○ Overview

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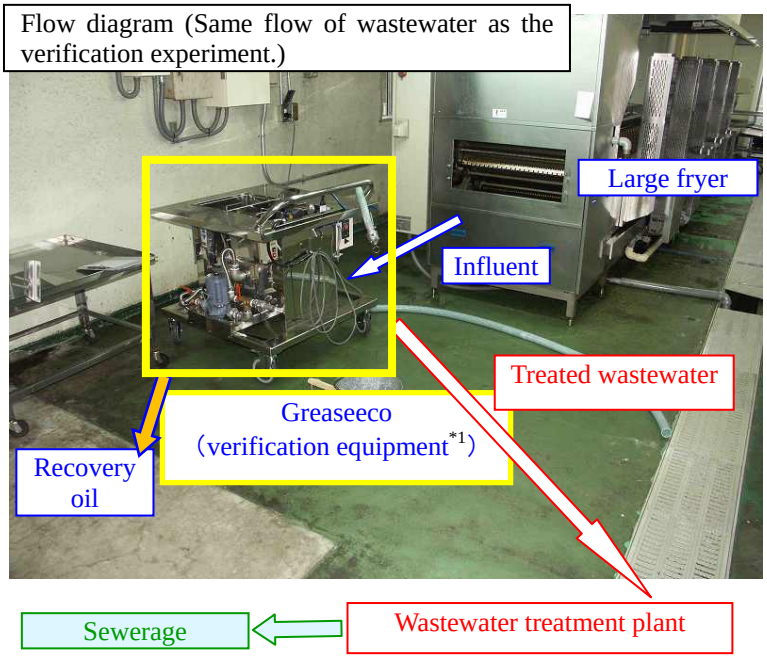
Technology intended for verification / verification applicants	Oil separating recovery equipment for washing large fryer Greaseeco 850-850MFP / Daitogiken Co.,Ltd.
Demonstration institution	Saitama-ken Environmental Analysis & Research Association
Period of the experiment for verification	November 17, 2011 ~ November 18, 2011
Purpose of this technology	This verified technology has been adopted for an organic wastewater treatment device that treats wastewater discharged from washing large fryers. In many cases, hot water is used for washing large fryers and the fat concentration in the wastewater is high. The movable device incorporating this verified technology separates and collects the fat in the wastewater, reducing the pollution load.

1. Outline of the technology intended for verification

Flow diagram (Same flow of wastewater as the verification experiment.)



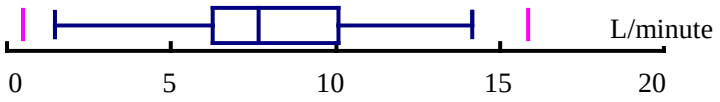
Principle

This device*1 (within the yellow frame) separates the fat contained in the wastewater discharged after washing large fryer while the fat concentration is still high. The fat in the wastewater is easily separated due to the difference in specific gravity between fat and water, and then the floating fat is collected.

*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	school lunch service center
Project scale	Large belt-conveyor fryer: One set (cooks about 5,000 servings of fried food a day)
Address	19 Kayama, Hidaka-shi, Saitama
Influent quantity into the equipment intended for verification *2 (Box plot *3)	influent quantity 219L/2days  *2 : For influent quantity, see Section 7.1 "Results of Monitoring Items" of the detailed version (Page 16,17 of main part). *3 : For the box plot, see "How to Read the Box Plot" (for Reference)

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

Category	Item	Specifications and water treatment capacity
Outline of the facility	Model	Greaseeco 850-850MFP
	Size and weight	Body of equipment for verification experiment W850mm×D850mm×H850mm・90kg
Design conditions	Object	n-hexane extract content (n-Hex)
	Performance	Wastewater treatment 20~40 L/min , oil removal 15 L/hr (Maximum 45 L/hr)
	Treatment object	n-hexane extract content (n-Hex) removal ratio 90% or over

3. Results of the verification experiment

3.1 Use of existing data

The same type of treatment device has been installed in other facilities, and the test data previously obtained from those facilities was used in this verification test to shorten the verification test period.

