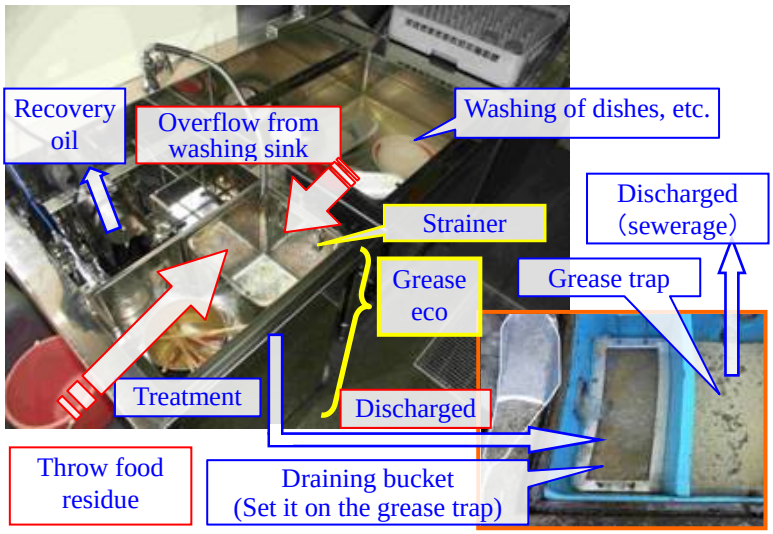
○ Overview

Technology intended for verification /environmental technology developer	Oil separating recovery equipment for commercial kitchen sink “Greaseeco DS-2 600-600” /Daitogiken Co.,Ltd.
Demonstration institution	Saitama-ken Environmental Analysis & Research Association
Period of the experiment for verification	February 11, 2010 to February 13, 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.)



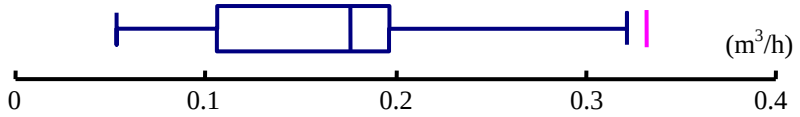
Principle

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	Ramen restaurant (Tenkaippin Co., Ltd.　Sendai bypass shop)
Project scale	Total floor area : 165.62m^2　　Number of seats : 29
Address	8 Shinbashiminami, Koriyama section, Taihaku ward, Sendai-shi, Miyagi
Box plot*2 of estimated influent volume*3 entering the device	 Influent estimate into the verification equipment in a day is 2.1 m^3/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-2 600-600
	Size and weight	Body of equipment for verification experiment W600mm×D600mm×H800mm・55 kg
Design conditions	Object	n-hexane extract content (n-Hex)
	Water treatment capacity per a day	21.6 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 location where the verification test was conducted, the wastewater containing oily leftover ramen soup (mainly animal oil and fat) was discharged during operating hours while the kitchen was in use and wastewater containing a high concentration of fats was temporarily discharged.

Our investigation found that the concentration of n-hexane extract (n-Hex) in influent fluctuated substantially because the type of work in the kitchen differed during the day (washing of the sink, etc.) and different types of ramen that were oily or not so oily were served. The removal ratio of n-Hex was 95.0%, achieving the treatment target shown in Table 3-1 (on Page 5 of the Detailed Version) and target removal ratio of at least 90% in the verification test shown in Table 5-3 (on Page 12 of the Detailed Version). In addition, the hourly removal ratio was almost constant and stable removal was achieved. (See Table 6-5 and Table 6-7 on Page 22 of the Main Part in the Detailed Version.)

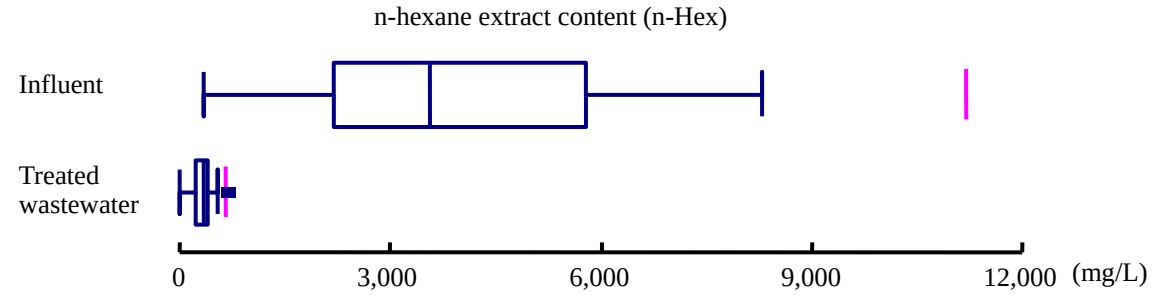
Results of the verification experiment [n-hexane extract content (n-Hex) is indicated below.][*1]

