



Hymatek Controls AS is primarily a supplier of turbine governors and excitation equipment for hydropower production. We develop, manufacture and deliver all our products ourselves. We are a key player in the Norwegian market and have a growing export business.

Master thesis/specializing project with summer internship

Title: A Digital Twin-Based Approach to Excitation Systems of Synchronous Generators

Department: Department of Electric Power Engineering, NTNU

Firm: Hymatek Controls AS

Supervisor: Jonas Kristiansen Nøland, jonas.noland@ntnu.no, Department of Electric Power Engineering

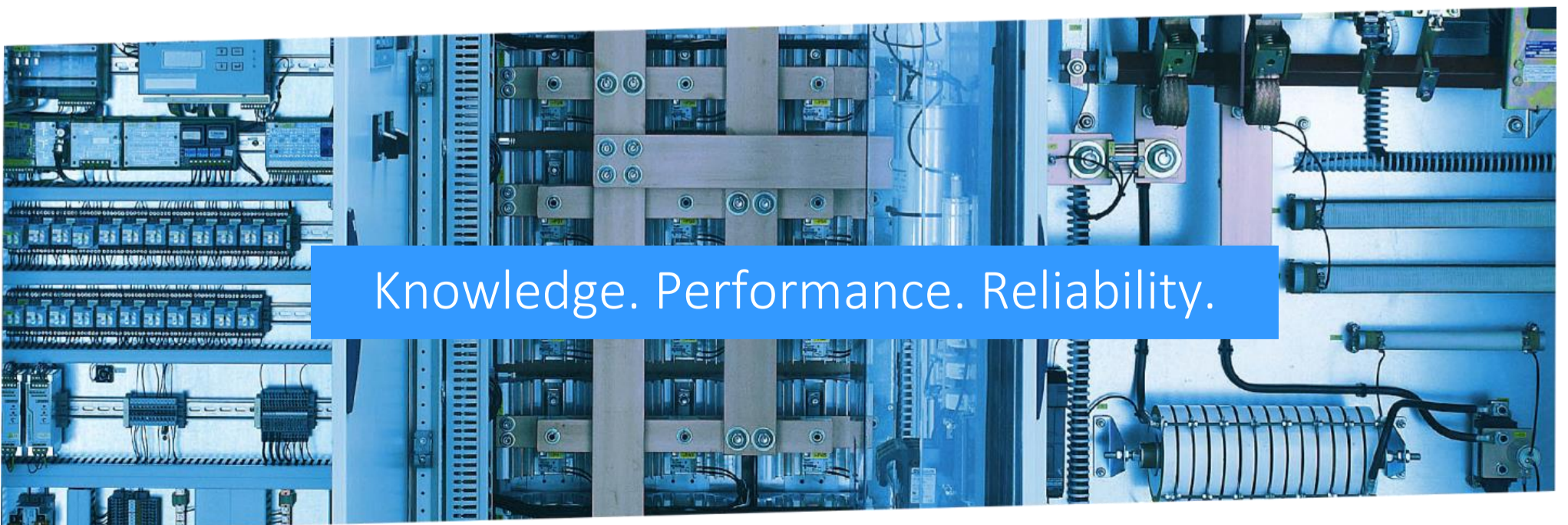
Co-supervisor: Jon Are Suul, jon.are.suul@ntnu.no, Department of Engineering Cybernetics

Co-supervisor: Mathias Gallefoss, mathias.gallefoss@hymatek.no, Hymatek Controls AS

Norway and Europe are currently in the phase of a global energy transition. In this era, a rapid increase in renewable penetration, combined with intermittent end-user behavior, radically changes the operating regimes of our base power generation facilities. In Norway, 95% of electricity production comes from hydropower.

This master thesis/specializing project is a cooperation between the Department of Electric Power Engineering at NTNU and Hymatek Controls AS. We are looking for a fourth-year student at the department of electrical power engineering with a passionate interest for simulation, electrical machines and control theory.

The project focuses on the investigation of a hydropower plant, with special emphasis on the excitation system and generator. The first part of the project is to develop a simulation model of the generator and excitation system. The simulation model can be developed in an established platform such as Matlab/Simulink. The simulation model needs to be tested and verified based on actual data from a hydropower plant.





