An alternative dynamic modelling approach to understand the removal of emerging pollutants in wastewater treatment plants

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Abstract

Understanding emerging pollutant (EP) dynamics in wastewater treatment plants (WWTPs) is key to improved processing. The main route by which EPs enter the water environment is the WWTP. Data to parametrise existing complex wastewater treatment models from operational WWTP is of limited availability. In particular, to help gain insight into the dynamics of EP, data on the activated sludge model developed by the International Water Association (IWA) for xenobiotic (ASM-X) is sparse. Also, sampling both influent and effluent concentrations of pollutants at the same time fails to take into account the hydraulic retention time (HRT) and plug flow across the WWTP. This case study considered three EPs, namely trimethoprim (TRI), oseltamivir (OSE) and doxycycline (DOX). We investigated the link between the relationship of the influent and effluent load to HRT across the WWTP using correlation analysis. The results suggest that HRT of WWTP have a wider range than those reported. Also, we proposed an alternative modelling approach, which describes the full-scale WWTP as one process. The modelling results show a good fit (based on the likelihood ratio test at a significance level of $\alpha = 0.05$) compared to the measured effluent EP concentrations.

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