# CFD optimization of vortices in a hyperbolic funnel and an impeller system

## Background

Both a hyperbolic vortex and an underwater impeller can be used to dissolve gasses into water very efficiently. An impeller creates a hyperbolic vortex through which the gas phase is sucked into the water where it partly dissolves, thereby increasing the oxygen content (see Fig. 1). In case of an hyperbolic funnel the vortex is created by the system's geometry.

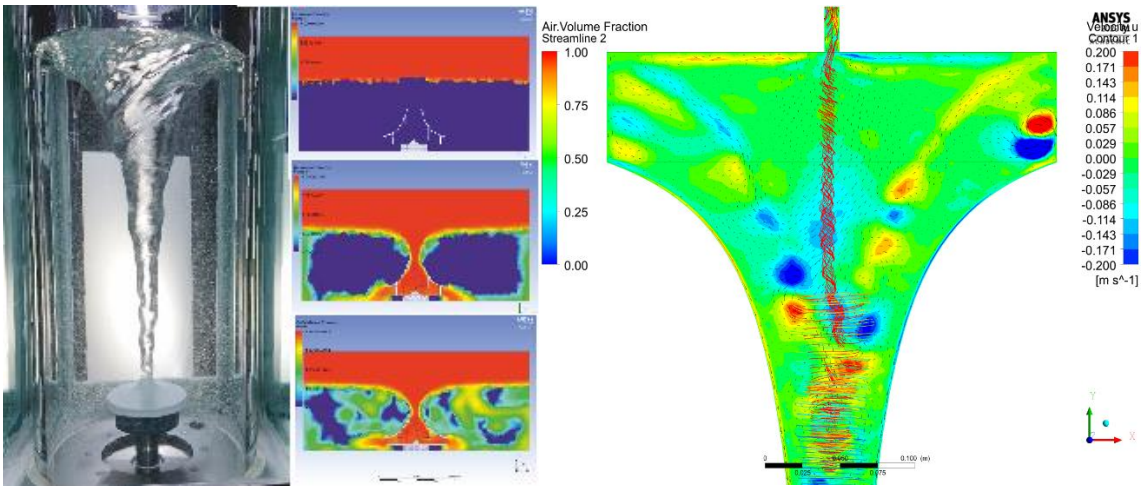


**Fig.1:** Impeller creating a vortex (left); impeller CFD simulation (middle) and funnel CFD simulation (right)

Preliminary results have shown both systems can be properly simulated using the state-of-the-art CFD software ANSYS (see Fig. 1, right). The goal of this internship is an optimization of both (existing and working) models to include and optimize gas solubility, different reservoir sizes, depths, velocity of the impeller in order to simulate in which configuration the impeller could be used most efficiently. These results will be compared to measurement results obtained from practical tests of the devices provided by other participants of the Wetsus' Applied Water Physics research theme.

## Requirements

The ideal candidate has had previous experience with CFD, especially the FLUENT module of ANSYS, and some theoretical knowledge in this field. Taking initiative and good communication are important. A good lap-top or desktop computer with fast internet access to serve as terminal for the simulation server is required.
Starting date: ASAP
Duration: At least 3 months; can eventually be extended to a master thesis (6 months)

## Research institute

This project is a cooperation of the Fluid dynamics of energy systems team at TU Delft and Wetsus, Centre of Excellence for Sustainable Water Technology, located in Leeuwarden. The institute employs people from very different fields and backgrounds and combines this knowledge for the best results. This project is part of the Wetsus Applied Water Physics theme. Wetsus has an international environment where the working language is English, so fluency in this language is required. Dependent on the further development of the corona pandemic, we will attempt to allow the candidate to work from home via remote login as much as possible. The researcher will be supervised by Dr. Elmar C. Fuchs (Wetsus) and Prof. Dr. René Pecnik (TU Delft).

## Application

If you are interested in this project, please contact Dr. Elmar C. Fuchs at Wetsus (elmar.fuchs@wetsus.nl) or Prof. Dr. Rene Pecnik at Delft University of Technology, r.pecnik@tudelft.nl for more information or directly apply by sending your CV to the same address. If In absence of an Erasmus grant the internship/MSc thesis includes a reimbursement of €175.- per month for living expenses.