aims to develop a scientific methodology for designing internal combustion engines that use hydrogen. This methodology involves small-displacement diesel engines for commercial vehicles and larger-displacement engines for trucks. The goal is to optimize the efficiency of internal combustion engines while minimizing NOx emissions and controlling the abnormal combustion characteristics often found in these engines.

The objective of the thesis is to understand the physico-chemical mechanisms of premixed combustion in a medium-duty research engine with spark ignition and indirect injection. This approach involves both experimentation and 0D/1D simulation. The detailed analysis will propose internal combustion engine concepts that run on hydrogen to optimize efficiency and reduce pollutant emissions. Additionally, it will develop a model framework to understand combustion behavior, which will be integrated into onboard control systems.

To achieve this, the doctoral candidate will need to acquire knowledge in hydrogen combustion, propose and implement experimental test protocols, and become familiar with 0D/1D simulation and physicochemical modeling tools. The unique nature of the topic will allow the selected candidate to interact with experts at Renault Trucks and other doctoral students from the DELHYCE industrial chair, gaining strong skills in physicochemistry and turbulent combustion in air-hydrogen mixtures.

Keywords: Hydrogen; Green combustion; Spark Ignition engine

Academic supervisor	Pr. Fabrice FOUCHER, PRISME Laboratory, Université d'Orléans, France, fabrice.foucher@univ-orleans.fr https://www.univ-orleans.fr/fr/prisme/les-projets/en-cours/moteurs-combustion-interne-hydrogene
Doctoral School	École Doctorale EMSTU ED552 (Université d'Orléans)
Renault Trucks supervisor	Jean-Marc Neveu, jean-marc.neveu@volvo.com
PhD location	PRISME Laboratory , Université d'Orléans, France
Duration and start date	3 years, starting in fourth quarter 2024
Employer	Université d'Orléans
Language requirements	Fluency in French or English
Profile	Engineering degree or Master's degree in energy, fluid mechanics, propulsion.

To apply, please send your cover letter and CV to the supervisors indicated here above.