

Forrez, I., Carballa, M., Boon, N. and Verstraete, W. (2008) Biological removal of 17 α -ethinylestradiol (EE2) in an aerated nitrifying fixed bed reactor during ammonium starvation. *Journal of Chemical Technology and Biotechnology* (*In press*, doi: 10.1002/jctb.2016).

BACKGROUND: Conventional wastewater treatment plants (WWTPs) tend to partially remove recalcitrant chemicals, such as pharmaceuticals. Among these, the synthetic estrogen 17 α -ethinylestradiol (EE2) is of great environmental concern. In this work a continuously aerated submerged fixed bed bioreactor was used for the biological removal of EE2 at $\mu\text{g L}^{-1}$ levels.

RESULTS: Removal efficiencies higher than 96% were obtained at a hydraulic retention time (HRT) of 4.3 days and a volumetric loading rate (B_v) of $11 \mu\text{g EE2 L}^{-1} \text{d}^{-1}$. Increasing the B_v up to 40 and $143 \mu\text{g EE2 L}^{-1} \text{d}^{-1}$ led to slightly lower removal efficiencies, 81 and 74%, respectively. Nitrification was confirmed to be the main biological mechanism involved in EE2 removal. Most interestingly, the elimination of EE2 was not affected by the absence of ammonium in the feed, suggesting that ammonia-oxidizing bacteria (AOB) were able to maintain their population density and their activity, even after several months of starvation.

CONCLUSION: The concept of an aerated submerged fixed bed bioreactor, capable of removing estrogens in a sustainable and biological way, shows great potential as an effluent polishing step for existing WWTPs.