① The result of kitchen wastewater treatment of restaurant which provide ramen etc. (March,20 2008)

Water sampling time	n-hexane extract content (n-Hex)			Biochemical oxygen demand (BOD)		
	Influent (mg/L)	Treated wastewater (mg/L)	Reducing rate (%)	Influent (mg/L)	Treated wastewater (mg/L)	Reducing rate (%)
12:00	2,100	160	92.4	17,800	1,050	94.1
12:55	4,500	280	93.8	42,800	5,530	87.1
14:35	4,700	96	98.0	41,100	749	98.2
18:30	7,900	160	98.0	44,800	2,550	94.3
Minimum value	2,100	96	－	17,800	749	－
Maximum value	7,900	280	－	44,800	5,530	－
Average value	4,800	174	96.4	36,600	2,470	93.3

② The result of wastewater treatment of large fryer in supply center of school meals (September 18, 2008)

Measurement index : n-Hex	n-hexane extract content (n-Hex)			Average value	Reducing rate of the concentration water quality (%)
Influent (mg/L)	25,000		35,000	30,000	99.5
Treated wastewater (mg/L)	170	230	85	160	

3.2 Water quality verification experiment

The wastewater treated by this device has a high concentration of fat because it is discharged when washing the fryer. Also, the concentration of n-hexane extract (n-Hex) in the influent fluctuates significantly because the fryer is washed in a short time. In the verification test, 99.0% of the n-hexane extract was removed, achieving the target removal efficiency of at least 90%. Thus, this treatment device shows excellent removal efficiency for highly concentrated fat.

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

Measurement value	Influent		Treated wastewater		Removal ratio
Concentration of water quality (mg/L)	Minimum to maximum value	Average value	Minimum to maximum value	Average value	－*1
	1,100～180,000	37,000	120~350	200	
Pollution load (g/minute) [The unite of total amount is (g/2days)]	Minimum to maximum value	Total amount	Minimum to maximum value	Total amount	99.0%
	22~1,300	4,100	1.3~9.4	40	

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.

Box plot of n-hexane extract content (n-Hex) Unit : (mg/L)

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
Concentration of water quality (mg/L)	Minimum to maximum value	Average value	Minimum to maximum value	Average value	－*1
	833～56,500	16,600	329～1,380	748	
Pollution load (g/minute) [The unite of total amount is (g/2days)]	Minimum to maximum value	Total amount	Minimum to maximum value	Total amount	94.0%
	17~737	2,370	4.3~35.0	141	

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

3.3 Operation and maintenance item

(1) Environmental impact item

Item	Verification result
Amount of sludge	No sludge is generated in the treatment process by the verification equipment.
Amount of wastes	No waste is generated in the treatment process by the verification equipment. However, the fire scums attached to the strainer are removed when cleaning the equipment.
Noise	The verification equipment did not produce significant noise during operation compared with the surrounding noise.
Odor	When operating or stopping the device, no unusual odors were emitted compared with the cooking odors in the kitchen.
Recovery of valuables	Amount of fat collected during the verification test period: 6.2 kg/2 days (weight including water was measured.)

(2) Used resources index

Item	Verification result
Amount of electric energy used	0.885kWh/day (Average value of two days)
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 (one inspection/day) Check of water volume and connection of hose and power source	One person without any special skills is required.
Recovery of oil	5 minutes/day (after day's work is finished)	One person without any special skills is required.
Cleaning of the equipment intended for verification	30 minutes (one cleaning/day) (after day's work is finished) Disassembly, washing and reassembly of the treatment device	One person without any special skills is required.

