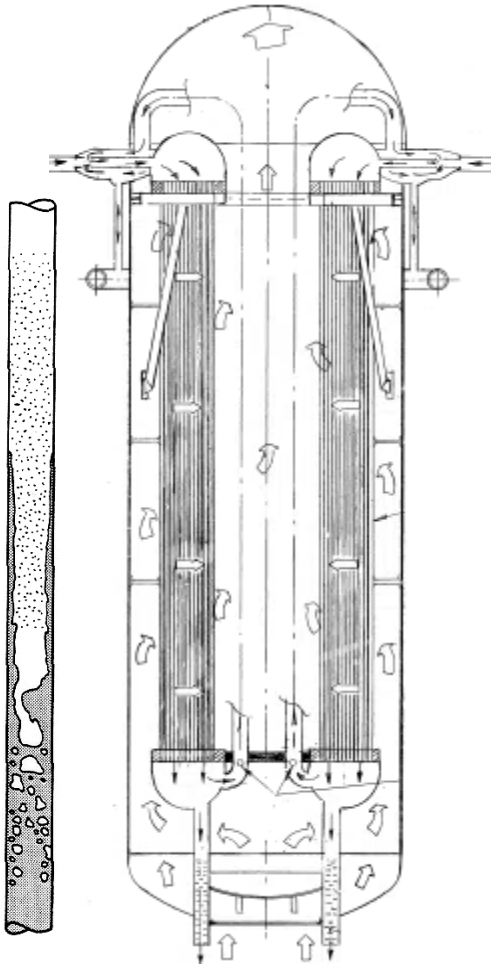
FS Dynamics is a focused and independent consultancy company providing highly skilled competence within fluid- and structural dynamic analysis. We are recruiting excellent engineers with equality and diversity in mind and can offer our employers competence development, a work environment surrounded by satisfied and motivated colleges at the leading consultancy company within technical calculations.

Master Thesis work about

CFD analysis of the heat transfer in a preheater

FS Dynamics has a well-developed cooperation with Swedish and Finnish nuclear power industry where FS Dynamics contributes with experience and deep theoretical knowledge within various simulations. Steam produced in a power plant is converted into electricity by steam turbines powering a generator. Steam that has passed the high-pressure turbine still carries much energy that can be used in the low-pressure turbines, but then the steam must be dried to avoid damage to the turbines. To achieve this, the steam from the high-pressure turbine is first passed through a moisture separator where water drops are separated. After the moisture separator the dried steam is superheated in a preheater before it enters the first low-pressure turbine.



The preheater consists of four tub packages, each consisting of more than 1000 tubes. Each tube package is vertically divided in sever sections. Steam from the high-pressure turbine is flowing through the sections, on the secondary side of the preheater, to get heated on its path towards the first low-pressure turbine. On the primary side of the preheater, high temperature steam from an intermediate step in the high-pressure turbine is flowing into the vertical tubes from above, condenses at the tube walls while transferring some of its heat to the steam on the secondary side.

In a previous Master Thesis project the flow distribution through the different tube package sections has been investigated while assuming a constant heat transfer coefficient for all sections. However, the heat transfer coefficient varies with different flow regimes. The aim of the present Master Thesis project is to focus on the heat transfer between the primary steam and the tubes and refine the flow distribution analysis with a heat transfer coefficient that varies in the vertical direction through the different tube sections. The work may include both analytical calculations as well as CFD analysis at different levels of complexity. The project is of a high technical level and if it is successful it will be of great benefit within the nuclear power industry.

Outline of the project:

1. Literature study of previous relevant work.
2. Analytical and CFD calculations of the flow and heat transfer in a tube on the primary side.
3. Steady-state CFD of the flow distribution through the tube sections on the secondary side.
4. Summary in report.

The assignment is suitable for one student with genuine interest of technical simulations within fluid dynamics. The assignment is done at the spring semester of 2020 at FS Dynamics's office in Gothenburg at supervision of an experienced CFD engineer. To apply, send personal letter, CV and course transcripts to Christian Fyhr.

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