Study on UV Disinfection of Treated Wastewater for Sewage Treatment Plants

Whole term	2005.6～2006.3	

(Purpose)

Treated wastewater has been conventionally treated mainly with chlorine. However, an alternative disinfection technology replacing chlorination is demanded for diverse reasons. For example, special circumstances of water areas (for preservation of rare species) to which treated wastewater is discharged or recycling of treated water for landscape use.

This study aims to survey the background and observed effects of sewage treatment plants where ultraviolet (UV) disinfection systems have already been implemented, and clarify applicability of the UV disinfection technology. Based on the result of survey, this study identifies the mechanism, characteristics, efficient utilization, and performance of UV disinfection and summarizes technical points on planning, design, maintenance, and management of sewage treatment plants using the technology.

(Results)

（1） Applicability

A survey by means of questionnaires was conducted of sewage treatment plants with UV disinfection systems installed, asking for the specific reasons why the UV disinfection technology was selected. About 90 % of the respondents mentioned preservation of aquatic resources and rare species, sources for tap water, and recycling such as for the landscaping use. Our study has also defined these reasons as applicable areas of the UV disinfection technology.

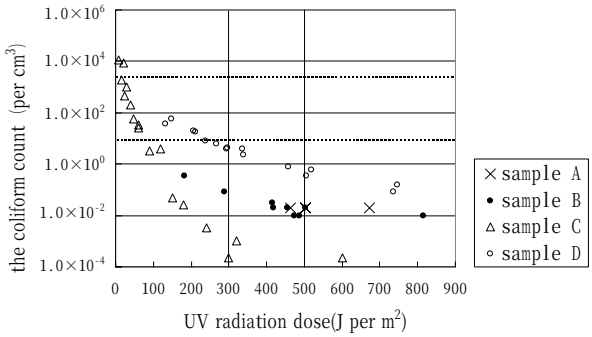

Fig. 1 Relationship between UV radiation dose and coliform count

（2） Design specifications

1） Design wastewater flow

To set the capacity of a UV disinfection system, the design maximum hourly wastewater flow should be adopted.

2） UV transmittance

To set the UV transmittance for a design, we actually measured UV transmittance of wastewater at each sewage treatment plant. For installation of a system to a newly constructed plant, we set a UV transmittance of 70% or more as the standard.

3） Disinfection performance

Figure 1 shows disinfection performance data of samples collected. When a UV radiation dose of 300 to 500J per square meter was applied, the coliform count after disinfection was 10 per cubic centimeter or less in each sample case. Even if we take into consideration a 30-fold increase of coliform count from photoreactivation, the coliform count can constantly be limited within 3,000 per cubic centimeter.

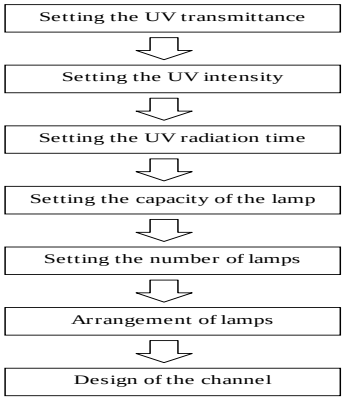

Fig.2 Design procedure for an open channel UV disinfection

Therefore, we concluded that the average disinfection performance immediately after disinfection should be set to 99.9% and that a UV radiation dose of 300 to 500J per square meter (from 30 to 50 milliwatt-second per square centimeter) is required to achieve such performance.

（3） Design

We analyzed design methods for open channel UV disinfection systems and closed chamber UV disinfection systems. Figure 2 shows a procedure for designing an open channel UV disinfection system.

In this study, we conducted model designing as shown in the reference document as well as sorting out design details of each system.

（4） Installation and pilot test

We outlined installation procedures for open channel UV disinfection systems and closed chamber UV disinfection systems. Key points at the time of installing each unit were also studied.

（5） Maintenance

We outlined the operation management, safety controls, and maintenance checks required to maintain a UV disinfection system. As for maintenance checks, we suggested recommended intervals for each check item to be checked, and the frequency of lamp replacement based on the downward curve of UV intensity according to the working hours of various UV lamps.

Collaborators : Japan Institute of Wastewater Engineering Technology, Ishigaki Company, Ltd.,
Ebara Corp., Kubota Corp., Sanki Engineering Co., Ltd.,
Kobelco Eco-Solutions Co,.Ltd., Tsukishima Kikai Co.,Ltd.,
Nishihara Environment Technology Inc., NGK Insulators,Ltd.,
Hitachi Plant Technologies, Ltd., Mitsubishi Kakoki Kaisha,Ltd., Unitika Ltd.
Researchers : Masayuki Matsuura, Takashi Kirihara, Hiroichi Mizukawa, Kiyoshi Yamamoto

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