2007

Pilot Project for Environmental Technology Verification

Technical field： Organic wastewater treatment for small-scale enterprises

Organic wastewater treatment for small-scale enterprises
(kitchen/restaurant, food manufacturing industry)

A report on experimental verification results

Demonstration institution: Saitama-prefectural Environmental Analysis & Research Association

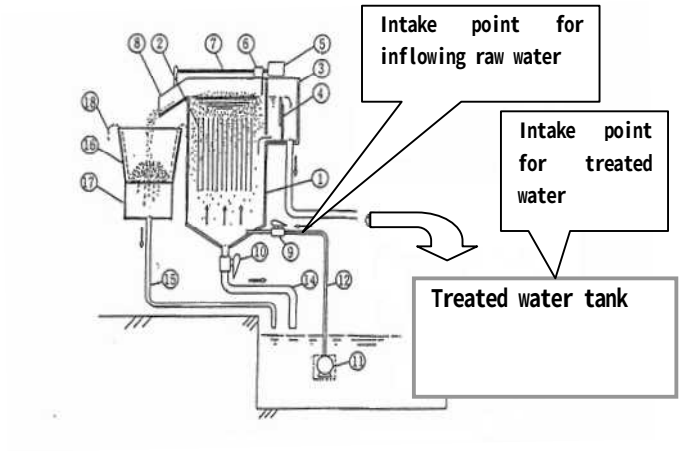
Environmental technology developer: NT labo Co. Ltd

Technology/product name: Electrolytic wastewater treatment unit (DZ101KC)

Electrolytic wastewater treatment unit developed by NT labo Co., Ltd.

Technology intended for verification /environmental technology developer	Kitchen wastewater treatment facility/NT labo Co., Ltd.
Demonstration institution	Saitama-prefectural Environmental Analysis & Research Association
Period of the experiment for verification	From October 24, 2007 to January 31, 2008
Purpose of this technology	This technology includes a system that makes the oil in organic wastewater rise to the surface for collection by an electrolytic response. The system works as a unit that removes oil and as an auxiliary unit for grease interceptor that improves the quality of wastewater.

1. Outline of the technology intended for verification

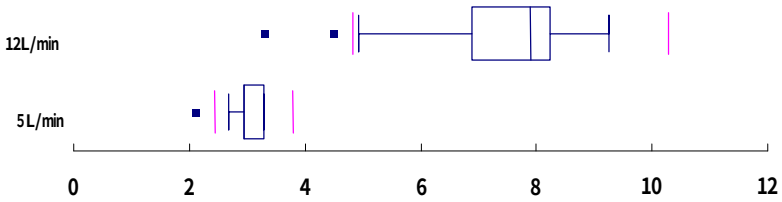


Principle

In the electrolysis tank, wastewater is electrified between the anode (aluminum electrode) and cathode (iron electrode). Then, aluminum hydroxide generated by the anode adsorbs the pollutant, and transforms it into floc. Hydrogen gas generated by the cathode raises the floc to the surface, which separates the pollutant from wastewater.
This technology is environment-friendly without chemical usage.

2. Outline of the verification experiment

○Outline of the location for performing the verification experiment

Project type	Student's cafeteria (cafeteria #1, building #6 of Nippon Institute of Technology)
Project scale	Total floor area: 1404.7 m^2 Number of seats: 1,000
Address	4-1 Gakuen-dai Miyashiro-machi Minami-saitama-gun Saitama
Amount of wastewater during the verification experiment (L/min)	 ※What was calculated in the verification experiment was not the total amount of wastewater treated at the experiment location, but the amount of two types of wastewater transferred by the metering pump.

○Specifications and performance of the equipment used for verification

Category	Item	Specifications and performance
Outline of the facility	Model	DZ101KC
	Size and weight	*W* =770 mm×*D* =1,300 mm×*H* = 1,300 mm 100kg
Design conditions	Object	Normal-hexane extracts(*n*-Hex) biochemical oxygen demand(BOD)
	Amount of wastewater per day	Actual result: 7.5 m^3/day (12 L/min setting) 2.9 m^3/day (5 L/min setting)
	Treatment object	*n*-Hex less than 30 mg/L (the original setting was more than 90% of removal rate for both *n*-Hex and BOD).

