

Joint Research on Excess Sludge Reduction Technology Using Oxidants (Conventional Activated Sludge Process)

Year of Research

2011~2013

Establishment of energy and resource recycling

(Purpose)

In order to apply the "Sludge Reduction Technology Using Oxidant," the "Manual for Excess Sludge Reduction Technology Using Oxidant (March 2009)" was developed in 2008 for the excess sludge generated from the OD process and long-term aeration process. This research focuses on the excess sludge of the conventional activated sludge process.

The sludge reduction technology is implemented at the Matsuoka Water Resources Reclamation Center in Oita City where the conventional activated sludge process is adopted. The purpose of this study is to evaluate the effect on the sludge and water treatment facilities using the performance data obtained before and after the implementation, and then organize the planning, design, construction and operation and maintenance of the facilities to create the technical manual.

(Results)

(1) Outline of the technology

This technology supplies excess sludge to the sludge reduction facility and destroys the bacterial cell in the sludge using a chemical agent (oxidant) to perform the solubilization process. For application in the conventional activated sludge process, the solubilized excess sludge is returned to the primary sedimentation tank in order to reduce the influent load of the reactor.

(2) Benefits of implementation

1) Effect on the sludge treatment facility

The amount of solid matter generated per influent SS was decreased by 12 to 14% during the period from winter to summer, and we confirmed a sludge reduction effect. Also, reducing the amount of excess sludge removal could shorten the operation time of the mechanical thickening machine. We also confirmed improved dewatering properties due to the increased filter rate of the sludge dewatering machine.

2) Effect on the water treatment facility

The SS, BOD, COD_{Mn}, and T-N in both influent and effluent were almost the same values, and the water quality was fine. However, the T-P was increased by approximately 0.5 mg/L because some phosphorus leaked from the excess sludge.

3) Comparison with excess sludge of OD process, etc.

A summary of operation conditions for each treatment system is shown in **Table 1**. From the results, we found that the excess sludge of the conventional activated sludge process requires a lower chemical agent concentration than that of the OD process.

In the conventional activated sludge process, the HRT of the reactor is shorter than the OD process, and only excess sludge is solubilized. As a result, a lower sludge reduction rate was observed.

Table 1: Summary of operation conditions for each treatment system

Treatment system	Conventional activated sludge process	OD process Long-term aeration process
Treatment factor	0.5 - 0.7	1.5
Chemical agent additive ratio	20%	30%
Concentration of chemical agent	2,000mg/L	3,700mg/L
Reaction time of chemical agent	2 hours	5 hours
Solubilization rate	Approx. 25%	Approx. 25%
Sludge reduction rate	12 - 14%	Approx. 60%
Effect on the sludge treatment facility	Improved dewatering performance	-
Effluent quality	T-P: Increased by 0.5mg/L	T-P: Increased by 1 - 1.7mg/L COD: Increased by 1mg/L
Increased power rate for aeration in an air blower facility	Increased by 20%	Increased by 20%

(3) Cost calculation

When the unit price of dewatered cake disposal is set at 16,000 yen/t and the unit price of chemical agent (oxidant) is set at 100 yen/kg for calculating the cost, cost reductions of 5.6% and 7.6% are expected for sewage inflows of 5,000 m³/day and 50,000 m³/day, respectively.

(Summary)

As a result of the research, the "Manual for Excess Sludge Reduction Technology Using Oxidants (Conventional Activated Sludge Process)" was created.

In the future, we hope that this technical manual is used by sewage works operators as a solution to reduce the cost of sludge disposal.

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Key words

Excess sludge reduction, conventional activated sludge process, oxidant, solubilization