Synergistic effect of chlorination and sand filtration for efficient elimination of invertebrate leakage in BAC filter

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ABSTRACT

The problem of excessive propagation and leakage of invertebrates in the biological activated carbon (BAC) treatment process have received increasing attention in recent years. Herein, the potential of a combined chlorination and sand filtration process for reducing invertebrate leakage is investigated, based on pilot-scale studies. In this developed design, the chlorine dosage and filtration velocity of the sand filter were optimized. Meanwhile, the abundance of invertebrates, the turbidity, the chlorine concentrations in the inflow water and the effluent were also recorded. It was found that the addition of chlorine could improve the efficiency of invertebrate removal in a sand filtration system. Within the parameters of the filtration velocity (8 m/h) and the operation time (144 h), the average invertebrate removal efficiency of the sand column (particle size: 0.3–0.5 mm) increased from 61.9% (without chlorine added) to 89.9% (with 0.5 mg/L chlorine added). When the filtration velocity increased to 12 m/h, a dose of 1.5 mg/L chlorine was required to obtain a relatively high average removal efficiency (83.0%), as the removal efficiency decreased with the increase of filtration velocity. The invertebrate survival status was confirmed to be the key factor that affected the removal efficiency. Chlorine was effective for inactivating invertebrates, and for further inhibiting their movement and reproduction, which finally resulted in an improved interception function for the sand filtration. Additionally, during the filtration, the head loss and chlorine consumption were too minimal to be of concern.

Keywords: Invertebrate; Chlorination; Sand filtration; Biological activated carbon

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