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Effects of Operational Conditions on the Performance of Triethylamine Biofiltration

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Abstract:

Nitrogen compounds such as triethylamine are odorants generally found in chemical plants and foundries in which cold-box cores are made. In this study, the efficiency of biofiltration of triethylamine (TEA) vapor was evaluated. Experiments were conducted in two 6-L biofilters arranged in three stages and packed with inoculated compost - wood chips (40:60v/v) as the filter medium. The seed inoculum was obtained from municipal activated sludge. Tests were made to compare effects of initial temperature ($30\pm 1^\circ\text{C}$, biofilter A) and ($23\pm 2^\circ\text{C}$, biofilter B) on the performance of the biofilter. TEA elimination rate pattern was evaluated by changing loading rates (6-138 gm-3h-1 and hydraulic retention times (40-60 s) while operating at constant temperature and humidity at 50-55%. Results showed that organic loading rates (OLR) of up to 114.4 gm-3h-1 (biofilter A) and 90.56 gm-3h-1 (biofilter B) could be handled without any apparent indication of maximum elimination capacity and substrate inhibition. The elimination capacity of biofilters could reach up to 72 gm-3h-1 (biofilter A) and 61.5 gm-3h-1 (biofilter B). When the loading of TEA exceeded the critical values, substrate inhibition occurred and the elimination capacity decreased. However, the requirement of keeping the pressure drop below 4 cm water gauge per meter of bed height to avoid operational problems warranted lower than maximum capacity operation. The optimal OLR values of 90 ± 14 gm-3h-1 are suggested for hydraulic retention time value of 48 s and temperature of $30\pm 1^\circ\text{C}$. Under these conditions, elimination capacity of 71 ± 3 gm-3h-1 and removal efficiency of $81\pm 14\%$ was achieved.

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Triethylamine

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