Institute for Fusion and Reactor Technology
Division Innovative Nuclear Systems
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Simulation of turbulent flow in rod bundle

Bachelor Thesis / Master Thesis

Task description

The fuel element geometry most frequently used in nuclear reactors is the rod bundle. Most nuclear fuel rods are arranged into arrays in either square or triangular pitched patterns with coolant flowing axially through the subchannels formed between the rods. The mixing of cooling fluid in a rod bundle through the gaps between the rods reduces the temperature differences in the coolant as well as along the perimeter of the rods. The prediction of the temperature distribution in the coolant and along the rod perimeter is of major importance in nuclear reactor safety and design.

In this project, the candidate will be responsible for further developing and validating of existing Computational Fluid Dynamics (CFD) solver. The solver is implemented in the open source CFD toolbox OpenFOAM. RANS simulation of turbulent flow in a bare rod bundle will be performed, and a new concept about the flowstructure that enhances heat transport between subchannels will be proposed. Possibility to attend international workshops organized within THINS Project is given (costs will be covered by the project funds). Language of the project is english. Intensive OpenFOAM course will be provided.

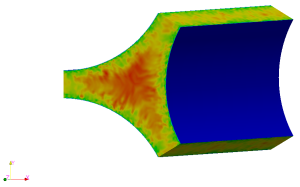

Abbildung 1: Instantaneous velocity field

Prerequisites

- Background in fluid dynamics
- Familiar with C++
- Interest in modeling and CFD

Start date

after consultation

Duration

6 months (depending of the scope of work)

Person in charge and contact

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