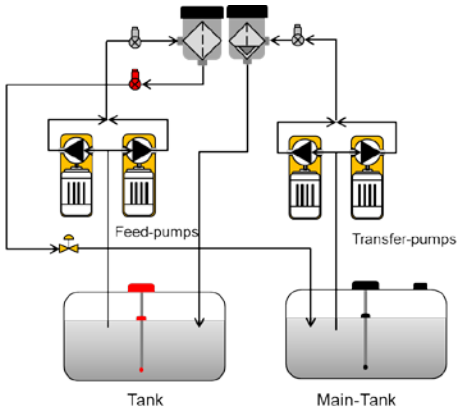
MASTER THESIS DESCRIPTION PAPER

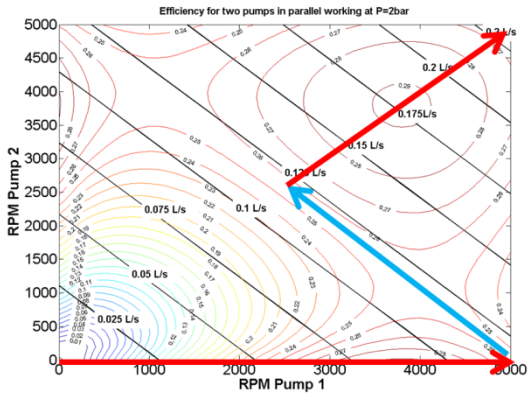
Title:	"Optimization and control of feed- and transfer-pumps"
Student:	Carlos Jorques Moreno
Supervisors:	Dr. Ola Stenlåås, Susanna Jacobsson
Examinator:	Dr. Tore Hägglund
Developed at Scania for the Automatic Control department in Lund University	

Abstract: This thesis investigates the different factors affecting the performance of a system composed by two tanks connected by four pumps, two by two in parallel, in order to optimize its design and behavior with a controller.

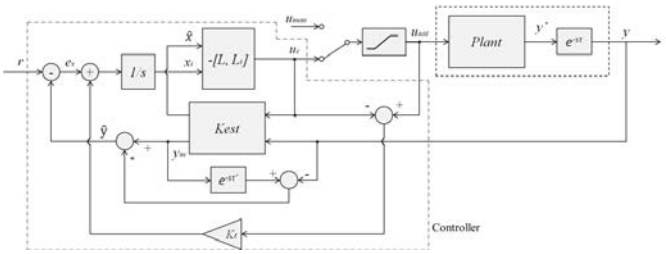


Problem description: The complexity of the system is due to all the different components it has and the constraints, limitations and boundaries into the system. The challenge consists in define optimality criteria dealing an optimal solution regarding the handling of two parallel pumps, controlled variables and overall performance.

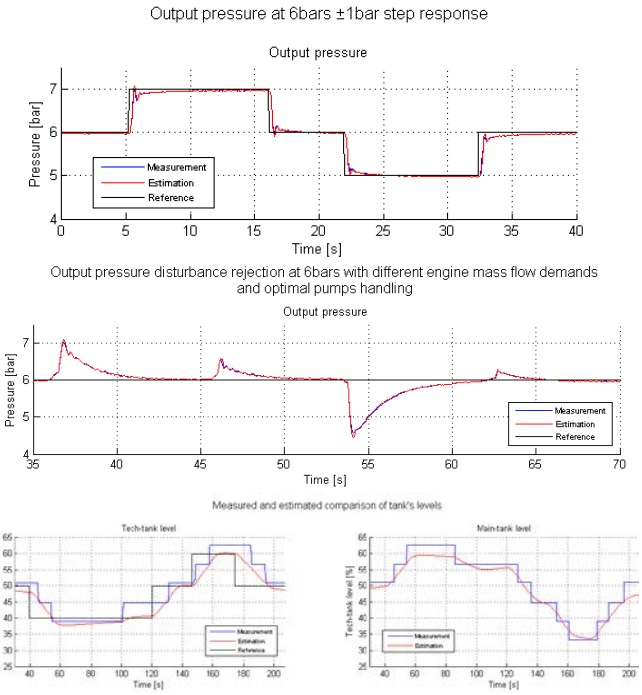
Solution approach: The optimization is separated in the two parallel pumps optimal handling; and pumps endurance. The optimal for two parallel pumps shows that it is better to run both pumps at the same RPM over a certain amount of required fuel:



The controller structure and strategy is selected to be a LQG regulator extended with a Smith predictor, optimizing a quadratic heuristic criteria to enhance pump endurance and regulate the output pressure and tank's level, as well as overcome dynamic problems as time delay, noise and sensor discretization:



Results: experimental tests show how the controller handles properly the reference tracking as well as the disturbance rejection:



Conclusions: The pumps should be selected to have higher efficiency within the working rage and the disturbance rejection performance can be improved by including extra variables.

Future work: It will be the implementation of the controller and extend the controller with adaptive strategies. More information regarding the factors affecting the pump endurance will be required for a better optimization approach.