3. Results of the verification experiment

◯ Water quality verification items

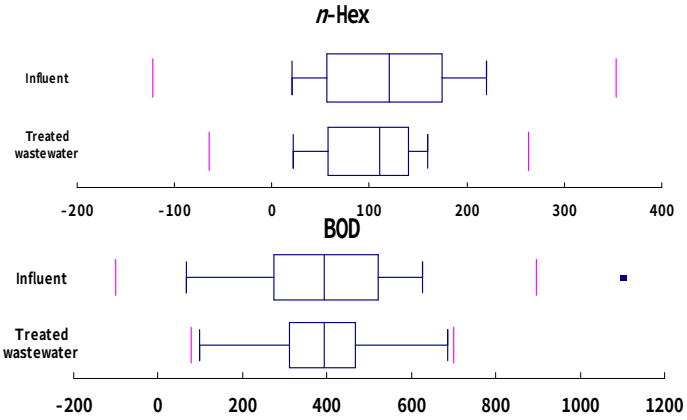
Items	Unit	Verification result (bottom line-top, median) upper: result of the research #1～#4*2 lower: result of the research for improvement and follow-up		
		Influent	Treated wastewater	Removal rate (%)*1
n-Hex	mg/L	20-220 (120)	22-160(110)	8.3-38.9 (25.7)
		24-110 (60)	6-36 (20)	25-91.9 (66.7)
BOD	mg/L	66.4-625 (394)	99-685 (393)	1.0-60.3 (23.2)
		167-463 (318)	122-337 (224)	7.5-38.5 (14.1)

*1. The removal rate was calculated according to the formula Rate=[(pollution loading amount of influent)-(pollution loading amount of treated wastewater)]/(pollution loading amount of influent)

*2. The results of the research #1～#4 indicates the water quality in the daily research, the weekly research, the regular research#1～#4.

(1) Result of the research #1～#4

According to the result of the research #1～#4, the removal rates for both *n*-Hex and BOD were low under the following operating conditions:(12L/min, voltage=5 V, current=20 A)

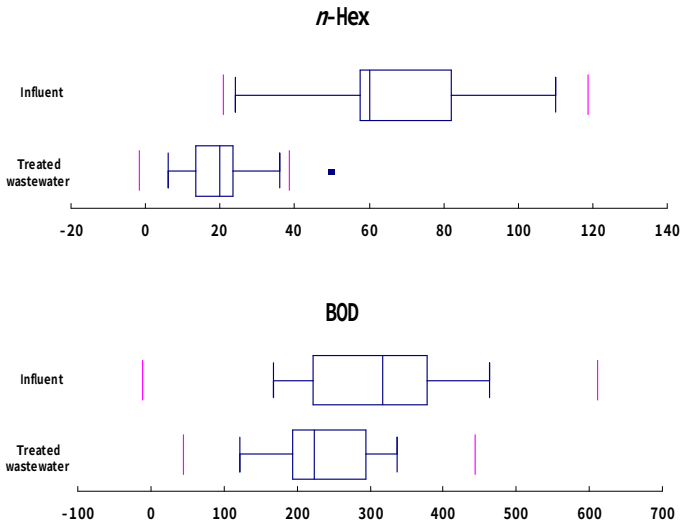


(2) Result of the research for improvement and follow-up

After the examination by the verification committee, the operating conditions were improved and the following results were obtained.

Improved specifications: The inflow was changed from 12 to 5 L/min, the voltage was changed from 5 to 8 V, and the current was changed from 20 to 40 A.

As a result of the improvement, the removal rate of *n*-Hex increased, and therefore, the quality of the wastewater met the quality standards (less than 30 mg/L). Moreover, the removal rate of BOD increased, although, this increase was not sufficient to make the wastewater quality meet the quality standards.



