

Master Thesis

LES of turbulent mixed convection to a liquid metal flowing in a concentric annulus

Description

A heat exchanger geometry frequently used is the rod/pipe bundle, where the flow between the rods can be approximated to an annular pipe flow. Therefore, this geometry can be used to study the basic fluid flow and heat transfer characteristic of the more complicated one. Furthermore, because of the presence of two walls with different curvature, the fluid flow and heat transfer features differ substantially from those of a pipe or channel flow.

In this thesis the candidate will perform a CFD analysis using Large Eddy Simulation (LES) for both turbulent forced and mixed convection to a liquid metal flowing upwards in a heated concentric annular pipe. Due to their very low Prandtl number, liquid metals have a different heat transfer mechanisms compared with ordinary gases and liquids. The resulting different velocity and temperature scales allow performing a LES for the flow field while with the same grid a DNS for the temperature field. The results should form a database for the validation of RANS models.

Tasks

- LES simulations at different Reynolds numbers with OpenFOAM
- Detailed post-processing
- Evaluation and interpretation of the obtained results

Start date

As soon as possible but anyway before the 15.03.2017.

Duration

6 months.

Annotations

The thesis will be held at the Institute of Nuclear and Energy Technologies in Campus North.

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