Project: Production Optimization of Gas Lifted well network

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Offshore oil and gas production systems consists of many interconnected wells and processes such as compressors and booster pumps. Often such processes are constrained by processing capacities, flow constraints and reservoir constraints. Optimal operation involves making decisions such as well head choke position, gas lift allocation etc. Typically, mathematical models are used to assist in the decision making process. However, models may not accurately predict the behaviour of the system due to inherent uncertainty in the models. Disregarding the uncertainty renders the computed solution suboptimal or even infeasible.

Robust Real-time optimization (RTO) methods can be employed for online re-computation of optimal setpoints while explicitly taking the constraints into account. Robust formulations of steady state RTO with data reconciliation may also be considered. Alternatively, ideas of self-optimizing can be implemented to achieve near optimal operation without the need for online optimization. Models of gas lifted wells are already available and can be used as a starting point.

Possible tasks of this project are:

* Extend the gas lifted well model with compressors/pumps
* Self-optimizing control structure for gas lifted well optimization for different uncertainty combinations and analysis on the need for online RTO
* Investigate steady state RTO methods for gas lift optimization problem
* Definition of challenges and opportunities for future research

The project requires basic knowledge of self-optimizing control, optimization (TTK4135 recommended, but not required). Advanced knowledge in MATLAB/Simulink is additionally required. Knowledge of CasADi or TOMLAB is an advantage.

This project is part of SUBPRO. For any questions and/or you are interested in this project, feel free to contact Sigurd Skogestad or Dinesh Krishnamoorthy (dinesh.krishnamoorthy@ntnu.no).