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○ Overview

Technology intended for verification	Meat processing factory corresponding type Greaseeco FOS-900-1200
verification applicants	Daitogiken Co., Ltd.
Demonstration institution	Saitama-ken Environmental Analysis & Research Association
Period of the experiment for verification	November 25, 2010 to November 26, 2010
Purpose of this technology	This device incorporating the verified technology was developed as one of the organic wastewater treatment devices for food-processing plants. In the plant where the verification test was performed, wastewater containing a high concentration of fat is discharged in the process of boiling chicken bones and the pollution load is very high. However, by installing this treatment device, the pollution load is reduced for treated wastewater that subsequently flows into wastewater treatment facilities.

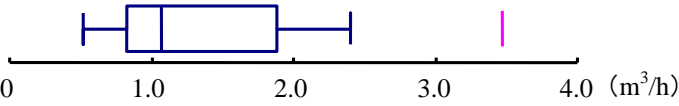
1. Outline of the technology intended for verification

<p>Flow diagram (Same flow of wastewater as the verification experiment.)</p>	<p>Principle</p> <p>The treatment device^{*1} (within the yellow frame) separates the fat in the overflow of the cooking liquid discharged in the process of boiling chicken bones while its fat concentration is still high. The fat in the wastewater is easily separated due to the difference in gravity between fat and water, and the floating fat is collected.</p>

*1 : An actual device incorporating the verified technology was used for this verification test.

2. Outline of the verification experiment

(1) Outline of the location for performing the verification experiment and conditions of the place for performing the verification experiment (equipment · influent quantity)

Project type	Meat processing factory (Naoetsu-Yushi Co. Ltd., Joetsu, Niigata)	
Address	2447 Higashi-nakajima, Joetsu, Niigata, Japan	
Project scale	Boiling tank 2machines (0.5 m ³ and 1.5 m ³)Quantity of Chicken bones boiling about3,000 kg/day	
Influent quantity into the equipment intended for verification (Box plot *2)	Influent quantity 3.98 m ³ /day	
	*2: For the box plot, see “How to Read the Box Plot” (for Reference) (Page 24 of the main section in the detailed part).	

(2) Specification and performance of the equipment used for verification

Category	Item	Specifications and water treatment capacity
Outline of the facility	Model	FOS-900-1200
	Size and weight	Body of equipment for verification experiment W1,200mm×D860mm×H900mm · 200kg
Design conditions	Object	n-hexane extract content (n-Hex)
	Water treatment capacity per day	Maximum 144 m ³ /day (Case of continuous operation for 24 hours)
	Treatment object	n-hexane extract content (n-Hex) Reducing rate of concentration 90% or over.

3. Discussion of utilization of examination data that investigated in the past for purpose of shortening in verification examine.

The same type of device was installed in another facility and a verification test was conducted on March 20, 2008; the test data is shown as the water quality concentration in the following table. The Saitama-ken Environmental Analysis & Research Association (First Conference) examined the feasibility of shortening the verification test period based on this test data. It was concluded that the period could be shortened because the test data indicated a very high and stable reduction ratio for n-Hex and BOD, while also considering the “2009 Verification Test Report”^{*1} (Verification Nos. 020-0902 and 020-0903) for the same type of device in this project.

The result of existing data (March 20, 2008) : Concentration water quality

Water sampling day	n-hexane extract content (n-Hex)			Biochemical oxygen demand (BOD)		
	Influent (mg/L)	Treated wastewater (mg/L)	Reducing rate (%)	Treated wastewater (mg/L)	Influent (mg/L)	Reducing rate (%)
March 20, 2008	2,100	160	92.4	17,800	1,050	94.1
	4,500	280	93.8	42,800	5,530	87.1
	4,700	96	98.0	41,100	749	98.2
	7,900	160	98.0	44,800	2,550	94.3
Minimum value	2,100	96	92.4	17,800	749	87.1
Maximum value	7,900	280	98.0	44,800	5,530	98.2
Average value	4,800	170	95.6	36,600	2,470	93.4

*1: The verification examination result report of technical field of organic wastewater treatment for small-scale enterprises in environmental technical verification (2009) sees http://www.env.go.jp/policy/etv/list_20.html#B02 .

