2008

Pilot project for environmental technology verification

Technical field of organic wastewater treatment for small-scale enterprises

Technology for organic wastewater treatment in small-scale enterprises (kitchen/restaurant and food manufacturing industries)

The report of result of experimental verification

Outline

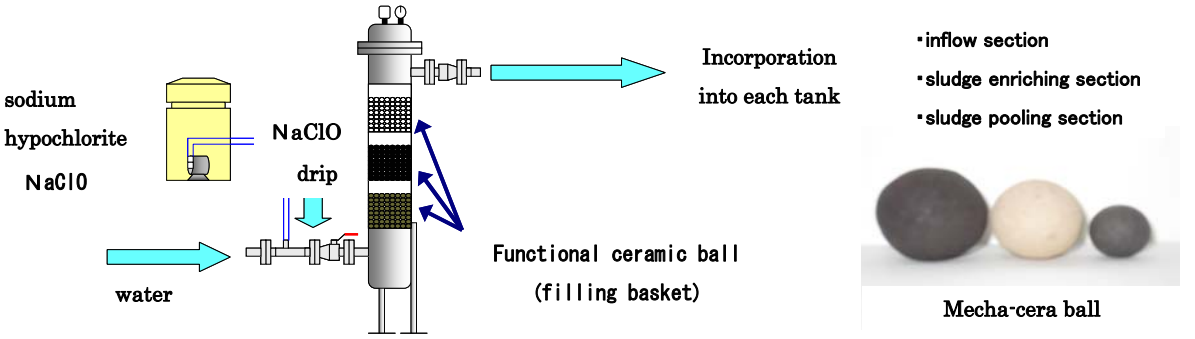
Demonstration institution: Saitama Environmental Analysis & Research Association

Environmental technology developer: SEISUI Corp.

Technology/product name: Mecha-cera device (type SDO-A-100)

Technology verification/environmental technology developer	Ceramic device (type SDO-A-100)/SEISUI Corp.
Demonstration institution	Saitama Environmental Analysis & Research Association
Period of the verification experiment	From September 18 to December 4, 2008
Purpose of this technology	Application of aqueous solution that contains free chlorine (ClO^-) to a ceramic (or mecha-cera ball) that acts as a chlorin oxidation catalyst activates free chlorine and produces nascent oxygen with a strong oxidative effect. Mecha-cera is a system that is effective for reducing the volume and deodorizing sludge with the help of active water that has sufficient oxidizing capability.

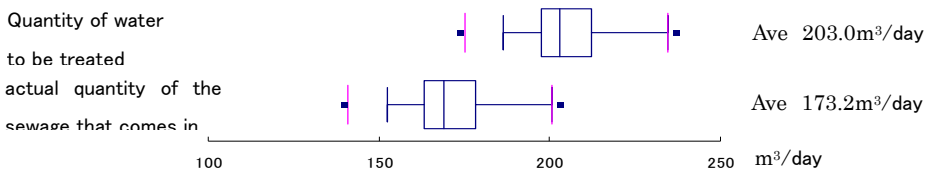
1. Outline of the technology to be verified



[Principle] Air agitation triggers a catalytic reaction after sodium hypochlorite is added and water (or mecha-cera water) that touches the ceramic in the system is injected into the treatment plant. Mecha-cera water with sufficient oxidizing capability resolves the organic substance in wastewater or sludge into CO_2 (carbon dioxide), H_2O (water), and N_2 (nitrogen) and is effective for reducing the volume of the sludge.

2. Outline of the verification experiment

○Outline of the experimental site

Project type	Agricultural commune drainage (the Nakaizumi treatment plant at Mibu-machi Shimotsuga-gun Tochigi)
Project scale (planned value)	Type: JARUS III Planned number of men involved in the treatment: 700 Planned sewage quantity: 189 m^3/day Hourly maximum: 22.8 m^3/h Quality of influent: BOD 200 mg/L Quality of treated water: BOD 20 mg/L
Address	171 Nakaizumi Oaza Mibu-machi Shimotsuga-gun Tochigi
Quantity of wastewater during experimental verification	

○Specifications and performance of the equipment to be verified

Category	Item	Specifications and performance
Outline of the facility	Type	SDO-A-100
	Size/Weight	216.3 mm (ψ) × 1,888 mm (body length：1,488 mm) 117 kg (including 25 kg for ceramic fill)
Design conditions	Object	Amount of sludge
	Amount of wastewater per day	Maximum: 270 m^3/day (adjustable to 50 m^3/day)
	Treatment object	Volume loss of sludge by more than 70%

3. Results of the verification experiment

We measured the amount of sludge before and after the verification device was introduced to compare the values. The amount of sludge was 14.8 m^3 in June 2008, when the verification device had not been introduced. After the device was introduced, the amount of sludge was measured twice. The amount was 11.1 m^3 in September 2008 and 14.8 m^3 in November 2008.

