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INTERNATIONAL WORKSHOP
ADVANCES IN CLEANER PRODUCTION

“CLEANER PRODUCTION TOWARDS A SUSTAINABLE TRANSITION”

Life Cycle Assessment of Wastewater Treatment Systems for Conventional Activated Sludge and UASB Reactor followed by Activated Sludge

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Abstract

Concern about the environmental dimension of sustainability has gained increasing importance in society, however, studies that make a comparative analysis of the technological wastewater treatment alternatives in the design stage of the treatment systems still show up incipient and restricted with regard to the consideration of environmental variables in decision making. Life Cycle Assessment (LCA) a tool initially designed for the analysis of the environmental performance of products, has been very efficient to evaluate the potential environmental impact of sewage treatment plants. In this context, in the present work, the Life Cycle Assessment tool was used in order to evaluate the potential environmental impacts of two sewage treatment systems: conventional activated sludge and UASB reactor followed by activated sludge. The modeling of systems and calculations involved in the evaluation of the impact of the life cycle have been achieved by the use of OpenLCA software, in order to be identified the most significant environmental issues and make a comparison of the environmental performance of the systems. Of the ten categories of the environmental impact evaluated by the CML method, LAC system showed worse environmental performance than UASB reactor followed by activated sludge system in eight of them. Through sensitivity analysis, it was found that for the impact categories acidification and marine ecotoxicity, the electricity required for aeration systems had a great influence on the results.

Keywords: Wastewater treatment; LCA; Conventional Activated Sludge System; UASB reactor; Sensitivity Analysis