Optimal control for water distribution

Target group

This project proposal addresses 8th sem. students within Control and Automation at Aalborg University.

Background

With the increased introduction of renewables in the energy grid, the power supply is becoming increasingly fluctuating. On the top of this, many water utilities have installed solar panels which they want to utilise to their full extent. The objective of this project is to investigate possibilities of utilising water networks as energy storage without violating constraints on the water resources and water consumption. In this way, in periods of excess supply, surplus energy can be stored as potential energy in elevated water reservoirs. The stored energy can then be utilised in periods of energy deficiency to ensure continued water supply. On the other hand, the water in the reservoirs shall be changed sufficiently often to ensure that quality parameters such as oxygen content is within acceptable bounds. As a matter of fact, water is often aerated at the treatment facility to ensure a sufficient oxygen level.

Fig 1: Aeration steps at treatment facility

Project description

An optimal control strategy for controlling pressure and flows in a water distribution network is to be developed in the project. It is not feasible to test the developed solution in real life within the project period. Therefore a test facility is available for testing the controllers developed in the project.
It is expected that the following tasks will be included in the project:

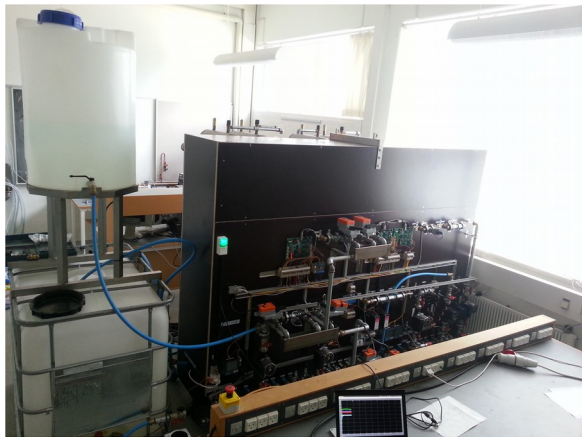

Fig 2: Laboratory setup at AAU

- (Graph-based) modelling of a complex networked system.
- Understanding the control problem in water distribution systems.
- Design the optimal controller for the system.
- Test the controller on a simulation model and on the test facility.

Project proposers

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