PhD position in a French- German joint supervision
«TideMorpher - Tidal Turbine Technologies with Morphing Blades»

Project Summary:

Tidal energy, resilient to climate and weather changes, is a key resource for sustainable energy infrastructure. Hydrokinetic cross-flow tidal turbines (CFTT) offer high power density and low ecological impact but face challenges like alternating loads and low efficiency. The TideMorpher project aims to address these issues by developing morphing blade technologies using both passive and active mechanisms.

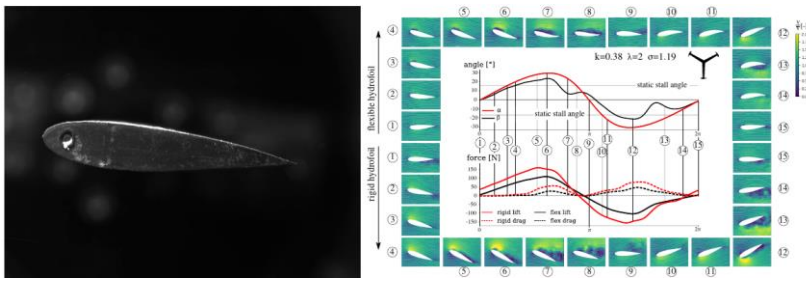

Figure 1: (Left) The hyper flexible rotor blade at the hydrodynamic tunnel at Grenoble allows to improve the performance and endurance of CFTT (right) Full characterisation of the FSI on blade level for a CFTT with span-wise hyper-flexible rotor blades using surface tracking, high-speed Particle-Image-Velocimetry and synchronised force measurements

An interdisciplinary team from Grenoble (France) and Magdeburg (Germany) is conducting experimental and numerical research to optimize blade morphing trajectories using surrogate models, evolutionary algorithms, and automated experiments. These studies, including high-speed optical measurements and CFD/FSI simulations, seek to improve flow control and efficiency rising methods with a broad application on turbomachinery and aero- and hydrodynamics. The project integrates advanced sensors, piezo-based actuators, and builds on past biomimetic robotics, optimization and turbomachinery research.

Your contribution:

You will conduct advanced experimental studies using coupled strain gauge, acceleration and non-invasive measurement techniques to characterise fluid-structure interactions on a CFTT at blade level (Fig.1). In addition, you will perform complementary numerical simulations using the open-source multiphysics toolbox OpenFOAM (Fig.2 (left)). An application of the technology to the existing laboratory model in Magdeburg (Fig.2 (right)) will validate the results.

You will be integrated into the Laboratory of Geophysical and Industrial Flows in Grenoble and the Institute of Fluid Dynamics and Thermodynamics in Magdeburg and will spend extended periods at both universities.

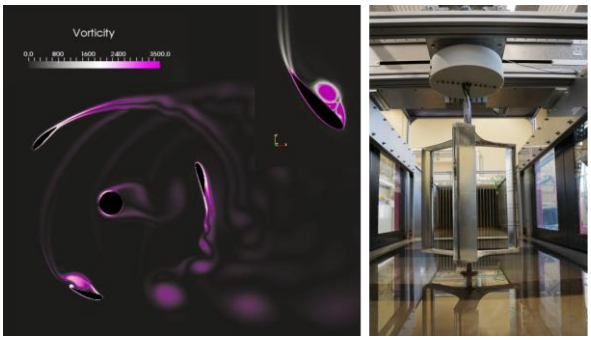

Figure 2: (left) Numerical simulations of a CFTT using OpenFOAM (right) lab scaled flume model of a CFTT in Magdeburg

You will be assigned to both universities. In the first phase, you will be employed at the University of Grenoble-Alpes for 18 months, which will be financed by TEC21 and in a second phase for 18 months at Otto-von-Guericke Universität Magdeburg with a contract as a research assistant or a scholarship, which is to be defined.

Affiliation:

You will be affiliated with both universities and spend at least 30% of your doctoral studies at each university. Joint supervision by both institutions ensures high-quality work, allowing you to benefit from the expertise of both institutes and earn a joint doctoral degree from both universities. You will be part of the energy team at the Laboratory of Geophysical and Industrial Flows (LEGI) in Grenoble (www.legi.grenoble-inp.fr) and the Laboratory of Fluid Dynamics and Technical Flows (LSS) at the Institute of Fluid Dynamics and Thermodynamics in Magdeburg (www.lss.ovgu.de). You will work under the supervision of Dr. S. Hoerner, Dr. P.-L. Delafin at the University Grenoble-Alpes and Prof. D. Thévenin and Dr. S. Abbaszadeh at Otto-von-Guericke Universität Magdeburg.

Your technical skills:

- very good knowledge in fluid and solid mechanics (mandatory)
- either good knowledge in experimental methods e.g., particle-image velocimetry, strain gauge measurements with basic knowledge in numerics (preferred)
- or good knowledge in computational fluid mechanics e.g., OpenFOAM (PreCiCe) or Fluent with at least basic knowledge in experimental techniques (possible)
- programming skills in Python, skills in C++ are an advantage
- knowledge and experience in computational solid mechanics e.g., Calculix or Ansys Mechanical is an asset
- knowledge in electronics and control are appreciated

Personal skills:

- very good English skills (mandatory)
- strong analytical skills
- motivation to work in a multicultural environment with multiple long time stays at both universities
- German and/or French language skills are an asset
- existing intercultural experience is a plus

Previous formation, diplomas:

An academic graduation at Master level or Engineering Diploma (Bac+5) in Mechanics, Energy or comparable

General information

Start of the PhD: 1/10/2025
Duration: 3 Years
Application due until: 15/6/2025

Contact for the questions related to the position:

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