Regarding the sludge properties, SS was 28,000 mg/L, solid content 2.90%, and water content 97.1% before the device was introduced. After the device was introduced, SS was 30,700 mg/L, solid content 3.15%, and water content 96.8% in September 2008, while SS was 37,800 mg/L, solid content 3.80%, and water content 96.2% in November 2008. This result showed that the sludge density increased and water content decreased after the device was introduced.

Amount of sludge and its properties before and after the introduction of the verification device

Month when sludge was carried out	June 2008	September 2008	Novenber 2008
Mecha-cera device	before the device was introduced	after the device was introduced	
Amount of sludge(㎥)	14.8	11.1	14.8
SS of sludge(mg/L)	28,000	30,700	37,800
Solid content(%)	2.90	3.15	3.80
Water content(%)	97.1	96.8	96.2

Since approximately 12~16 m^3 of sludge was regularly removed once a month before the introduction of the device, we used the data for June 2008 to represent a standard value and determined the volume loss rate of sludge by calculating the amount of sludge per month after the introduction of the device. As a result, from July to September 2008 the amount of sludge was 3.7 m^3 per month and volume loss rate of sludge 75%. From October to November 2008, the amount of sludge was 7.4 m^3 per month and volume loss rate of sludge 50%. The five month average for the amount of sludge was 5.18 m^3 per month and volume loss rate 65%.

Amount of sludge and volume loss rate of sludge before and after the introduction of the verification device

Month when sludge was carried out	June 2008	July 2008	August 2008	September 2008	Octorber 2008	Novenber 2008	Averege from July to November 2008
Mecha-cera device	before the device was introduced	←	after the device was introduced			→	
Amount of sludge(㎥)	14.8	3.7	3.7	3.7	7.4	7.4	5.18
Volume loss rate of sludge(%)		75.0%	75.0%	75.0%	50.0%	50.0%	65.0%

After determining the amount of SS contained in the sludge, we calculated the total amount of SS before and after the introduction of the device in order to further examine the components of the volume loss. In June 2008, when the device had not been introduced, the total amount of SS contained in the sludge was 414.40 kg. Meanwhile, from July to September 2008 the total amount of SS was 113.59 kg per month and volume loss rate of SS 72.6%. From October to November 2008, the total amount of SS was 279.72 kg per month and volume loss rate of SS 32.5%. The five month average for the amount of SS was 177.42 kg per month and volume loss rate of SS 57.2%.

Formula | Total amount of SS (kg) = SS contained in sludge (mg/L) × amount of sludge (m^3)

Total amount of SS contained in sludge and volume loss rate of SS

Month when sludge was carried out	June 2008	July 2008	August 2008	September 2008	Octorber 2008	Novenber 2008	Averege from July to November 2008
Mecha-cera device	before the device was introduced	←	after the device was introduced			→	
SS of sludge(mg/L)	28,000	30,700	30,700	30,700	37,800	37,800	34,250
Amount of sludge(㎥)	14.8	3.7	3.7	3.7	7.4	7.4	5.18
Total amount of SS(kg)	414.40	113.59	113.59	113.59	279.72	279.72	177.42
Volume loss rate of SS(%)		72.6%	72.6%	72.6%	32.5%	32.5%	57.2%

Taking the above into consideration, it is assumed that both the amount of sludge and total amount of SS were reduced by 60% per month during the verification period.

○Environmental impact

Item	Verification result
Noise	Treatment facilities and neighboring areas: 53 dB
Odor	Odor index: less than 10

○Used resources

Item	Verification result
Amount of electric energy	5.7 kWh/day
Amount of chemical used for wastewater treatment	Sodium hypochlorite 20 kg/3 months

○Operation and maintenance of the performance item

Maintenance item	Maintenance time per operation and maintenance frequency	Number of persons and skills required for maintenance
Periodic check	2 h/once a week	2 persons/knowledge on operation and maintenance
Cleaning of mecha-cera ball	1 day/once in six months	1 person/knowledge on operation and maintenance

