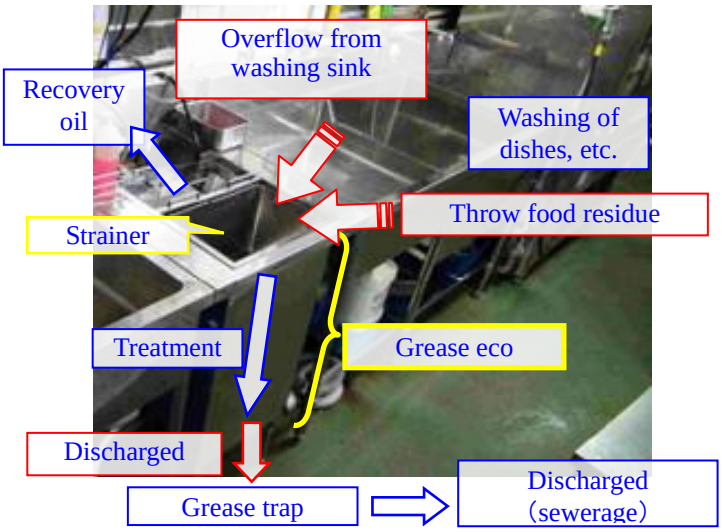
○ Overview

Technology intended for verification /environmental technology developer	Oil separating recovery equipment for commercial kitchen sink “Greaseeco DS-2 750-600P” /Daitogiken Co., Ltd.
Demonstration institution	Saitama-ken Environmental Analysis & Research Association
Period of the experiment for verification	February 17, 2010 to February 19, 2010 and March 8, 2010
Purpose of this technology	The treatment device is especially effective for removing the fats from kitchen wastewater discharged after washing the cooking and eating utensils and then draining the treated wastewater. Removing the fats from the wastewater in restaurants and cafeterias reduces the load on the subsequent sewerage and septic tanks. In addition, the removed fats can be reused for other applications.

1. Outline of the technology intended for verification

Flow diagram of verification equipment*1 (Same flow of wastewater as the verification experiment.)



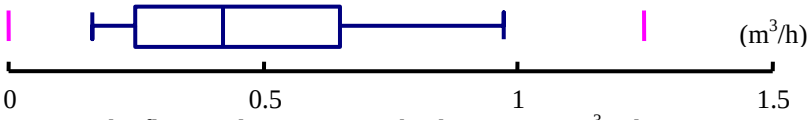
Principle

This verification equipment is designed in same type as kitchen sink on the market, and strainer, heating heater, separation tank, and belt for recovery oil (motor for deriving belt) is equipped in treatment equipment. The wastewater is heated for easy separation of the fats from the wastewater based on the difference in specific gravity, and the separated fats are collected.

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

2. Outline of the verification experiment

2.1 Outline of the location for performing the verification experiment

Project type	Cafeteria (Maruhiro department store, Kawagoe store)
Project scale	Number of seats : 400
Address	2-6-1 Shintomicho, Kawagoe-shi, Saitama
Box plot*2 of estimated influent volume*3 entering the device	 The estimated influent volume entering the device is 3.6 m^3 a day. *2 : For the box plot, see “How to Read the Box Plot” (for Reference the detailed version Page 17 of main part). *3 : Influent estimate is the data during the experiment. See Table 6-1 (the detailed version Page 16 of main part).

2.2 Specification and performance of the equipment used for verification

Category	Item	Specifications and water treatment capacity
Outline of the facility	Model	DS－2 750－600P
	Size and weight	Body of equipment for verification experiment W600mm×D750mm×H790mm・70kg
Design conditions	Object	n-hexane extract content (n-Hex)
	Water treatment capacity per a day	23 m^3/day (maximum)
	Treatment object	n-hexane extract content (n-Hex) removal ratio 90% or over

3. Results of the verification experiment

3.1 Water quality verification experiment

In the facility where the verification test was conducted, the wastewater contained a small amount of fats for the period from starting the day's work until near the end of the day's work. However, the wastewater discharged just before ending the day's work contained a large amount of fats due to washing the fryer. In the verification test, the concentration of n-hexane extract (n-Hex) in the influent fluctuated substantially because the fryer was washed just before ending the day's work and the food materials and cooking modes differed according to the menu, which was changed every day. The removal rate of n-hexane extract (n-Hex) was 90.9%, achieving the target of at least 90% in the verification test as shown in Table 5-3 (Page 12 of the Main Part in the Detailed Version). The removal rate was especially high when highly concentrated fats were temporarily contained in the influent. (See Table 6-4 and Figure 6-7 on Page 22 of the Main Part in the Detailed Version.)

