**Master thesis projects 2018.**

**Sigurd Skogestad**

**Project: Dynamic extremum seeking control**

Cosupervisor: Dinesh Krishnamoorthy.( Reserved for Jeongrim Ryu)

**Project: Comparison of extremum seeking control algorithms for gas lift optimization.**

Cosupervisor: Dinesh Krishnamoorthy (reserved for Rebecca Gullberg)

**Project: Green energy power plant control at Norske Skog.**

Supervisor: Sigurd Skogestad

Co-supervisor at Norske Skog, Skogn: Andreas Volden

Co-supervisor NTNU: Cristina Zotica

The project is related to Steam boiler unit at the Norske Skog plant in Skogn, north of Trondheim. The steam boiler makes electric power from different organic waste, including waste from trees and from the waste water treatment plant. The main objective of the project is to identify the bottleneck and suggest way to move towards optimal operation.

A bit more details:

Norske Skog Skogn is a pulp and paper mill producing newspaper and improved newspaper grades. At the plant there are several topics suitable for thesis work and one is given here. Some topics comprise more analytical work using e.g. MATLAB/SIMULINK (Octave and SciLab are preferred alternatives), while other topics are more PLC programming oriented or a combination of both above mentioned.

The mill's primary boiler providing steam is a compact CFB (circulating fluidized bed). Todays boiler production is constrained below rated capacity. Main tasks of this project includes identifying active (and potential active) constraints, revise control structure and control loops performance to identify production bottleneck(s). Parallel to assessing an increase of boiler performance, the candidates shall consider boiler emissions and aim to lower these. Initially, the candidates shall review literature on the boiler principle, preferably from similar applications of CFB boilers.

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As mentioned, other topics are also possible.

**Project: Modeling and simulation of an inclined pipe separator**

Cosupervisor: Christoph J. Backi.

The task of the candidate will be to develop a mathematical model (dynamic / steady state) of an inclined pipe separation process with application to the oil and gas industry and potential subsea application. A pipe separator is a separation device working on the principle of separation by density differences and gravitational forces and is by principle related to gravity separators.

Specific tasks include:

* Literature review of potentially existing pipe separator models as well as inclined pipe separators with industrial applications that have already been established
* Modeling of the major dynamic / steady state principles by means of first principles / physical phenomena
* Development of a simulation model to test and verify the mathematical model in a software like Matlab/Simulink and/or Modelica
* Writing a project report about the conducted work including and describing the above-mentioned points

**Project: Process control Case study at Perstorp**

Supervisors: Krister Forsman and Sigurd Skogestad

Krister Forsman is Professor II at NTNU and has given guest lectures in the process control course about industrial control strategies. He leads the control group at Perstorp, which is a Swedish chemical company with many plants all over the world and many intersting control problems. To keep the application current and of interest to Perstorp the specific application will be decided later. The work will generally involve the following (mostly using Matlab):

1. Derive a simple process model (Simulink/Matlab)

2. Match to current operation data

3. Propose an improved control strategy. This will often involve suggestions for moving the throughput manipulator and introducing cascades or simple model-based strategies.

Typically, the project may deal with the modelling and matching with data, and the master thesis will focus on the control part.

and comparing with data from the real plant and the master thesis will focus on control.