matter, which instead is very important in MBRs, because of the high concentration of biomass and the low food/biomass ratio, characteristic of these systems. To overcome such a limitation in the present paper it is proposed a new mathematical model, which modifies the one proposed by Lu et al. (2001), integrating it with ASM1 and ASM3. The new model is based on the death-regeneration cycle, as ASM1, and includes the storage process, as ASM3. Moreover, as the model proposed by Lu et al., it considers the production of SMPs. In more details the model considers the following processes: i) storage of organic matter and SMPs operated by heterotrophic microorganisms; ii) growth (aerobic or anoxic) of heterotrophs on the stored substrates; iii) growth of autotrophic microorganisms on the influent ammonia nitrogen; iv) production of nitrates and SMPs; iv) production of inert compounds and SMPs as consequence of metabolic processes and biomass decay. All biodegradable products (including biodegradable SMPs) are supposed to be recycled in the system, becoming part of the influent substrate, in agreement with the mentioned death-regeneration principle. Model's parameters are calibrated using the experimental data obtained on a pilot MBR plant, configured in the pre-denitrification mode, fed with synthetic wastewater. The same pilot plant, working in a different condition, is used for model validation. To reduce the number of parameters to be calibrated, some of kinetic constants are measures through respirometry, using the biomass produced in the pilot plant, while the others are derived from the available scientific literature.

Keywords: MBR; Mathematical model; Respirometry; SMP

References

Henze M., Gujer W., Mino T., van Loosdrecht M.C.M., Activated Sludge Models ASM1, ASM2, A5M2d and ASM3. Scientific and Technical Report No. 9. IWA Publishing, London, UK. 2000.

Lu S. G., Imai T., Ukita M., Sekine M., Higuch T., Fukagawa M., A model for membrane bioreactor process based on the concept of formation and degradation of soluble microbial products, Water Res 35 (2001) 2038-2048.

290

Combination of different advanced oxidation processes and activated carbons for treatment of salt water

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Bilgewater is a corrosive polluted effluent from the bilge of ships that mainly originates from seawater infiltration and leakage of engine oil and fuel. Each year, thousands tons of hydrocarbons from bilge are discharged at sea. In order to prevent hydrocarbon discharge at sea from the bilge of ships, the International Maritime Organization (IMO) enacted the MARPOL 73/78 convention in which effluents are now limited to those with maximum oil content of 15 ppmv.

Photocatalysis, ozonation and active carbons were investigated separately and in combination as tools for the purification of polluted salt water. Coupling different processes enables to overcome many drawbacks related to the use of the single technologies and at the same time to exploit possible synergistic effects. In particular, photocatalysis alone suffers of slow purification rates for high salinity solutions whereas, in the presence of bromide ions, ozonation alone produces toxic oxidation by-products (mainly bromate ions). Activated carbons treatment does not afford pol-