

JOB OFFER – STAGE

Analysis and simulation of hydrogen-oxygen and propane-oxygen combustion for the decarbonization of high-temperature systems

OFFER INFORMATION

Reference: EetS-2025-TP-1

Location: 42 Avenue Gaspard Coriolis – 31057 Toulouse

Team: E&S

Supervisors:

- Dr Thierry POINSOT
- Dr Laurent GICQUEL

Gratification: 700€ net per month - M2 level or last year at engineering school

Period: 6 months - from: 06/01/2025

Key words: Decarbonization Hydrogen Oxygen Simulations

CERFACS

Cerfacs is a private research, development, transfer and training center for modeling, simulation and high-performance computing. Cerfacs designs, develops and proposes innovative software methods and solutions to meet the needs of its partners in the aeronautics, space, climate, environment and energy sectors. Cerfacs trains students, researchers and engineers in simulation and high-performance computing.

Cerfacs works closely with its seven partners: [Airbus](#), [Cnes](#), [EDF](#), [Météo France](#), [Onera](#), [Safran](#) et [TotalEnergies](#).



HOSTING TEAM - E&S

The Energy & Safety team, formerly the CFD-Combustion team, focuses on cross-disciplinary activities aimed at developing, optimizing and deploying scientific codes dedicated to advanced combustion calculations in industrial geometries. The team focuses on the simulation of flows, applying them to aircraft, rockets, helicopters, car engines, turbines and more. The result is essential tools for a wide range of applications, with the leitmotiv: let's calculate systems before we build them. More specifically, team members develop models and tools covering chemical reduction, turbulence, combustion, two-phase systems, combustion instabilities, etc., to meet both academic and industrial challenges. Thanks to its position, the team collaborates with numerous scientific groups, design offices of Cerfacs associates, and other Cerfacs teams.

CONTEXT

One of the first areas where hydrogen will be deployed massively to reduce our CO2 emissions is heavy industry where the need to reach very high temperatures (>2500 K) requires flames that are currently obtained by burning fossil hydrocarbons with pure oxygen. In these areas, current fuels (CH4, CH3H8) will be replaced by hydrogen. Several applications of this type exist at Saint Gobain, which collaborates with CERFACS on the simulation of these systems.

MISSION



For this internship we will study the transition from C₃H₈ to H₂ on flames stabilized in oxycombustion. The simulation will allow to study the flame attachment, its length, the induced velocity field.

The internship will be essentially theoretical and numerical, at CERFACS in Toulouse but will also use experimental results obtained at the Saint Gobain research center for C₃H₈/O₂ flames.

The intern will use simulation codes for combustion, developed in the aeronautical field, in particular the AVBP code (cerfacs.fr/avbp7x/) which is the world reference in the field.

AVBP will be used to simulate C₃H₈/O₂ then H₂/O₂ combustion in the Saint Gobain configuration to study:

- Stationary combustion for established flames, flame-wall interactions, pollutant emissions
- Ignition or extinction sequences, flashback

The intern will use and participate in the development of AVBP for H₂/O₂ combustion in line with Saint Gobain's needs. The candidate will learn high-performance CFD simulation, combustion, decarbonization and hydrogen specificities. He will be based mainly in Toulouse, at CERFACS on the Météo France campus and will be integrated into the CERFACS CFD team with more than 40 other PhD students working as a team in a group that is the first in the world on the simulation of hydrogen-air flames.

DESIRED PROFILE

- Master 2 or Engineering school final year
- Expertise in CFD and if possible in combustion

WHAT WE OFFER AT CERFACS

- Broad access to technology, a rich interpersonal environment, in-house skills recognized nationally and internationally.
- An inclusive and equitable work environment.
- A structure accessible to people with disabilities.
- Possibility of benefiting from 1.83 days of reduced working hours per month, linked to your choice of a 39-hour rather than 35-hour working week.
- 50% reimbursement of public transport costs.

HOW TO APPLY ?

To apply, please send your CV and covering letter to poinsot@cerfacs.fr , applications are open until 30/12/2024.

See you soon at CERFACS!