# Modelling of PI regulator in CFD

If you have a strong interest in Computational Fluid Dynamics (CFD) and wants to dig deeper into its practical uses – this Master Thesis project is something for you. The use of different regulators in the industry are many and one is the control of different heat

exchanger systems. Implementing the regulator in CFD can better help companies to understand, refine and develop different control systems of their products.

Quintus Technologies is the world-leader in high pressure products working with extreme pressure and temperatures for processing of todays and tomorrow's

materials used in areas such as aerospace, medical, energy and space. With this research and development work you will help drive forward the simulation capacity of Sweden´s world leading company within high pressure.
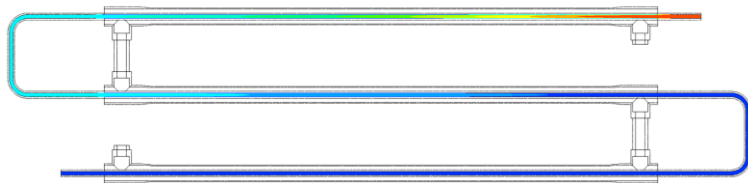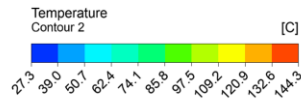
Background

Today, Quintus's technological innovations have expanded HIP-processing parameters to encompass higher pressure and temperatures with unmatched control, and increased capacities. We develop products from research sizes up to the world's largest HIP production systems.

Range of different HIP systems manufactured by Quintus

Heat exchangers are used in lots of different systems. They are utilized in both water system and gas system amongst others. The control is of importance both from a performance view but also for the safety of the machines. Since the pressure and temperatures can be of very high magnitude practical testing can be both time consuming, complicated, and expensive. Utilizing CFD is a great tool to help companies in these areas. The uses and benefits of computational fluid dynamics (CFD) have greatly accelerated over the last decades making it much more user friendly and time effective to model different physics.

Task description

At Quintus heat exchangers are used in different areas of our machines. To have an energy effective and sustainable cooling and heating of different processes in the hip cycle heat exchangers can be controlled by a regulator. One such common regulator is the PI regulator. The task will be to try to implement a PI regulator used in Quintus products into CFD on a specific heat exchanger and try to model the behaviour. The task will also include comparing the result/model with reality and try to improve the control of the heat exchanger by means of tuning the PI regulator.

The objective in the project is to examine how to model and control an PI regulator in CFD. Compare the result to today's practice and improve on the design. The main tasks will be:

- Implementing PI regulator in CFD
- Transient analysis of the flow field and conjugate heat transfer between heat exchanger and surroundings
- Validation of the results against operation
- Improvements on the design and control

The hope is that the work shall raise the bar for what can be achieved with the CFD tool and to help improve Quintus machines to be more effective and sustainable.

Suitable background

- Master of science program in Mechanics, Physics, Mathematics or similar
- Skilled in fluid dynamics and numerical analysis
- Accustomed with CFD products

Application information

The thesis will take place at Quintus office in Västerås and is aimed for one person. The selection will be ongoing so therefore apply as soon as possible. Send your CV together with grades to Per or Anton.

Contact person Quintus Technologies

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