Model Predictive Control of Offshore Power Stations With Waste Heat Recovery - DTU Orbit (08/11/2017)

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The implementation of waste heat recovery units on oil and gas offshore platforms demands advances in both design methods and control systems. Model-based control algorithms can play an important role in the operation of offshore power stations. A novel regulator based on a linear model predictive control (MPC) coupled with a steady-state performance optimizer has been developed in the SIMULINK language and is documented in the paper. The test case is the regulation of a power system serving an oil and gas platform in the Norwegian Sea. One of the three gas turbines is combined with an organic Rankine cycle (ORC) turbogenerator to increase the energy conversion efficiency. Results show a potential reduction of frequency drop up to 40%for a step in the load set-point of 4 MW, compared to proportional–integral control systems. Fuel savings in the range of 2–3% are also expected by optimizing on-the-fly the thermal efficiency of the plant.

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