

MASTER'S THESIS WORK – Simplified 2D CFD model for flow between plates of small distance

COMPANY BACKGROUND

FS Dynamics is an independent consulting engineering company group specialized in advanced simulations and analysis of fluid- and structural dynamics. The company employs more than 100 consultants in Sweden. All consultants in FS Dynamics are holders of a master's degree and about 25% hold a Ph.D. exam.

THESIS OBJECTIVES

Simulations with huge differences of length scales in different directions are computationally expensive due to the high mesh count and in consequence long simulation times. If we consider a model which includes the flow between two flat plates of size $l \times l$ with small distance h , where $h \ll l$, it would be desirable to simulate the flow between the plates with a simplified 2D model with only one cell in z-direction instead of a 3D model to save mesh count in this direction. Two different cases can be considered: planar Poiseuille flow (plates are not moving, flow is driven by pressure gradient) and Couette flow (one plate is moving parallel to the non-moving plate, flow is driven by shear from the plates).

The goal of this project is to:

- Develop a simplified 2D model with one cell in the z-direction
- Validate the model against 3D simulations (and experiments if possible)
- Quantify the savings in mesh count and CPU time
- Quantify the limitations of the simplified 2D model w.r.t. geometry, type of fluid, compressibility, time-dependence of flow, flow regime

The project includes the following steps:

- Literature study of similar models
- Model development of simplified 2D model and implementation in StarCCM+
- Simulations in StarCCM+ (model validation and quantification)
- Report

STUDENT PROFILE

We are searching for students interested in writing their master thesis within the field of CFD, for instance students from solid and mechanics, structural or civil engineering. Prior knowledge of Ansys Fluent or StarCCM+ is of advantage.

APPLICATION

Send your application to:

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