Results of the verification experiment [n-hexane extract content (n-Hex) is indicated below.][*1]

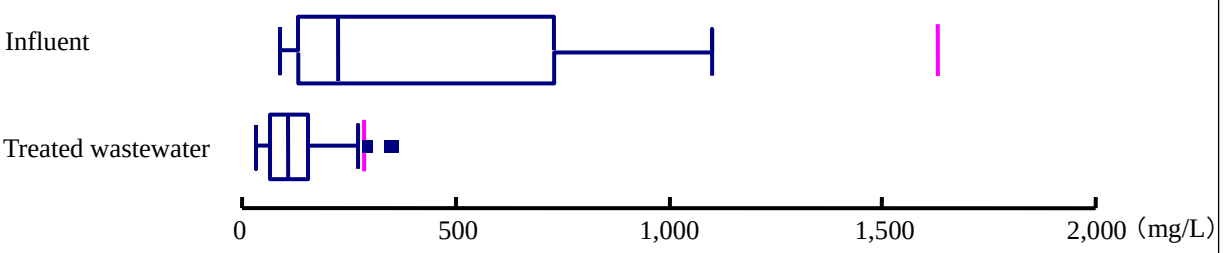
Measurement value	Influent		Treated wastewater		Removal ratio
Concentration of water quality	Minimum to maximum value (mg/L)	Average value (mg/L)	Minimum to maximum value (mg/L)	Average value (mg/L)	–[*2]
	88 ~ 17,000	1,668	34 ~ 340	122	
Pollution load	Minimum to maximum value (g/hour)	Total amount (g/3days)	Minimum to maximum value (g/hour)	Total amount (g/3days)	90.9%
	22 ~ 8,313	13,347	7 ~ 214	1,213	

*1 : No number of significant figures is set in this table.

*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

n-hexane extract content (n-Hex)



*The high-concentration measurement values of influent (13,000 mg/L and 17,000 mg/L) are not indicated in the box plot.

*3 : For the box plot, see "How to Read the Box Plot" (for Reference the detailed version Page 17 of main part).

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.][*4]

Measurement value	Influent		Treated wastewater		Removal ratio
Concentration of water quality	Minimum to maximum value (mg/L)	Average value (mg/L)	Minimum to maximum value (mg/L)	Average value (mg/L)	
	307 ~ 33,400	3,414	280 ~ 1,640	775	－[*5]
Pollution load	Minimum to maximum value (g/hour)	Total amount (g/3days)	Minimum to maximum value (g/hour)	Total amount (g/3days)	
	82 ~ 10,514	25,428	75 ~ 1,102	8,005	68.5%

*4 : The effect digit is not established in the value of the table.

*5 : It was not shown removal ratio in the concentration of water quality because removal ratio calculated by pollution load.

3.2 Operation and maintenance item

(1) Environmental impact item

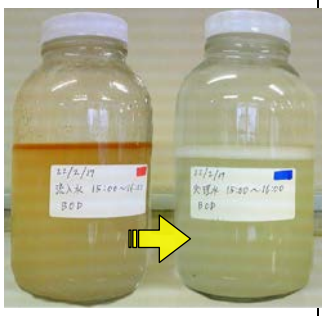
Item	Verification result
Amount of sludge	The food residue, the specific gravity of which is large, settled at the bottom of the separation tank of the device. A total of 1.5 kg of food residue was collected during three days in the verification test period (collected directly from the drain pipe).
Amount of wastes	No waste is generated in the treatment process by the verification equipment. However, the food residue in the strainer attached to the device was removed once a day. The other strainer on the drain pipe was cleaned once after the verification test was performed for three days.
Noise	Ambient environment of the device　When the device was stopped: 67 (dB), When it was operating: 72 (dB)
Odor	The verification equipment did not produce abnormal odor while it was operating or stopped compared with other odors in the kitchen.
Recovery of valuables	The recovered oil quantity during the verification experiment was 1.8 kg/3days. Oil recovery  Keep recovered oil 

(2) Used resources index

Item		Remark	
Amount of electric energy used	Power consumption	The verification equipment : 1.01kW（Motor : 10W,Heating heater : 1kW）	
	Operating time	8 to 24 hours	・If fats were left in the device when the day's work was finished, the device was operated until the next morning. The operation ratio of the heater was reduced to 1/3 to 1/4 according to the water temperature. ・In this verification test, the device was operated at night on Feb. 18 until the next morning.
Amount of chemical used for waste water treatment		No chemicals, biochemicals or aeration were used.	

