

Research Study for Performance Evaluation of Sedimentation Type High-Rate Filtration Facility in Chishima Waste-water Treatment Plant (Osaka City)

Year of research	2009~2010	Improvement of combined sewer system
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(Purpose)

Osaka City has constructed combined sewer system in about 97 % of city area. So, improvement of combined sewer system is urgent for creating good water environment. Technical development is proceeded in order to increase amount of treated water at wet weather, utilizing existing facilities, because it is difficult to construct new treatment facility by acquisition of new site. In this study, performance evaluation research of “Sedimentation type high-rate filtration facility” was performed. This system was developed to aim to use “Wet weather high-rate sewer treatment system” that was up-flow filtration using floating filter media and was evaluated at SPIRIT21 as an alternative technique of conventional primary sedimentation basin. And this system was improved to be able to operate through wet and dry weather and to set in a part of existing primary sedimentation basin for space saving. Research study for performance evaluation was conducted in actual facility that was constructed in Tisima waste-water treatment plant under the adoption of function upgrading promotion work (new technology utilization type) in new generation sewerage back-up work for 2 years with Osaka city. We evaluated the degree of attainment of high-rate filtration performance target that was determined based on practical realization study using the joint study result above.

Table 1 Result of Dry Weather Survey

Item	Evaluation Condition			Evaluation Items			
	Filtration Rate	Influent Sewer Concentration		Recovery Rate at Dry Weather			Filtrate Water Recovery Ratio
		SS	BOD	SS	BOD	Debris	
	m/day	mg/L(Ave)	mg/L(Ave)	%	%	%	%
Performance Criterion	340, 500	80>	120>	45>	35>	100	90>
1 Aug.17,18/2009	340	46	70	51	23	100	92
2 Aug.26,27/2009	500	50	110	45	21	100	95
3 Nov.9,10/2010	340	81	111	57	43	100	88
4 Dec.9,10/2010	500	70	161	49	29	100	66
5 Dec.15,16/2010	340	66	135	61	32	100	83
6 Jan.25,26/2011	500	72	160	54	24	100	78
Average				53	29	100	84

(Results)

(1) Performance Evaluation of High-Rate Filtration Facility

Results of performance evaluation based on dry and wet weather survey under the fixed filtration rate and continuous operation are following.

①SS Removal Performance : SS removal performance at the dry weather that it had more than 45 % removal rate was judged when influent sewer concentration was over 80 mg/L that was evaluation condition, because removal rates satisfied performance criterion at all investigations. SS removal rate at wet weather was confirmed to satisfy more than 30 %, a performance criterion.

②Debris Removal Performance : Only the third time survey at the wet weather did not satisfy 100 % Debris removal rate but this debris in the filtration water was judged not to come from raw water because it was thought the influence by periphytic alga generated in the filtration tank.

③BOD Removal Performance : Not all of surveys at the dry weather did not satisfy the performance criterion of removal rate, 35 %. BOD removal performance was confirmed to have same removal performance compared with the existing primary sedimentation basin of Tisima waste-water treatment plant even though it had a smaller site. BOD removal rate at wet weather was confirmed to satisfy more than 30 %, a performance criterion.

④Filtrate Water Recovery Rate : 80 % of performance criteria was satisfied at wet weather. On the other hand, decreasing of filtrate water recovery rate was shown according to the passage of operation time in the high-rate filtration facility. More than 90 %, a performance criterion (achievement frequency: more than 85 %), is able to be achieved if selection and conduction of suitable cleaning are performed depending on change of initial filtration head loss.

For all of these reasons, this high-rate filtration facility is confirmed to be useful as an alternative technology of primary sedimentation basin.

(2) Drawing up Performance Evaluation Document

Performance evaluation document was summarized including facility operation and maintenance characteristics based on the past operation record for 2 years.

Table 2 Result of Wet Weather Survey

Item	Evaluation Condition			Evaluation Items			
	Filtration Rate	Influent Sewer Concentration		Recovery Rate at Wet Weather			Filtrate Water Recovery Ratio
		SS	BOD	SS	BOD	Debris	
	m/day	mg/L(Ave)	mg/L(Ave)	%	%	%	%
Performance Criterion	800, 1200	—	—	30>	30>	100	80>
1 Nov.10,11/2009	800	195	163	59	51	100	90
2 Jun.15,16/2010	800	96	108	52	55	100	91
3 Sep.27,28/2010	1200	68	126	58	54	98	86
4 Oct.8,9/2010	1200	70	125	60	51	100	85
Average				57	53	100	88

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Key words	Floating Filter Media, High-Rate Filtration Facility, Alternative Primary Sedimentation Basin, Space Saving
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