

嫌気ろ床接触ばっ気方式の農業集落排水施設における 嫌気ろ床槽のCOD除去性能に関する一考察

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概 要

嫌気ろ床接触ばっ気方式の農業集落排水施設から得られたデータより、非超過確率分布へのあてはめ等を通じて嫌気ろ床槽流入水と各室流出水のCOD濃度における分布特性とCOD除去性能を把握した。嫌気ろ床槽の流入水と各室流出水のCOD濃度は正規分布によく適合していることが判明した。嫌気ろ床槽のCOD除去性能は、槽内水の浮遊物質の蓄積・捕捉と槽内物質からの剝離・再溶出に影響されており、COD除去率について流入水のCOD濃度から概ねの値を推定できた。嫌気ろ床槽のCOD除去率は、槽内を押し出し流れと仮定し、浮遊物質の捕捉・沈殿と槽内物質からの剝離・再溶出作用を反映した1次反応式を用いて推定できることが分かった。また、嫌気ろ床槽のCOD除去率には槽内のT-N低下濃度が関係しており、窒素除去がCOD除去性能にも影響をしていることが確認された。嫌気ろ床槽のCOD除去率について、水量負荷、槽内SS低下濃度/流入水COD濃度比、流出水SS濃度/流入水COD濃度比、及び槽内T-N低下濃度/流入水COD濃度比を説明変数とする重回帰式が求められた。さらに、嫌気ろ槽のCOD除去性能の安定を図るためには、槽内の汚泥堆積厚を適切に管理することの重要性が示唆された。

Study on Characteristics of COD Removal in an Anaerobic Filter Tank of Rural Sewerage Facilities with Submerged Biological Filters

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Abstract

COD removal performance in anaerobic filter tank was investigated using observed data on rural sewerage facilities with a submerged biological filters. It was found that the probability distribution of influent and effluent COD in anaerobic filter tank agreed with the normal distribution. It was found that COD removal in anaerobic filter tank was influenced by capability to catch suspended solids and deachment-and-elution of accumulated matter in filters of anaerobic filter tank. It was assumed that anaerobic filter tank was represented as plug flow reactor and COD reduction was employed with a first order reaction. COD removal in an anaerobic filter tank was also assumed to depend on influent loading, influent COD concentration, SS reduction, effluent SS concentration, and T-N reduction. The multiple regression equation between COD removal and five factors can be obtained from observed data. The predicted values of COD removal in an anaerobic filter tank were approximately in agreement with the observed values. The deposited sludge on the bottom of an anaerobic filter tank have considerable influence on the effluent SS concentration from the anaerobic filter tank/influent COD concentration in the anaerobic filter tank. The control of hydraulic loading rates in an anaerobic filter tank and effluent SS concentration from an anaerobic filter tank is effective in maintaining COD removal efficiency in an anaerobic filter tank. The COD removal have limitation due to elution of accumulated biofilm in filters of anaerobic filter tank.