Computational Fluid Dynamic engineer position – Electrification of industrial furnaces

The industry relies heavily on combustion to fulfil its energy needs. However, the transition toward a carbon-free economy implies a paradigm change in the industry. This will lead to abrupt changes in the production process. A consortium of Belgian industrials – John Cockerill, MITIS, CRM, AGC, Aperam, GPAI – launched an ambitious research project focusing on:

- The use of electrical boosting in their furnaces to transition to the use of green electricity for temperatures below 700 °C
- The replacement of natural gas with green hydrogen produced through electrolysis for higher temperatures.

The project aims at building four industrial demonstrators, a glass furnace (AGC), a slab furnace (John Cockerill, Aperam), a rotary hearth furnace (CRM, John Cockerill) and micro gas turbines (MITIS). They will be equipped with electrical boosting and hydrogen/natural gas burners.

Historically, the process in those industries was optimised by experimental trial and error. The rapid transition they will have to cope with requires re-thinking the design methods, which is also the aim of this project.

In this context the ATM department of the Université Libre de Bruxelles (ULB) will:

- Be responsible for numerical simulations of the hybrid electric/combustion furnaces prototypes. This will require developing models accounting for turbulence/chemistry/radiation interactions.
- Develop a digital twin of those hybrid furnaces. In the past decade, the ATM department of the ULB has pioneered the application of data-driven techniques for reactive flow and semi-industrial furnaces. This expertise will be leveraged to build digital twins of those hybrid furnaces to ensure low pollutants emissions and high product quality using green energy.

This work will accelerate the transition toward a 4.0 industry.

The candidate will focus on numerical simulation of the furnace prototype and optimise the design by analysing the results. A strong collaboration between the candidate and the industrial will be critical to the project's success. He will also participate in the construction of the digital twins.

We seek candidates with a background in the following field:

Numerical combustion, Numerical simulation, Data-driven methods, Numerical simulation of radiation.

The position is readily available. The choice will be based on the candidates' profiles.

Job description

The candidate will focus on numerical simulation of the electrical boosting part of the slab and a rotary hearth furnace. He will interact with the industrial partners to define an optimised design. Multiphysics simulations will be developed to account for both electric/combustion operations.

The initial contract is two years long with a possible extension.

Requirements

- MSc in Engineering, Chemistry, Physics and Applied Mathematics, with a focus on either fluid mechanics, combustion modelling or radiation.
- A qualification equivalent to a first-class honours degree is preferred.
- Experience in numerical methods, excellent computational skills, experience with C++ programming, and interest in CFD.
- Experience with Ansys Fluent is a plus.
- The English language is mandatory.

Selection process

The selection process is based on two steps:

- Evaluation of the documents provided by the Applicant
- Interview of candidates meeting the eligibility requisites (evaluated through the first step). The interviews will be organised remotely via Skype or Teams.

List of Documents to be provided:

- Letter of motivation (approx. 1 page)
- Copies of degree and academic transcripts (with grades and rankings)
- Summary of master's thesis (approx. 1 page)
- Short CV including a publication list (if any)
- Two reference letters from academics.
- Proof of English language skills
- Passport copy

Send your application package to:

Axel.Coussement@ulb.be, Alessandro.Parente@ulb.be

PhD in data-driven modelling of industrial furnaces to drive transition in energy-intensive industries

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This work will accelerate the transition toward a 4.0 industry.

The candidate will focus on developing a digital twin of either the electrical boosting or combustion of green hydrogen of the furnaces. The model will be built combining numerical simulation results and experimental measurements. The goal is to develop a predictive digital twin that could be used in a control loop or for optimisation purposes.

We seek candidates with a background in the following field:

Data-driven methods, Numerical simulations, Applied mathematics.

The position is readily available. The choice will be based on the candidates' profiles.

Job description

The candidate's objective will focus on developing digital twins of the furnaces, relying both on numerical simulations and experimental measurement as input. The candidate will focus on one of the applications (to be decided), interact with industrials and choose the most suited methods. The model will then have to be integrated into the industrial prototype.

The contract is for four years.

Requirements

- MSc in Engineering, Chemistry, Physics and Applied Mathematics, with a focus on either fluid mechanics, combustion modelling or radiation.
- A qualification equivalent to a first-class honours degree is preferred.
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