

## EXPERIMENTAL INVESTIGATION OF THE INFLUENCE OF THE BLOCKADE RATIO ON THE CHARACTERISTIC CURVES OF CROSS-FLOW TIDAL TURBINES

Master Thesis (LSS-MXX/XX) at the *Lehrstuhl für Strömungsmechanik und Strömungstechnik, OvGU*

The Turbomachinery Group of the Chair of Fluid Dynamics and Technical Flows collaborates in terms of the OPTIDE Project with the Chair of Electrical Drive Systems at OvGU, the Laboratory of Steel and Lightweight Design at the Hochschule Magdeburg-Stendal and the Laboratory of Ecological and Industrial Flows (LEGI) in Grenoble. This interdisciplinary research team aims for the development and optimization of a cross-flow tidal turbine with continuously pitched blades.

In previous work conducted in the OPTIDE project a cross-flow tidal turbine flume model has been developed. Unfortunately, the turbine characteristics are altered by confined flows, such as those in a flume, as they do not allow a free stream on the turbine.

The aim of this work is to quantify the influence of the flume on the turbine and to predict the characteristic curves of tidal turbines in open water from experiments carried out in the flume. Therefore, the blockage ratio (ratio between turbines and flume cross-section) is to be varied.



The work to be conducted comprises the following steps:

- Understanding the physics and the state-of-the-art in cross-flow tidal turbine research with focus on experiments
- Understanding the influence of various parameters (e.g. Blockade ratio, Froude number and Reynolds number) on cross flow tidal turbines
- Understanding the experimental turbine flume model and the related experimental setup in the water channel
- Design and manufacturing of two scaled Versions of the experimental turbine via additive manufacturing (3D-Printing)
- Measurements of the characteristic curves (performance curve) of the turbines under different operating conditions
- Post-processing and analysis of the results

Aim of the work is to measure, post-process and analyse the characteristic curves of at least 3 differently scaled versions of the experimental Turbine and to calculate the influence of the blockage ratio.

### Supervisors:

- M.Sc. Timo Bennecke, LSS (timo.bennecke@ovgu.de)
- M.Sc. Karla Ruiz-Hussmann, LSS
- Dr-Ing. Stefan Hoerner, LEGI

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