Promotion of Water Treatment Technology Considering Energy Optimization and Risk Control

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(Key words) energy consumption, hygienic risk

1. Introduction

Sewerage greatly contributes to maintenance of good water environment, removing organic matter, nutrient salt, and harmful microorganisms in sewage. Meanwhile it has been recognized that sewerage service by local governments generates greenhouse gas much more than other services and reduction of greenhouse gas is therefore urgently required and that the sewerage service is facing issues resulting from new demand from society, such as utilization of sewerage resources. This Division has been conducting researches and studies from various viewpoints in order to respond to such new social demand expected for sewage service.

2. Examination of energy optimization in air blowing system

Air blowing system accounts for the most amount of power consumption in sewage treatment facilities, and power saving is a major issue for them. As a specific means for power saving, a technology for controlling air blow rate by grasping required air blow rate by sensor is mentioned. However, specific effect of power saving is not clear since power consumption at a reduced air blow rate varies according to models of air blowers, etc. This study identified the relations between "air blow rate" and "power consumption" by conducting hearings from manufacturers about typical air blowers. Based on the results of this study, we estimated power consumption according to air blow rate control conditions based on results of estimation in model facilities in order to clarify the effect of power saving by the air blow rate control technology.

As an example of the study results, the Table shows the results under the conditions (Case 1: Intake valve, Case 2: Inlet vane) where the air blow rate control method of the cast-iron multi-stage turbo blower (Air blow rate: 107 m^3 / min (6,420 m^3/h), pressure 5,800 mgAq). As compared with the power consumption per unit blow rate during operation at the blow rate equal to 60% of the rate in rated operation, Case 1 increased 21% and Case 2 increased 16.5%, which suggests that the increase rate of inlet vane was lower.

Using these results, we estimated power consumption in the model treatment facilities. As the result of applying the air blow rate control technology, power consumption reduced 23-35% as compared with consumption during operation in constant air blow.

Table: Relations between air blow and power consumption by an air blower control mechanism

		Case1	Case2
Rated	Air blow rate (m^3/h)	6,420	6,420
	Power consumption (kwh)	137	133
	Power consumption per A unit air blow rate	0.0214	0.0207
80% of air blow rate	Air blow rate (m^3/h)	5,136	5,136
	Power consumption (kwh)	119	113
	Power consumption per B unit air blow rate	0.0231	0.0220
	B/A	107.9%	106.2%
60% of air blow rate	Air blow rate (m^3/h)	3,852	3,852
	Power consumption (kwh)	100	93
	Power consumption per C unit air blow rate	0.0259	0.0241
	C/A	121.0%	116.5%

3. Evaluation of hygienic risk control technology for treated water / recycled water

Since recycling of sewage treatment water has been proceeding at home and abroad, it is urgently required to study the risk of using recycled water and performance evaluation of treatment technology. In this study, we first conducted a questionnaire survey on the use of recycled water and organized the recycling methods introduced according to purpose of use in order to consider appropriate treatment method in water use, recycled water use, etc. in the discharge points of sewage treatment water from the viewpoints of hygienic risk (annual infection risk), cost, and energy consumption. Figure shows an example of this survey.

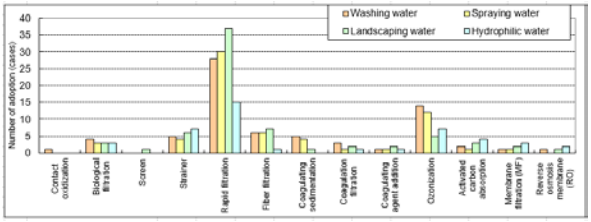

Figure: Number of recycling treatment methods adopted according to purpose of use

The number of rapid filtration method was the largest in each purpose of use and ozonization method was the second largest, except for landscaping water. For landscaping water, which is not directly used by humans, treatment methods that require much power consumption, such as ozonization method, would not be adopted. In contrast, membrane filter method and reverse osmosis membrane method, by which high water quality can be obtained, are relatively adopted as hydrophilic water, which is directly used by humans, although the number of adoption is small.