4. Results of the verification experiment

4.1 Water quality verification experiment

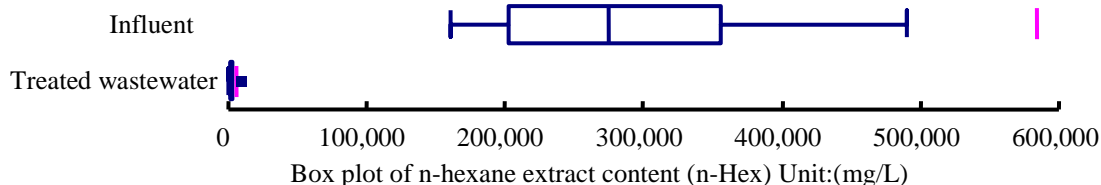
The wastewater that was discharged from the place where the treatment device was installed in the food processing plant (where the verification test was conducted) was the overflow of cooking liquid from the process of boiling chicken bones, and so it contained a high concentration of fat. The concentration of n-hexane extract (n-Hex) in the influent fluctuated significantly because the boiling was performed as a batch process. In the verification test, 98.4% of the n-hexane extract (n-Hex) was removed, achieving the target removal ratio of at least 90%. Thus, the removal ratio of fat by this device is very high.

Results of the verification experiment [n-hexane extract content (n-Hex) is indicated below.]

Measurement value	Influent		Treated wastewater		Removal ratio
	Minimum to maximum value	Average value	Minimum to maximum value	Average value	
Concentration of water quality (mg/L)	160,000~490,000	290,000	960~8,200	2,900	_*2
Pollution load (g/hour) [The unite of total amount is (g/2days)]	40~550	2,030	0.34~24	33	98.4%

*2 : Since the removal efficiency is calculated based on the pollution load, it is not indicated in the water quality concentration field.

The verification test results, particularly the box plot for the water quality concentration, show that the concentration of substances in the treated wastewater is within a fixed range. This indicates that the wastewater treatment is stable although some measurement values show a high concentration of the substance



*Results of biochemical oxygen demand (BOD) are as follows for reference.



Verification examination results of reference test item [Biochemical oxygen demand (BOD) is indicated below.]

Measurement value	Influent		Treated wastewater		Removal ratio
	Minimum to maximum value	Average value	Minimum to maximum value	Average value	
Concentration of water quality (mg/L)	220,000~669,000	402,000	2,890~14,400	6,070	_*1
Pollution load (g/hour) [The unite of total amount is (g/2days)]	55.5~743	2,770	0.623~41.6	64.1	97.7%

*1 : Since the removal efficiency is calculated based on the pollution load, it is not indicated in the water quality concentration field.

4.2 Operation and maintenance item

(1) Environmental impact item

Item	Verification result	
Amount of sludge	No sludge is generated because the wastewater was the overflow of cooking liquid from the boiling unit.	
Amount of wastes	Only a slight amount of waste was attached to the fat collection belt. The device was cleaned once a day at the location where the verification test was conducted.	
Noise	The verification equipment did not produce significant noise during operation compared with the surrounding noise.	
Odor	The verification equipment did not produce abnormal odor while it was operating or stopped.	
Recovery of valuables	Amount of fat collected during the verification test period: 378.76 (L/2 days)	 <p>Greaseeco (verification equipment)</p> <p>Recovery oil</p> <p>Oil tank</p>
		<p>Status of fat collection (in the wastewater treatment room)</p> <p>The collected fat is used as fuel for the heat source.</p> 


(2) Used resources index

Item	Verification result
Amount of electric energy used	40 W/h
Amount of chemical used for waste water treatment	No chemicals, biochemicals or aeration were used.

(3) Operation and maintenance performance item

Maintenance item	Maintenance time per operation and maintenance frequency	Number of people and skill required for maintenance
Check before use	10 minutes/day, (Starting work) Assembling the motor and belt. Check of water quantity	One person without any special skills is required.
Recovery of oil	Recovery oil in treatment 2 ~ 3 times 10minutes / time	One person without any special skills is required.
Cleaning of the equipment intended for verification	10minutes / day (After the finishing work) Dismantlement of the motor and belt, washing and drainage work.	One person without any special skills is required.

