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Real-time Control of sewer pumps by using ControlNEXT to smooth inflow at Waste Water Treatment Plant Garmerwolde

Klaas-Jan van Heeringen (1), Ronald van Nooijen (2), Kees Kooij (1), and Bokke Postma (3)

(1) Deltares, Operational Water Management, Delft, Netherlands (klaas-jan.vanheeringen@deltares.nl), (2) Delft University of Technology, (3) Water Authority Noorderzijlvest, Groningen, the Netherlands

The Garmerwolde waste water treatment plant (WWTP) in the Groningen area of the Netherlands, receives waste water from a large area. That waste water is collected from many sewer systems and transported to the WWTP through pressurized pipes.

The supply of waste water to the WWTP is relatively low and very irregular during dry-weather conditions, resulting in a random pattern of flows. This irregularity is the effect of the local control of the pumps, where the pumps are individually operated as an on/off control based on the water levels in the connected sewer system. The influent may change from zero to high values in a few minutes. The treatment processes at the WWTP are negatively influenced by this irregularity, which ends in high costs for energy and use of chemicals.

The ControlNEXT central control system is used to control the 5 largest pump stations, such that the total inflow at the WWTP becomes much smoother. This results in a reduction of operational costs of about 10%.

The control algorithm determines whether the actual condition is dry or wet, based on real-time radar precipitation images and the rainfall forecast product HiRLAM. All actual data is also collected and validated, like water levels, pump operations and pump availability. This data management is done using Delft-FEWS. If the situation is identified as “wet”, the sewer systems are emptied as far as possible to create maximum storage. If the situation is “dry” (and of course there is a dead band between dry and wet), the pumps are operated such that the total inflow into the WWTP is smoothed. This is done with a Greedy algorithm, developed by Delft University of Technology. The algorithm makes a plan for the next 24 hours (as the daily inflow has a typical daily pattern) and generally stores some water volume in the sewer systems during the day to be able to continue operations during the night.

The pumps are controlled with a time step of 5 minutes, where ControlNEXT manages the communication of pump operation setpoints to the SCADA system. In case of failing communication, backup procedures are programmed in the PLC of the pump stations. In that case the old on/off operation based on local water levels will be used.

The system has been operational since January 2016 and has been monitored since then. In addition to monitoring the positive effect on the inflow at the WWTP, an important issue is the possible sedimentation in the sewer systems. This will be monitored too.