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]
	340 ~ 36,000	5,843	4 ~ 720	330	
Pollution load	Minimum to maximum value (g/hour)	Total amount (g/3days)	Minimum to maximum value (g/hour)	Total amount (g/3days)	95.0%
	33 ~ 8,266	41,201	0.4 ~ 149	2,054	

*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



*The high-concentration measurement values of influent (16,000 mg/L and 36,000 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]

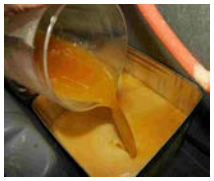
Measurement value	Influent		Treated wastewater		Removal ratio
Concentration of water quality	Minimum to maximum value (mg/L)	Average value (mg/L)	Minimum to maximum value (mg/L)	Average value (mg/L)	
	720 ~ 18,000	3,909	160 ~ 3,400	1,919	－[*5]
Pollution load	Minimum to maximum value (g/hour)	Total amount (g/3days)	Minimum to maximum value (g/hour)	Total amount (g/3days)	
	69 ~ 3,667	23,699	15 ~ 1,002	12,480	47.3%

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

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

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 6 kg of food residue was collected during three days in the verification test period (An approximate calculation was performed assuming that the sludge settled on the bottom of the separator in the device.).
Amount of wastes	No waste is generated in the treatment process by the verification equipment. However, The food residue on the strainer must be removed once or twice a day, and the residue in the draining bucket must be removed once a day.
Noise	The surroundings of verification equipment Shut down period 73(dB), Operation period 74(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 9.7 kg/3days. Oil recovery  The collected fats are stored for recycling. 

(2) Used resources index

Item		Remark	
Amount of electric energy used	Power consumption	The verification equipment : 1.015kW (Motor : 15W, Heating heater : 1kW)	
	Operating time	24hours	The operation ratio of the heater was reduced to 1/3 to 1/4 according to the water temperature.
Amount of chemical used for waste water treatment		No chemicals, biochemicals or aeration were used.	

(3) Operation and maintenance performance item

Item	Remark
Remark on water quality	Although the oily leftover ramen soup and wastewater after washing the eating utensils were discharged from the kitchen where the verification test was conducted, the removal ratio of n-Hex was 95%, achieving the target of wastewater treatment. Furthermore, even though the influent volume fluctuated, a stable removal ratio was obtained. Especially, even when the influent contained a high concentration of fats, the removal ratio of fats was good. Therefore, this treatment device is suitable for removing fats of high concentrations and reduces the load on the subsequent grease trap, septic tank, etc.
	 Japanese-style soup　　Animal fat soup (soy sauce taste) n-Hex：22,000　　n-Hex：190,000 n-Hex of leftover ramen soup (mg/L)
	 From left, influent, wastewater treated by the device, and effluent from the grease trap
The operation of verification equipment and number of persons and skill necessary for operating and maintaining the device	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.
Reliability of the equipment intended for verification and how to solve the problems	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.
Evaluation of the instruction manual of operation and maintenance	The instruction manual for operation and maintenance was easy to understand.
Features of the device confirmed in the verification test	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.

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 date (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-600-600			
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×D600mm×H800mm ~ ・55kg ~			
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			2,095,000 ~ yen
		Body type	2,000,000 ~ yen	1 set	2,000,000 ~ yen
		Delivery cost	20,000 ~ yen	1 set	20,000 ~ yen
		Installation work	75,000 ~ yen	1 set	75,000 ~ yen
		Running cost (monthly)			4,326yen
		Electric power consumption	17.8 to 22.8 yen/kWh	240kWh	4,326yen
		Per 1 m^3 of treated wastewater (Water quantity of the location for performing the verification experiment 63 m^3/month)			69 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.

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

●Depending on the amount of fats, it may not be necessary to operate the treatment device at night. Please operate the device as needed.