(4) Qualitative remark

Item	Remark												
Remark on water quality	<p>The influent into the treatment device at the verification test location contains a high concentration of fat (maximum about 50%), and the wastewater volume fluctuates. However, since the removal ratio of fat by the device is very high and stable, it is suited for treating wastewater containing a high concentration of fat. In addition, since no chemicals are used and high heat is not applied, the separated fat degenerates only very slightly and the collected fat is reused. Furthermore, by collecting the fat, the pollution load on subsequent wastewater treatment facilities can be reduced. In this food processing plant, although the membrane separation process is used in subsequent wastewater treatment facilities, the membrane does not become clogged, no other operational problems occur and good treated wastewater is obtained.</p>  <table border="0"> <tr> <td></td> <td style="text-align: center;">Left: Influent</td> <td></td> <td style="text-align: center;">Light: Treated wastewater</td> </tr> <tr> <td>n-Hex</td> <td style="text-align: center;">490,000mg/L</td> <td>n-Hex</td> <td style="text-align: center;">960mg/L</td> </tr> <tr> <td>BOD</td> <td style="text-align: center;">669,000mg/L</td> <td>BOD</td> <td style="text-align: center;">2,890mg/L</td> </tr> </table>		Left: Influent		Light: Treated wastewater	n-Hex	490,000mg/L	n-Hex	960mg/L	BOD	669,000mg/L	BOD	2,890mg/L
	Left: Influent		Light: Treated wastewater										
n-Hex	490,000mg/L	n-Hex	960mg/L										
BOD	669,000mg/L	BOD	2,890mg/L										
Operations required for initiation	The quantity of water in verification equipment confirms reaching regulated amount, and the power switch was turned on.												
Operations required for shutdown	The power switch was turned off												
Reliability of the equipment intended for verification	No trouble occurred in the verification equipment during the experiment.												
How to solve the problems	If a trouble occurs, contact the manufacturer (applicant for verification).												
Evaluation of the instruction manual of operation and maintenance	The instruction manual for operation and maintenance was easy to understand.												
Others	This verified device collects the separated fat, which can be reused as a substitute for fuel oil A. Therefore, the cost for purchasing fuel and for disposing of industrial waste can be reduced, and the pollution load on subsequent grease traps, domestic wastewater treatment tanks and facilities can also be reduced. In addition to reducing the cost, the device will help reduce CO ₂ emissions and environmental load.												

5. Reference information

The information shown in this chapter is provided by the applicant for verification at its responsibility for publication of the technical data and not the subject of the verification experiment. The Ministry of the Environment and the organization conducting the verification experiment are not responsible for the information in this chapter.

○ Product data

Items		Column to be filled in by the applicant for verification				
Name/type		Meat processing factory corresponding type Greaseeco FOS-900-1200				
Manufacturer (distributor)		Daitogiken Co.,Ltd.				
Contact address	TEL / FAX	TEL (0282) 28-0606 / FAX (0282) 28-1221				
	Web address	http://www.greaseeco.co.jp				
	E-mail	daito@greaseeco.co.jp				
Size and weight		W1,200mm×D860mm×H900mm about 200kg				
Necessity for pre-treatment and post-treatment		None				
Supplementary facility		None				
Life of the equipment		20 years for the main body and 4 years for the driving parts (The warranty period is one year. The equipment has been used for 3 years to date, without failure.)				
Time for initiation		The equipment can be used immediately after installation.				
Approximate cost (yen)		Expense item	Unit price	Quantity	Total	
		Initial cost				~
		Body type	13,500,000 yen~	1 set	13,500,000 yen~	
		Delivery cost	150,000 yen~	1 set	150,000 yen~	
		Installation work	300,000 yen~	1 set	300,000 yen~	
		Running cost (monthly)				
		Electric power consumption	22.8 yen/kW	40W/h	60.2 yen/month ^{*1}	
		Per 1 m ³ of treated wastewater (Actual verified quantity 87.6 m ³ /month: 3.98 m ³ x operation for 22 days)			0.7 yen/m ³ ·month	
Note: The cost of disposing of food waste is not included. Periodic maintenance and inspection can be performed by the user. *1: This amount is calculated when the equipment is operated 3 hours a day for 22 days.						

○ Other information from the manufacturer

- The most suitable GreaseEco model can be selected according to specific installation plans. However, our on-site investigation is required in order to obtain the highest effects at the lowest cost. Also available are custom models and designs based on the field conditions.
- The device uses no biochemicals, enzymes or adsorbents.
- Since the pollution load is reduced, the scale of wastewater treatment facilities can be reduced to 1/2 to 1/4 or less of the usual scale.
- The construction cost of wastewater treatment facilities can be reduced to 1/3 to 1/4 of the usual cost.
- This device can be effectively used for pretreating wastewater before the membrane process. The membrane does not become clogged and the treated wastewater can be reused.
- This device has been adopted for 3 years by a food processing factory near the place where the verification test was conducted.
- The volume of generated sludge is reduced to 1/10 or less. No sludge is generated in subsequent wastewater treatment facilities in summer, and the sludge volume can be substantially reduced.
- The plant that uses this device reuses the collected fat as fuel for the biomass boiler, reducing the use of oil and fuel oil A, and reducing global warming.
- The treated wastewater in the factory can be reused as recycled water. (It can be used to melt snow in winter.)
- The food processing plant that boils chicken bones reduced their production cost by using this device.
- Ryozo Noguchi, assistant professor at the Graduate University of Tsukuba, released a research paper on “Reduction of cost and CO₂ emission by collecting animal and plant fat from wastewater” in the plant that introduced this device and where the verification test was conducted.
- This device can be used for various businesses such as ramen restaurants, school and company cafeterias, feeding centers, food factories, and other businesses using fryers and steamers.