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The Effect of practical Considerations on the Control of a Dutch Water System

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Dutch “polder-boezem” systems are water systems that provide an interesting example of a control system where institutional and operational constraints on the control actions are the dominant factor in control design. The actuators have discrete outputs and are subject to saturation. Saturation occurs regularly. The discrete nature of the actuator settings and the regular occurrence of saturation forces the use of predictions in the control system. The current predictions provide twenty four hours of data. Institutional, technical and operational desires and constraints are incorporated into an allocation algorithm that takes on the role normally fulfilled by the objective function and its solver. This paper presents results for several different variations on a receding horizon model predictive controller designed specifically for this system. The variations concern different ways of incorporating minimum pump run time conditions into the controller. Data were obtained during a pilot project where this controller was used as a decision support module. For a period of one year we have both hourly updated twenty four hour predictions and an estimate of actual inflow based on the control actions taken.