Postdoctoral

Ecole/Institution/Société:
University de Sao Paulo, **Brazil / Sao Paulo**

Discipline:
Mechanical Engineering

Type d'emploi::
Full-time

Date de publication:
2022-04-18

Personne à contacter:
If you wish to apply for this position, please specify that you saw it on AKATECH.tech

Post-doctoral Topology optimization method for turbulent flow

Job Title: Post-doctoral Topology optimization method for turbulent flow - REF 22PDR159

Department: Mechatronics and Mechanical Systems Engineering

Institution: University de São Paulo, Sao Paulo,Brazil

Job Categories

- Post-Doc
- Academic Fields
- Mechatronics
- Mechanical Engineering
- Engineering Mechanics
- Engineering - Other

Project title:

- Topology optimization method for turbulent flow with application to helical-type labyrinth seals

Research theme area:

- Design of smart labyrinth seals to reduce GHG emissions in pneumatic machines (compressors and turbines)

Abstract:

The candidate will collaborate with researchers from the project "Design of smart labyrinth seals to reduce GHG emissions in pneumatic machines (compressors and turbines)" of the FAPESP-Shell Research Centre for Gas Innovation of Poli-USP at the University of São Paulo. Summary of the program and projects can be found at the RCGI website (http://www.rcgi.poli.usp.br/). One important source of GHG (Greenhouse gases) emission is turbomachine leakage, which is directly related to sealing. In particular, labyrinth seals are noncontact seals that are widely used in the industry, which mostly feature a passive operation.

However, the helical-type labyrinth seal pumps the leakage flow back to the inside of the turbomachine, meaning that it may lead to zero leakage, which is not possible without such active motion. Most works on labyrinth seals are centered around experimental analysis and simulations, but there are also works on parametric and shape optimizations.

More recently, the topology optimization method, which is the most flexible and generic optimization approach, started being investigated for labyrinth seals.

However, helical-type labyrinth seals have still not been considered, and require the development of new topology optimization formulations. The proposed research in fluid topology optimization encompasses some current challenges, such as higher rotating motions and turbulent flow. The numerical implementation will be performed in open source softwares, namely FEniCS/dolfin-adjoint for the adjoint model and optimization framework, OpenFOAM® for the simulation, and "FEniCS TopOpt Foam" for coupling both softwares.

Description:

The applicant will contribute in line with the main objectives of the project:

- Develop a topology optimization formulation for incompressible turbulent flows featuring high rotational motions;
- Develop a topology optimization methodology for designing helical-type labyrinth seals, aiming to minimize leakage or to achieve zero leakage;
- Apply the devised topology optimization formulation to design helical-type labyrinth seals for operation with methane or carbon dioxide.

Requirements to fill the position:

This project would be well-suited to a highly motivated candidate requiring programming skills in Python/C++, experience with HPC, experience with softwares FEniCS and OpenFOAM, proficiency in English, and experience in computational mechanics, finite element/volume methods, topology optimization, and analysis of algorithms.

- The postdoc candidate should be a PhD level specialist in Engineering, with the aforementioned capabilities.

INFORMATION ABOUT FELLOWSHIP:

This Postdoc fellowship is funded by FAPESP. The fellowship will cover a standard maintenance stipend of R$ 7.373,10 per month.

MORE INFORMATION:

https://www.rcgi.poli.usp.br/opportunities/

Position: Post-Doctoral Fellowship REF: 22PDR159

https://www.rcgi.poli.usp.br/opportunities-aplication/ AND APPLICATION AT REF 22PDR159 – Post-Doctoral Fellowship

Personne à contacter:
If you wish to apply for this position, please specify that you saw it on AKATECH.tech