Water quality based RTC using UV/VIS sensors

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EXTENDED ABSTRACT

Kallisto is a large scale research project at water board De Dommel in The Netherlands, in cooperation with several partners (Weijers et al, 2011). It consists of quantitative and qualitative continuous on line measurements and extended modelling of the WWTP (Waste Water Treatment Plant) Eindhoven, the contributing sewer systems and the river Dommel. The overall goal of the project is to optimise the performance of the total wastewater system by using impact based Real Time Control (RTC) in order to comply with the WFD (water framework directive).

At WWTP Eindhoven waste water of three catchment areas ('Nuenen/Son', 'Eindhoven Stad' and 'Riool Zuid') is collected and treated, as presented in Figure 1. At high influent flows the biological capacity of the WWTP is too small to treat all wastewater and the stormwater settling tank (SST) is put into operation. Once the SST is completely filled, it acts as a settling tank discharging the partly settled wastewater to the Dommel river. In addition, it is possible to directly discharge the influent at the WWTP via a bypass. Consequently, at WWTP Eindhoven there are three discharge options, thus creating opportunities for water quality based RTC due to the temporal variation of the water quality of each flow. Based on the available data of the UV/VIS sensors, being TSS, $COD_{dissolved}$ and COD) located at the WWTP, see Figure 1, the potential for water quality based RTC has been investigated.

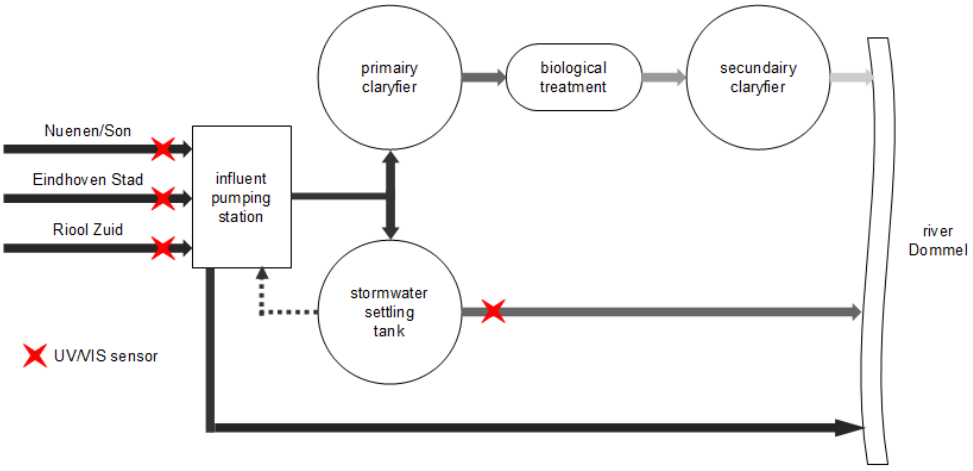

Figure 1. Schematic display of water flows at the WWTP Eindhoven.

Figure 2 shows normalised concentrations of COD for the influent at Riool Zuid and Nuenen/Son, and the SST effluent during a strong storm event at August 23th 2011 (19.2 mm in 1 hour).). The concentrations were normalized using the COD concentration at the onset of filling of the stormwater settling tank.

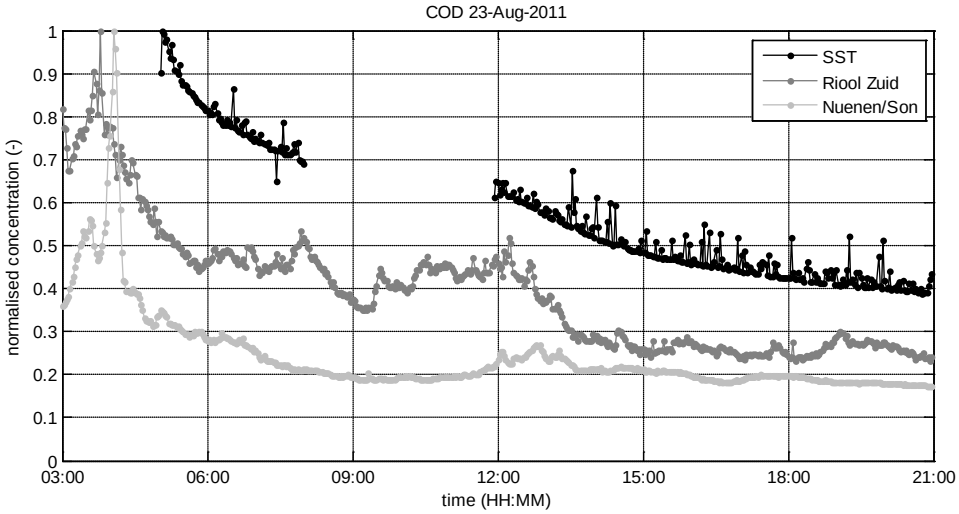

Figure 2. Normalised concentration of COD at August 23th 2012.

The COD concentration of the influent at Riool Zuid and Nuenen/Son during the storm event decreased with 50-65 % compared to the concentration at the onset of the event, due to dilution effects (discarding the peak concentration at the onset of the rain event). The concentration in the SST effluent also decreases due to the settling efficiency and the more diluted influent. However, the rate of the decrease in concentration levels differs between the WWTP influent and SST effluent. The decrease in the concentration of the WWTP influent is sharper than the decrease in the SST effluent concentration. During a part of the event, the WWTP influent even shows lower concentrations than the SST effluent.

These results indicate a potential for RTC, as during a certain period in the storm event the raw influent shows lower concentrations than the SST effluent. During this time, using the bypass could be preferred over using the SST, whereas during other parts of the event this is vice versa. Finally, it is concluded that high frequency quality measurements can help to decrease the pollutant load discharged to the receiving water by identifying the potential for water quality based RTC.

References

Schilperoort R.P.S. (2011). Monitoring as a tool for the assessment of wastewater quality dynamics. PhD thesis, Delft University of Technology, the Netherlands.

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