Post-Doc Young Researcher Position: experimental study of turbulent-combustion interaction for premixed flames of various NH3/H2/CH4/air blends

The European H2020 **FLEXnCONFU** project **(22 partners, https://cordis.europa.eu/project/id/884157/fr)** aims to demonstrate the **conversion of electricity** surplus into **alternative fuels** such as ammonia and hydrogen via a **P2X system** able to increase the **flexibility of fossil fuel power plant** reducing at the same time their **environmental impact.**

FLEXnCONFU in a nutshell

- FLEXnCONFU develops a novel P2X2P solutions to be integrated with power plants to enhance CC flexibility
- FLEXnCONFU overtakes the use of natural gas (NG) in combined cycle with the combustion of non-conventional fuels (H2/NH3) reducing CC environmental impact
- FLEXnCONFU enhance energy storage integration to load levelling power generation increasing its efficiency
- FLEXnCONFU exploits real data from pilot site and demo site to demonstrate its contribution to a smart, affordable and resilient power system where enhance the introduction of intermittent renewable energy.

One Work-package, leaded by Cardiff University (WP2) is dedicated to combustion system compatibility with non-conventional fuels with one part focused on CFD-DNS/LES studies. But the turbulent-combustion interaction for NH3/air, NH3/CH4/air, CH4/H2/air mixtures is absolutely not well known and few data are currently available [1-3].

PRISME Laboratory (https://www.univ-orleans.fr/fr/prisme) is in charge of the fundamental combustion study in order to provide reliable data for CFD development and guidelines for the combustion chamber design of the next gas turbine generation.

Therefore, the objective is to provide accurate experimental database to help the modelling development and to study the fundamental of combustion using various NH3, H2 and CH4 blends. These tests will be conducted in a spherical combustion chamber with isotropic and homogeneous turbulence at different initial thermodynamics conditions, i.e. temperature and pressure. In a first part several optical diagnostics will be implemented and evaluated in order to deeply study flame propagation and flame/turbulence interactions such as: PIV, Mie-Scattering tomography, OH* PLIF, etc. Then, the database will be done and discussed with the others partners of fundamental combustion tasks, and especially Technical University of Eindhoven, who is in charge of the modelling tool and Cardiff University, who is in charge of the semi-industrial experimental tests.

Profile

Ph.D. in mechanical engineering

Skills:

- Experience of designing and implementing experimental methods, with fundamental knowledge in fluid mechanics, premixed combustion, turbulence
- strong experience with optical diagnostics
- oral and written communication to report to the several partners and for congress and scientific journal.

Conditions

Start October 2020

Duration: 18 months

Location: Orléans France, Laboratoire PRISME (https://www.univ-orleans.fr/fr/prisme)

Gross salary between 2800€ and 3500€ depending on the applicant's experience

Contact

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References

1) T. Honzawa, R. Kai, A. Okada, A. Valera-Medina, P. J. Bowen, R. Kurose, Predictions of NO and CO emissions in ammonia/methane/air combustion by LES using a non-adiabatic flamelet generated manifold, Energy, Volume 186, 2019, https://doi.org/10.1016/j.energy.2019.07.101.
2) Y. Xia, G. Hashimoto, K. Hadi, N. Hashimoto, A. Hayakawa, H. Kobayashi, O. Fujita, Turbulent burning velocity of ammonia/oxygen/nitrogen premixed flame in O2-enriched air condition, Fuel, Volume 268, 2020, https://doi.org/10.1016/j.fuel.2020.117383.
3) C. Lhuillier, P. Brequigny, F. Contino, C. Rousselle, Experimental investigation on ammonia combustion behavior in a spark-ignition engine by means of laminar and turbulent expanding flames, to appear, Proceedings of the Combustion Institute 2020