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MODELING AND SIMULATION OF AN URBAN WASTEWATER TREATMENT PLANT WITH AN ANOXIC-AEROBIC-MBR SYSTEM USING GPS-X SOFTWARE

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Abstract

The startup and operation of an urban wastewater treatment plant (WWTP) are heavily influenced by effluent quality and operational expenses. To enhance efficiency and cost-effectiveness, the industrial sector increasingly turns to wastewater treatment system simulators. These tools predict and optimize operations, ultimately leading to financial benefits. The objective of this work was to evaluate the operation of a WWTP with an anoxic-aerobic Membrane Biological Reactor (MBR) system using GPS-X software, followed by a comparison of the energy operating cost with alternative models for wastewater treatment that match the effluent characteristics of the current system. Two proposed models were examined: an aerobic-MBR system and anoxic and conventional activated sludge systems. Model (1) simulation parameters correlated to 66.09-72.93% of those measured in the actual WWTP. The results revealed that, given sufficient space, the conventional anoxic and activated sludge system displayed superior economic feasibility in terms of operation, while maintaining equivalent effluent quality to the current configuration. Moreover, this study generated two novel treatment approaches: a modified model and an alternative model. Both integrated an aerobic tank, necessitating aeration and thereby equalizing energy costs associated with air injection. Briefly, WWTP simulation tools play a pivotal role in decision-making processes, facilitating comparisons of cost-efficiency and effluent quality. However, for enhanced accuracy, future endeavors should encompass comprehensive wastewater characterization. Despite potentially limited adoption in developing nations, these tools signify a substantial advantage and hold the potential to advance water treatment process selection.

Key words: GPS-X, MBR System, modeling, simulation, wastewater treatment plant

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