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Radiotracer Investigation in an Aeration Tank of a Waste Water Treatment Plant

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A radiotracer experiment was conducted in an aeration tank of a waste water treatment plant in a chemical plant in Malaysia. Idoine-131 (half-life: 8 days, energy: 360 keV (80%), 640 keV (9%)) as sodium iodide was selected to be used as a radiotracer. About 12.5 GBq (200 mCi) activity of radiotracer was used. The radiotracer was diluted in a volume of about 30 liter and injected into the splitter pit at a constant rate for a period of about 10 minutes using a specially fabricated injection arragnment. This ensures good mixing of the tracer with the inlet stream of wastewater and almost equal division of radiotracer into two individual tanks (tank A and tank B). The period of injection is negligibly small as compared to expected mean residence time of the wastewater in the tank and hence the tracer injection can be considered as an impulse or instantaneous injection.

The radiotracer was monitored at different strategically selected locations using 11 waterproof scintillation detectors (2 inch x 2 inch). All the detectors were connected to a common 12-channel computer controlled data acquisition system programmed to monitor tracer concentration data at an equal time intervals. During the acquisition, the data was saved at regular intervals. The continuous on-line monitoring of tracer was conducted for a period of 26 days.

Results revealed that no malfunctioning such as bypassing or short-circuiting of the flow was observed in the tank. The mean residence time in the tank was estimated to be about 6 days, which matches with the theoretical mean residence time (hydraulic retention time). The residence time in the membrane was negligible as compared to the residence time in the tank. No considerable dead volume was found in the tank(s). This indicated that the entire volume of the aeration tank was used for the treatment of the wastewater. A model with a tank connected to a dispersed plug flow component in series with a recycle flow was found suitable to describe the flow of wastewater. The results of the model simulation showed that the aeration tank (s) behave as an ideal mixer. However, the membrane behaved as a plug flow reactor. The result of simulation indicated that the recycle flow rate is about 1.4 times of the inlet flow. The results of the investigation will help the plant engineer to evaluate the performance of the aeration tank.

Country/Organization invited to participate

Malaysia

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