

Study on maintenance of disinfection and elimination process in small-scale domestic wastewater treatment facilities

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The purpose of domestic wastewater treatment is to reduce organic substances and pathogenic risk. To reduce the pathogenic risk, disinfection and elimination processes are generally applied. Although chlorination has been used as the main method of disinfection in domestic wastewater treatment systems, it produces chlorinated organic compounds that affect organisms in water body. Alternative disinfection methods have been applied in medium or large-scale wastewater treatment facilities such as rural sewage treatment plants and sewerage treatment plants. However, chlorination is still widely used in small-scale wastewater treatment facilities mainly because of its reliability, easiness of maintenance and low running cost.

In the present study the maintenance method of chlorination and application of the alternative disinfection methods were studied to improve the disinfection and elimination process in small-scale domestic wastewater treatment facilities. Chlorination and alternative disinfection methods were reviewed in Chapter 1, and the importance of disinfection and its present state in wastewater treatment facilities were discussed. In Chapter 2, the performance of chlorination in Johkasou system was evaluated. Although the residual chlorine was detected in the effluent of the most surveyed facilities, the number of total coliforms exceeded 3,000 CFU/ml in the 30% facilities. It was suggested that the remains of total coliforms were caused by insufficient retention time or effect of $\text{NH}_4\text{-N}$ and $\text{NO}_2\text{-N}$ in the effluent. Disinfection by combined chlorine was proposed to be applied in order to reduce the production of chlorinated organic compounds. The performance of disinfection of Johkasou effluent by UV radiation was evaluated in Chapter 3. UV radiation exhibited similar performance to chlorination. Color and turbidity in the effluents reduced the performance of disinfection. In Chapter 4, the performance of elimination in a membrane bioreactor process was examined. Although membrane filtration eliminated bacteria, chlorinated organic compounds were formed with high concentrations at chemical cleaning of membrane. The formation mechanisms of chlorinated organic compounds such as chloroform and dichloroacetonitrile were discussed.

The results and findings obtained through this study showed a considerable useful knowledge for operation and maintenance of disinfection and elimination processes in small-scale domestic wastewater treatment facilities.