○Qualitative remark

Item	Remark
Remark on water quality	We observed the influence of mecha-cera water exercises on the processing unit and effluent water quality, and found that the exercises did not influence these two parameters.
Time required for start-up	1 month (2 days for installation and 1 month for the whole procedure including trial operation)
Time required for shutdown	1 min
Reliability of the equipment intended for verification	During the verification test, the pipes unfastened because they had been temporarily installed in the existent treatment facility, but it was repaired immediately. There was no problem with the body of the equipment.
How to solve the problems	The instruction manual provided information on solving problems.
Evaluation of the instruction manual of operation and maintenance	How to solve the problems
Others	・The equipment was designed in such away that it was installed on the ground making it easy to fit it within limited space. In addition, it can be installed either indoors or outdoors depending on the conditions of the facility and almost all the operations are carried out automatically. ・It is necessary to find out a structural way to prevent the sludge from accumulating in the tank after it has been effectively exposed to the mecha-cera water. ・It is necessary to find out a way to supply mecha-cera water depending on the amount of influent wastewater. ・Since the equipment intended for verification is capable of operating depending on the type and the amount of influent water at each facility, it can be installed not only at wastewater treatment facilities for agricultural use but also at facilities that adopt other ways of purification. ・Volume loss of sludge decreases the amount of sludge by 60% per month, thereby ensuring that this procedure is cost-effective

Remark on water quality

	Item	before the introduction of the device (form September to december 2007)	during the verification test
quality Influent water	BOD	86.6 ～ 165 mg/L (123.7mg/L on average)	73 ～ 196 mg/L (117mg/L on average)
	SS	116 ～ 185 mg/L (144.2mg/L on average)	82 ～ 218 mg/L (129mg/L on average)
	Total nitrogen	16 ～ 24 mg/L (21.2mg/L on average)	15 ～ 34 mg/L (23mg/L on average)
	Total phosphorus	2.2 ～ 2.8 mg/L (2.4mg/L on average)	1.6 ～ 4.4 mg/L (2.7mg/L on average)
quality Effluent water	BOD	5.4 ～ 19.5 mg/L (9.9mg/L on average)	0.9 ～ 7.5 mg/L (2.9mg/L on average)
	SS	less than 10 mg/L	less than 10 mg/L
	Total nitrogen	10 ～ 16 mg/L (13mg/L on average)	10 ～ 14 mg/L (12mg/L on average)
	Total phosphorus	1.1 ～ 1.8 mg/L (1.3mg/L on average)	0.9 ～ 1.8 mg/L (1.4mg/L on average)

((Reference information)

Notice: The information on this page is supplied by a environmental technology developer who is responsible for the technical bulletin, and it is an exception to the verification.

○Product data

Item		Blank for environmental technology developer
Name/type		Mech-cera device/SDO-A-100
Manufacturer (Distributor)		SEISUI Corp.
Contact address	TEL/FAX	TEL (022)292-5595/FAX (022)292-5598
	Web address	http://www.seisui.jp
	E-mail	sendai@seisui.jp
Size/weight		216.3mm (ψ) × 1,888 mm (Body length：1,488 mm) 117 kg（including 25 kg for ceramic fill）
Necessity for pre-treatment and post-treatment		No
Supplementary facility		Submerged pump, chlorine drip, strainer, control board
Life of the equipment intended for verification		20 years
Time for initiation		1 month (2 days for installation and 1 month for the whole procedure including trial operation)

Approximate cost (yen)	Expense item	Unit price	Quantity	Total
	Initial cost			13,450,000
	Body type SDO-A-100		1 set	13,200,000
	Installation expense (including trial operation)		1 set	200,000
	Transportation expense		1	50,000
	Running cost (monthly)			
	Electric power consumption	15 yen/kWh	330 kWh	4,950
	Maintenance expense	25,000 yen/month	1 set	25,000
	Other consumption articles (sodium hypochlorite)	3,000 yen/month	3 cans	9,000
	per 1 m^3 of treated wastewater (with the condition that the inflow is 270 m^3/day) ※The disposal cost of sludge is not included.			Approximately 7 yen

○Other information from the manufacturer

・Mecha-cera device cuts down the running cost and maintenance fee.
・The device offers a technology that is adaptable to the wastewater treatment facility.
・Type HES is capable of purifying the air of sewage treatment facilities, drainage treatment facilities for agricultural use, food factories and large ironworks, resolving organic solvents for NOx and SOx removal equipment, spent hydrochloric acid and sulfuric acid neutralization process equipment at plating factories, and titanium oxide air cleaner,,and deodorizing or oxidatively resolving eight malodorous substances such as toluene, xylem, hydrogen sulfide, and ammonia
・The device can be installed in facilities that treat more than 5 m^3 of wastewater in a day. This technology can be use irrespective of the amount of influent water.
・Type ODS exercises an effect on treating wastewater from the food factories and kitchens as well as oily wastewater from car factories. Therefore, it reduces waste and cuts down the running cost and maintenance fee to a large extent.