

Re-evaluation of Disinfection Technology

(Research of FY 2017-2021)

1. Purpose

This study focuses on ultraviolet disinfection technology as a promotion of the treated water reuse. The purpose of the study is to re-evaluate the ultraviolet disinfection technology for the first time after 1998 and reflect the result to design criteria. Besides, JS will develop a disinfection technique using ultraviolet LED.

2. Achievement of This Year

This year, we make a questionnaire survey targeting 147 places published as "disinfection facilities (UV)" on "Statistics of Sewerage in Japan 2014." This survey, as a part of the re-evaluation, aims to know the working condition of adopting the ultraviolet disinfection.

The survey includes four questions which are: facilities profile, the specifications/elements of ultraviolet disinfection facilities, operation performance, and O&M conditions. We got valid responses of 112.

(1) Condition of facilities

- Some facilities adopted UV disinfection in 1998. After that, it increased up to 110 by March 2018. While we see an increase tendency, only two large scale WWTPs with a treatment capacity of more than 10,000m³ per day has introduced it.
- Most of small to middle scale WWTPs apply the infection facilities to OD process or OD process with nutrients removal. In large scale WWTPs, disinfection facilities are applied to CAS process.

- As reasons for the adopting disinfection facilities, 49% respondents answer "to protect aquatic resources of destination" and 39% give "to protect water creatures of destination." They are the top two out of multiple answers.

(2) Elements of the facilities

One hundred eleven facilities adopt disinfection facilities, 83 out of that are an open channel and 28 are a closed channel. Many of both channels have internal exposure type and low-pressure lamp.

(3) Operation performance

- The number of coliform group bacteria in the effluent is about 10/cc or less.
- As effluent quantity increases, the amount and cost of electric power per unit treated water required for ultraviolet disinfection tend to decrease.

(4) O&M conditions

- Smaller effluent quantity tends to need higher costs of maintenance, parts replacement, and repair for ultraviolet disinfection facilities.
- 10% of WWTPs make control when their effluent qualities fluctuate, or their effluent quantities increase. 14% of WWTPs control when their inflow amount decreases.
- 31 WWTPs which is equivalent to 44% change their UV lamps regularly depending on ages. 11 WWTPs, which is the most, do it in two years. On the other hand, 16 WWTPs make their replacement by total irradiation hours instead of ages.

- 14 WWTPs and nine WWTPs make their lamp replacement when the UV light strength descends and when the number of coliform group bacteria increases, respectively.
- 60% of breakdowns or failures relates to a lamp, stabilizer, washing apparatus, and protecting pipes.

3. Conclusion and Future issues

Next year, JS will make a field study at large-scale WWTPs to investigate the operation management at actual facilities. We will make evaluation items clear based on the research result of this year and try R&D and practical application of new ultraviolet disinfection technology.

Keywords: ultraviolet disinfection, O&M