(4) Qualitative remark

Item	Remark
Remark on water quality	The wastewater contains a high concentration of fat (maximum about 18%), and its water volume fluctuates. The verification test confirmed that the removal efficiency of fat by the treatment device is very high, achieving the target value. In addition, since the fat is collected, the pollution load on subsequent wastewater treatment facilities can be reduced.  Influent  Treated wastewater Influent : n-Hex 180,000mg/L、BOD 56,500mg/L Treated wastewater : n-Hex 180mg/L、BOD 596mg/L
Operations required for initiation	After checking that the verification equipment was filled with the specified amount of water, the power switch was turned on. Using the drain hose, connect the treatment device to the fryer.
Operations required for shutdown	Turn off the power switch, and remove the drain hose from the fryer and the treatment device.
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	Since this device is movable and can treat wastewater in about 20 minutes, it can be moved and connected to other fryers for overall wastewater treatment. Since no chemicals are added and high heat is not applied in the treatment process, the separated fat degenerates only very slightly, and so the collected fat can be reused as raw material for fatty acid production. Thus, this device can reduce the amount of waste treatment, recycle the resources, prevent clogging of pipes and decrease the pollution and environmental load on subsequent wastewater treatment facilities (such as grease traps and public sewerage systems).

4. Reference information

The information shown on this page 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 on this page.

○ Product date (reference information)

<table>
<tr><th colspan="2">Items</th><th colspan="4">Column to be filled in by the applicant for verification</th></tr>
<tr><td colspan="2">Name/type</td><td colspan="4">Oil separating recovery equipment for washing large fryer
Greaseeco 850-850MFP</td></tr>
<tr><td colspan="2">Manufacturer (distributor)</td><td colspan="4">Daitogiken Co.,Ltd.</td></tr>
<tr><td rowspan="3">Contact address</td><td>TEL / FAX</td><td colspan="4">TEL (0282) 28-0606 / FAX (0282) 28-1221</td></tr>
<tr><td>Web address</td><td colspan="4">http://www.greaseeco.co.jp</td></tr>
<tr><td>E-mail</td><td colspan="4">daito@greaseeco.co.jp</td></tr>
<tr><td colspan="2">Size and weight</td><td colspan="4">W850mm×D850mm×H850mm・90kg</td></tr>
<tr><td colspan="2">Necessity for pre-treatment and post-treatment</td><td colspan="4">None</td></tr>
<tr><td colspan="2">Supplementary facility</td><td colspan="4">None</td></tr>
<tr><td colspan="2">Life of the equipment</td><td colspan="4">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.)</td></tr>
<tr><td colspan="2">Time for initiation</td><td colspan="4">The equipment can be used immediately after installation.</td></tr>
<tr><td colspan="2" rowspan="10">Approximate cost

(yen)</td><td>Expense item</td><td>Unit price</td><td>Quantity</td><td>Total</td></tr>
<tr><td colspan="3">Initial cost</td><td>4,030,000 yen~</td></tr>
<tr><td>Body type</td><td>4,000,000 yen~</td><td>1 set</td><td>4,000,000 yen~</td></tr>
<tr><td>Delivery cost</td><td>30,000 yen~</td><td>1 set</td><td>30,000 yen~</td></tr>
<tr><td>Installation work</td><td>0 yen~</td><td>1 set</td><td>0 yen~</td></tr>
<tr><td colspan="4">Running cost (monthly)</td></tr>
<tr><td>Electric power consumption</td><td>22.8 yen/kW</td><td>40W/h</td><td>60.2 yen/month*1</td></tr>
<tr><td colspan="3">Per 1 m^3 of treated wastewater
(Actual verified quantity 2.42 m^3/month: 0.11 m^3 × operation for 22 days)</td><td>24.9 yen/m^3</td></tr>
<tr><td colspan="4">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.</td></tr>
</table>

○ Other information from the manufacturer (reference information)

- This device has been adopted for 4 years by a school lunch service center near the place where the verification test was conducted.
- The device uses no biochemicals, enzymes or adsorbents
- This movable model is most suited for washing fryers.
- The most suitable Greaseeco model can be selected according to a specific installation plan. However, our on-site investigation is required to determine the most economical and efficient model. Also available are custom models and designs based on the field conditions.
- The collected fat is reused as a recyclable resource. We can introduce collection traders.