Demo Case Update

From Waternet - Wastewater Treatment Plant Amsterdam West

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Wastewater Treatment Plant (WWTP) Amsterdam West of Waternet, the watercycle utility of Amsterdam and surrounding areas, has a capacity of 1 Million population equivalent and serves the city of Amsterdam. The current process control strategies are suboptimal with respect to energy use, greenhouse gas emissions (nitrous oxide and carbon dioxide) and effluent quality. With the use of (near) real-time plant data, process models and external data sources, a more optimal plant-wide control can be achieved. One of the seven treatment lanes of WWTP Amsterdam West was made available for introducing and testing of additional sensors, data driven control strategies and decision support based on newly to be developed Artificial Intelligence (AI) models and data fusion. The intelligent WWTP control will be designed to reduce greenhouse gas emissions and energy costs while maintaining good effluent quality.

At the WWTP, additional sensors and analysers are required to provide currently unavailable but essential data for the AI models. For example real-time data regarding the influent composition, such as organic load, phosphorus- and nitrogen content, are not available at this time. In the past months Waternet has selected and acquired these additional sensors and analysers. In total more than 15 new and reused sensors and analysers will be installed to measure extra parameters throughout the process, i.e. in the influent, in the biological treatment and in the effluent (sedimentation tank). Installation is ongoing and planned to be completed by the end of April. Sensor installation does not only entail the physical placement of the equipment, but also power and network connections, and integration in the SCADA system of the WWTP. The research lane will be officially opened before the summer, accompanied by a mini symposium.

The first newly developed AI tool is a soft sensor consisting of an Artifical Neural Network (ANN) model that estimates the individual aeration flows to each of the 7 aeration tanks based, on header pressure and valve positions, thus replacing failing sensor readings with model estimations. The soft sensor is essential to quantify the energy reduction. Currently three models are under development: (1) an AI model for prediction of the influent flow of the treatment plant, (2) an AI model that describes the behaviour of the treatment plant and (3) an AI control model that determines the optimal control settings based on a reward system that includes energy use and nitrous oxide emissions.

In order to benefit from the latest, powerful FIWARE standards and techniques regarding data sharing, validation, analysis and visualisation, Waternet collaborated with KWR and the other European partners to set the system and user requirements necessary for further development of the smart WWTP application. Additionally, the integration of FIWARE technology with the existing (legacy) data acquisition, storage and communication layer has been drafted and is currently under review by the FIWARE foundation.

In the upcoming months our efforts will be focussed on the first tests with FIWARE technology, (new) data acquisition, the development of data validation techniques and further refinement of the AI models.

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Project Consortium

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