(3) Operation and maintenance performance item

<table>
<tr><th colspan="2">Item</th><th>Remark</th></tr>
<tr><td rowspan="2">Remark on water quality</td><td colspan="2">The concentration of fats in the wastewater discharged from the verification test facility fluctuated. Since the removal ratio of highly concentrated fats was especially high, this device is well-suited for treating wastewater containing a high concentration of fats. The low-concentration influent mainly consisted of wastewater discharged after washing the eating utensils. Foam was found on the wastewater surface, no floating fats were present and the wastewater was in a mixed condition. The verification test was started immediately after the device was installed, and so the detergent was not properly used. The detergent must be properly used to ensure correct use of the device and to improve the situation.</td></tr>
<tr><td>Wastewater containing a high concentration of fats
*Fats float on the influent surface.

n-Hex(mg/L)
Left: influent 17,000
Right: Treated wastewater160
  </td><td>Wastewater containing a low concentration of fats
*Foam is found on both the influent and treated wastewater

n-Hex(mg/L)
Left: influent 130
Right: Treated wastewater 110
  </td></tr>
<tr><td colspan="2">The operation of verification equipment and number of persons and skill necessary for operating and maintaining the device</td><td>Operation and maintenance can be easily performed, and no special skills are required. A total of about 35 minutes was required for one person a day to operate and maintain the device.</td></tr>
<tr><td colspan="2">Reliability of the equipment intended for verification and how to solve the problems</td><td>No trouble occurred during the verification test. The motor may fail and the belt may become damaged if the device is used for a long period. However, this can be resolved simply by replacing the parts.</td></tr>
<tr><td colspan="2">Evaluation of the instruction manual of operation and maintenance</td><td>The instruction manual for operation and maintenance was easy to understand.</td></tr>
<tr><td colspan="2">Features of the device confirmed in the verification test</td><td>The fats separated and collected by the device can be reused as a raw material for fatty acid production. Therefore, this device reduces the treatment quantity of industrial wastes and the load on the subsequent grease trap and wastewater treatment facilities. In addition, the device circulates resources while reducing CO_2 emission and environmental load.</td></tr>
</table>

4. Reference information

The details of "4.1 Product Data (Reference Information) " and "4.2 Other Information from Manufacturer (Reference Information)" on this page were prepared by the engineers who developed this environmental technology, on their own responsibility for the purpose of providing technical information. The following details are not included in the verification this time. Therefore, the Ministry of the Environment and the verification institution bear no responsibility for these details.

4.1 Product data (reference information)

Items		Column to be filled in by the applicant for verification
Name / type		Oil separating recovery equipment for commercial kitchen sink "Greaseeco" / DS-2 750-600P
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		W600mm×D750mm×H790mm~・70kg~
Necessity for pre-treatment and post-treatment		None
Supplementary facility		Cooking equipment such as the sink, table for used eating utensils and worktable contacting the device body
Life of the equipment		25 years for the body (some devices have already been in use for 11 years) 2 to 6 years for driving and electrical parts
Time for initiation		The equipment can be used immediately after installation.
Approximate cost (yen)		

Expense item	Unit price	Quantity	Total
Initial cost			3,930,000 ~ yen
Body type	3,850,000 ~ yen	1 set	3,850,000 ~ yen
Delivery cost	30,000 ~ yen	1 set	30,000 ~ yen
Installation work	50,000 ~ yen	1 set	50,000 ~ yen
Running cost (monthly)			4,326 yen
Electric power consumption	17.8 ~ 22.8 yen/kWh	240 kWh	4,326 yen
Per 1 m^3 of treated wastewater(Water quantity of the location for performing the verification experiment 108 m^3/month)			40 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.			

4.2 Other information from the manufacturer (reference information)

●Grease Eco" is the world's first kitchen-sink type oil-fat separator. The removal rate of fats is 99% or more, and the collected fats can be recycled. Those features were highly appraised, and the device was selected as one of the world's best environmental technologies at Expo 2005 Aichi Japan, earning the "Global 100 Eco Tech Award".

●No customer complaints have been received, and no device has been returned to us.

●The user in the facility where the verification test was conducted acknowledged the fats removal effect of the device and decided to continue using it.

●This device meets the standards of the Society of Heating, Air-conditioning and Sanitary Engineers of Japan (SHASE-S217) for the removal ratio of 99.5% or more, and can be used instead of a grease trap. Even a ramen restaurant without a grease trap can operate this device without any problems.

●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. This device is manufactured based on the customer's requirements. Do not hesitate to contact us for further information.

●By removing fats, wastewater can be treated effectively. In addition, clogging of drain pipes is prevented, the treatment facility can be downsized and can be controlled more easily, and the operation cost can be reduced.

●In addition to wastewater treatment, the collected fats can be recycled as material for fuel and fertilizer. This helps facilities meet the ISO14001 standard and thus helps prevent global warming.

●SS of 400 micron or more in wastewater can also be removed.

●It is not necessary to frequently clean the grease trap installed behind the "Grease Eco", thus reducing the workload for users.