○Environmental impact items

Items	Verification result
Amount of sludge	~3.7 kg/day as oily industrial wastes (content: 69.3%)
Amount of wastes	Nothing remarkable other than sludge
Noise	65 dB in treatment facilities,63 dB in neighboring areas
Odor	Odor index: less than 10

○Used resources index

Items	Verification result
Amount of electric energy used	Electrolysis voltage: 5 V current: 20 A 0.14 W/L voltage: 8 V current: 40 A 1.07 W/L
Amount of chemical used for wastewater treatment	No chemical was used
Wastage of the aluminum sheet used as electrodes	The aluminum sheet (7.2 kg) to which a voltage of 5 V and a current of 20 A is applied should be changed every 450 h.(erosion 37.5% of the weight) The aluminum sheet (7.2 kg) to which a voltage of 8 V and a current of 40 A is applied should be changed every 130 h. (erosion 17.9% of the weight)

○Operation and maintenance performance item

Maintenance items	Maintenance time per operation and maintenance frequency	Number of people and skill required for maintenance
Periodic check	60 min (twice a month)	One person having knowledge of operation and maintenance
Replacement of aluminum sheets	30 min (once every 600 h for electrolysis)	one person having knowledge of operation and maintenance

○Qualitative remark

Items	Remark
Remark on water quality	Although the desired water quality after the treatment could not be achieved the quality of the wastewater after *n*-Hex met the waste quality standards (less than 30 mg/L) , as seen in the follow-up research after improvement(the average was 22 mg/L.) . In addition, it is expected that technical improvements such as batch-type operation might improve the removal performance. 5 L/min  Influent Treated wastewater Batch exprriment  Inflow 15 30 45
Time required for initiation	30 min(one person)
Time required for shutdown	1 min
Reliability of the equipment intended for verification	There was no trouble with the equipment intended for verification during the period of the verification experiment.
How to solve the problems	The instruction manual is useful for solving problems.
Evaluation of the instruction manual of operation and maintenance	There is nothing in particular to be improved.
Others	Although the grease trap had been cleaned once a week normally, that was not cleaned during three months under the examination.

(Reference information)

Note: The information on this page is what the environmental engineering developer applied on behalf of the technical bulletin on his own responsibility, and is an exception to the verification.

◯Product data

Items		Description given by the environmental-technology developer
Name/type		Electrolytic wastewater treatment unit (DZ101KC)
Manufacturer (distributor)		NT labo Co., Ltd.
contact address	TEL／FAX	TEL: (048)940-2243 FAX: (048)940-2246
	Web address	http://www.nt‐labo.co.jp
	E-mail address	info@nt-labo.co.jp
Size and weight		*W* =770 mm×*D* = 1,300 mm×*H* = 1,300 mm 100kg
Necessity for pre-treatment and post-treatment		None
Supplementary facility		As for the treated wastewater and after-load raw water, the installation of a sedimentation tank or an overflow weir after treatment tank is required for settling the suspended solids(SS).
Life of the equipment intended for verification		More than 10 years for vinyl chloride and steel work
Time for initiation		30 min (performance in the verification experiment)

Approximate cost (yen)

Data with the * mark are calculated from the result of the verification experiment

		Unit price	Quantity	Total
Initial cost				2,200,000
	main body DZ101KC	2,000,000	1	2,000,000
	Installation costs(including trial operation)	150,000	1	150,000
	Transportation cost	50,000	1	50,000
Running cost (monthly)				79,475
	Electric power consumption cost	20 yen/kWh	580 kWh	11,600
	Maintenance cost	30,000 yen/month	1	30,000
	Waste disposal cost Waste transportation cost	25 yen/kg 25,000 yen/use	215 kg (8.6 kg/day)	*5,375 *25,000
	Other expenses(aluminum sheet)	2,500 yen/sheet	6 (used for two months)	*7,500
	Cost per 1 m^3 of treated wastewater (the amount of treated wastewater is assumed to be 220 m^3/day).			361 yen

◯Information from other manufacturers

- Contrary to the aim of the verification experiment, the system could not treat the expected inflow sufficiently. However, after the improvement, the removal of *n*-Hex was affected.
- Low-priced electrodes are used for removal by electrolysis, which realizes high performance and low running cost.
- You can customize the size and the performance of the unit, depending on the circumstances.
- Once the unit is installed, you can operate it on the same day.