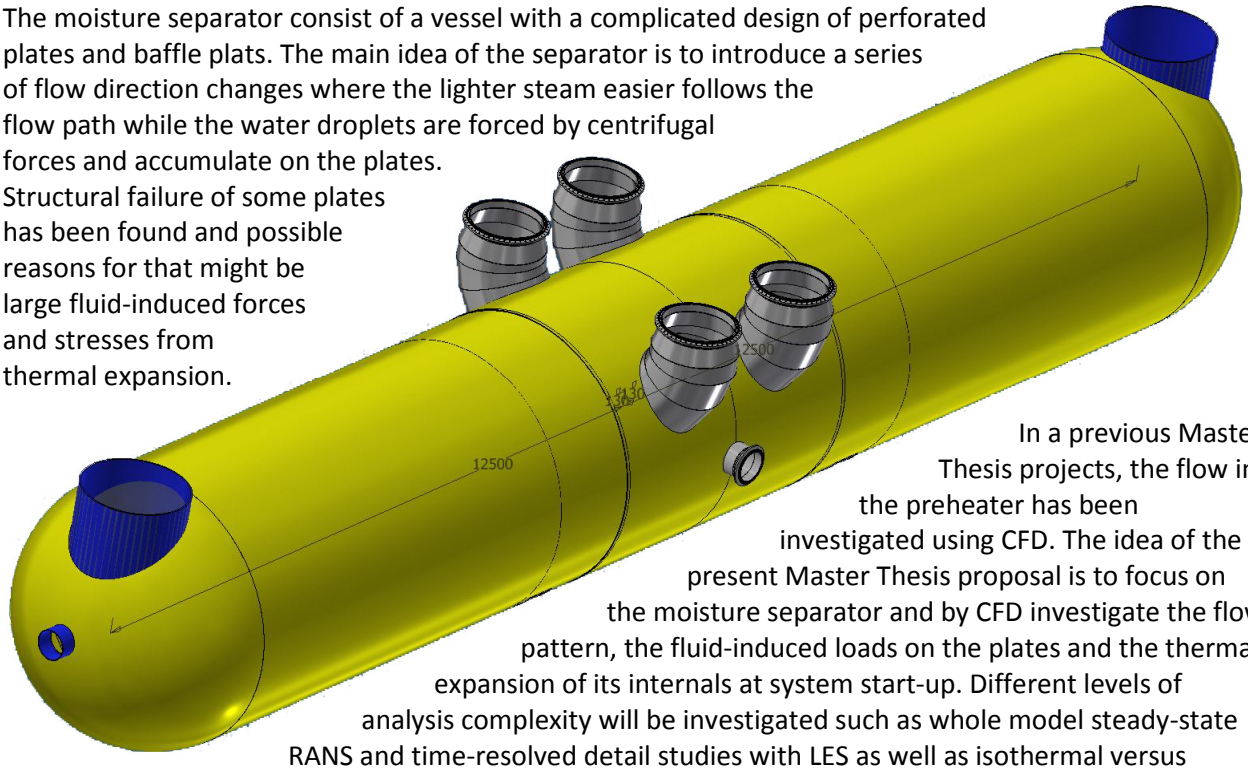
FS Dynamics is a focused and independent consultancy company providing highly skilled competence within fluid- and structural dynamic analysis. We are recruiting excellent engineers with equality and diversity in mind and can offer our employers competence development, a work environment surrounded by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

Master Thesis work about

CFD analysis of the flow in a moisture separator

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 moisture separator consist of a vessel with a complicated design of perforated plates and baffle plats. The main idea of the separator is to introduce a series of flow direction changes where the lighter steam easier follows the flow path while the water droplets are forced by centrifugal forces and accumulate on the plates. Structural failure of some plates has been found and possible reasons for that might be large fluid-induced forces and stresses from thermal expansion.



In a previous Master Thesis projects, the flow in the preheater has been investigated using CFD. The idea of the present Master Thesis proposal is to focus on the moisture separator and by CFD investigate the flow pattern, the fluid-induced loads on the plates and the thermal expansion of its internals at system start-up. Different levels of analysis complexity will be investigated such as whole model steady-state RANS and time-resolved detail studies with LES as well as isothermal versus thermal studies.

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. Preparation of an existing CAD-model, meshing and set-up of boundary conditions.
3. Performing steady-state CFD and time-resolved LES.
4. Analyse thermal expansion of internal parts.
5. Summary in report.

The assignment is suitable for one student with genuine interest of technical simulations within fluid dynamics. The assignment is done at earliest the spring semester of 2020 at FS Dynamics's office in Stockholm at supervision of two experienced engineers within CFD and nuclear engineering.

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