Generation of synthetic influent data for performing (micro) pollutant wastewater treatment modelling studies - DTU Orbit (23/08/2019)

The use of Activated Sludge Models (ASM) (Henze et al., 2000) is constantly growing and both industry and academia are increasingly applying these tools when performing wastewater treatment plant (WWTP) engineering studies. Besides describing the behaviour of traditional pollutants such as organic carbon (C), nitrogen (N) and phosphorus (P), ASM models have been successfully upgraded to predict the fate of different types of micro-pollutants (Benedetti et al., 2013). Indeed, the potential adverse effects of micro-pollutants in aquatic environments have been an object of intensive research during the last years (e.g. Ferrari et al., 2003). However, due to the time and the high cost of measuring campaigns, many simulation studies of full-scale Wastewater Treatment Plants (WWTPs) suffer from a lack of sufficiently long and detailed time series representing realistic wastewater influent dynamics (Gernaey et al., 2011). This is an important point since realistic data representing the influent wastewater dynamics are crucial to accomplish any WWTP modelling project (Rieger et al., 2012). For this reason, model-based influent generators/synthetic data are an alternative that has recently gained considerable interest (Flores-Alsina et al., 2014, Martin and Vanrolleghem 2014).

The objective of this paper is to show the usefulness of model based influent generators to reproduce (micro) pollutant influent characteristics when performing WWTP modelling studies. Using a 30000 PE WWTP as a case base, three different types of pharmaceuticals (antibiotic, anti-inflammatory, model stabilizer) are the selected micro-pollutant to run the study. In addition, the paper is complemented describing the influent variation of flow-rate (Q), traditional pollutants (COD, N, P) and temperature (T). Two different data sets (short/long term) are used to calibrate the different model blocks comprising the influent generator. Preliminary simulation results show that the generated synthetic data follows the same pollutant/micro-pollutant dynamics. In addition, uncertainty in the assumed loads/natural stochasticity is assessed using the Monte Carlo simulation technique. The paper will be complemented with a scenario analysis demonstrating how additional influent characteristic principles could be generated without the need to run (expensive) additional experimental campaigns.