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Further investigation using the established model can be one or more of the following tasks:

- Investigate of fault-ride through capability of modern static excitation systems. The result should be compared to the new requirements in "Nasjonal Veileder for Funksjonskrav i kraftsystemet 2020".
- Investigation of different types of electrical braking methods. The focus will be to compare different breaking technologies and optimize control.
- Investigate different online auto-tuning algorithms, based on particle swarm optimization (PSO) and other machine learning algorithms.
- Investigate tuning possibilities of the power system stabilizer (PSS) of the excitation system and concerning the ever-changing characteristics (impedance shape) of the power system.

During the development of the simulation model, other interesting topics may emerge. The problem description can be changed in cooperation with the supervisor and the company.

The specialization project and master thesis should be conducted autumn 2020 and spring 2021 respectively. During the summer of 2020 there will be a paid internship at Hymatek Controls.

Questions

For questions about the project, contact Jonas Nøland (NTNU) Jon Are Suul (NTNU) or Mathias Gallefoss (Hymatek Controls, 99231918).

About the internship

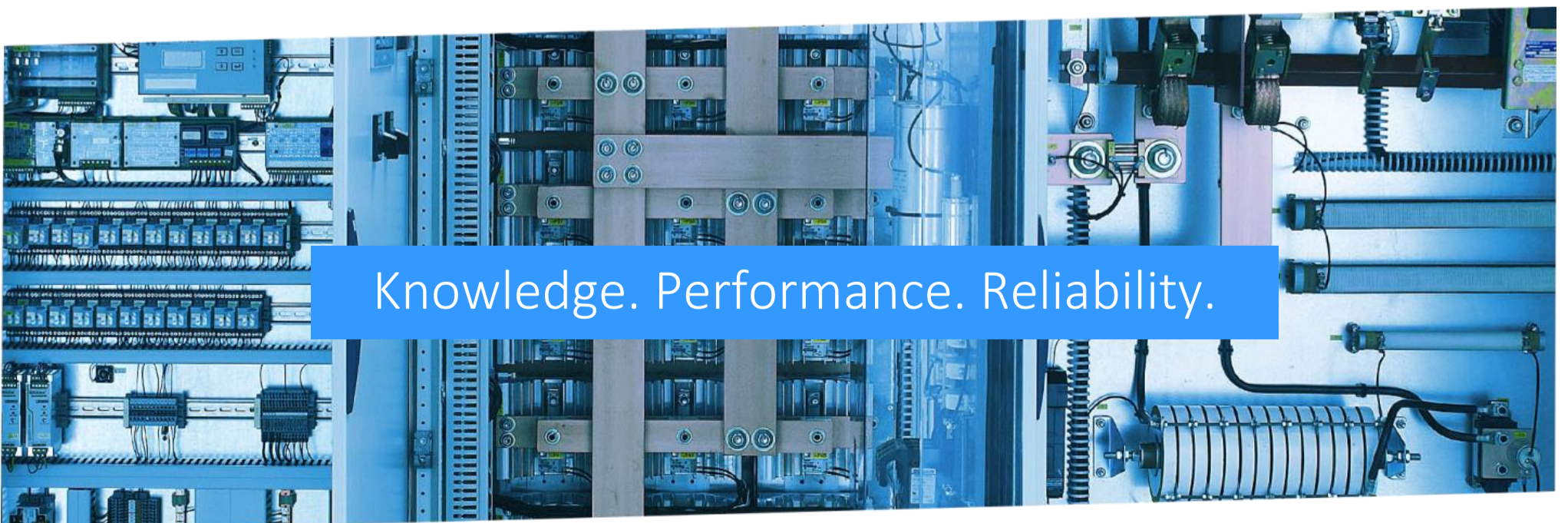
Workplace: Bryn, Oslo

Start: June 2020

Duration: By arrangement

Deadline: 01.03.2020

Submit application including CV and transcript of records to mathias.gallefoss@hymatek.no as soon as possible.



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