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Radiotracer Investigation of a Pulp and Paper Mill Effluent Treatment Plant

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Abstract

Background of the study:

Pulp and paper industry is highly dependent on water for most of its processes, producing a significant amount of wastewater that should be treated to environmental standards before discharging into the atmosphere. The wastewater generated primarily consist of substantial amount of organics, inorganics, nutrients, toxic and pathogenic compounds which are treated in an effluent treatment plant (ETP). Effluent treatment plant is a combination of primary, secondary, tertiary and advanced treatment and vary industry to industry according to the process utilized. Effective performance of ETP is crucial both environmental and economic point of view and radiotracer technique can be effectively used to optimize its performance and detect anomalies like dead zones, bypassing, channelling etc.

Methodology:

A detailed residence time distribution (RTD) analysis of the aeration tank and secondary clarifier were carried out at Shreyans Paper Ltd., Ahmedgard was carried out using Iodine-131 (^{131}I) as radiotracer to detect possible anomalies in the system. The aeration tank and secondary clarifier had capacity of 5472 m³ and 1017 m³ respectively. Flow rate of effluent water at the inlet of aeration tank was 5.21 ± 0.1 m³/min. A pulse input ^{131}I was injected 18 m from the inlet of aeration tank and monitored using eight scintillation detectors placed at various locations of the reactors. These detectors are attached to the data acquisition system (DAS) using wired network that facilitated collection and visualization of the online data. The recorded RTD data were used to evaluate the residence mean residence time (MRT).

Result:

The MRTs obtained from the experimental RTD data were found lower than their respective theoretical MRTs. Estimated dead volume of the secondary clarifier was found to be 30%, that indicates significant capacity of the tank is inoperative reducing its treatment efficiency.

Conclusion:

Radiotracer technique is a very effective tool to study complex industrial effluent treatment plant and identifying flow anomalies in the process unit.

Keywords: effluent treatment plants, wastewater, RTD, radiotracer

Country/Organization invited to participate

India

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