

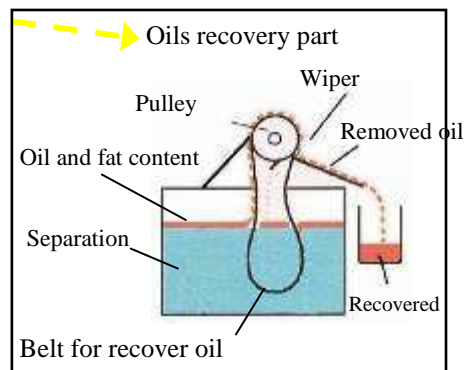
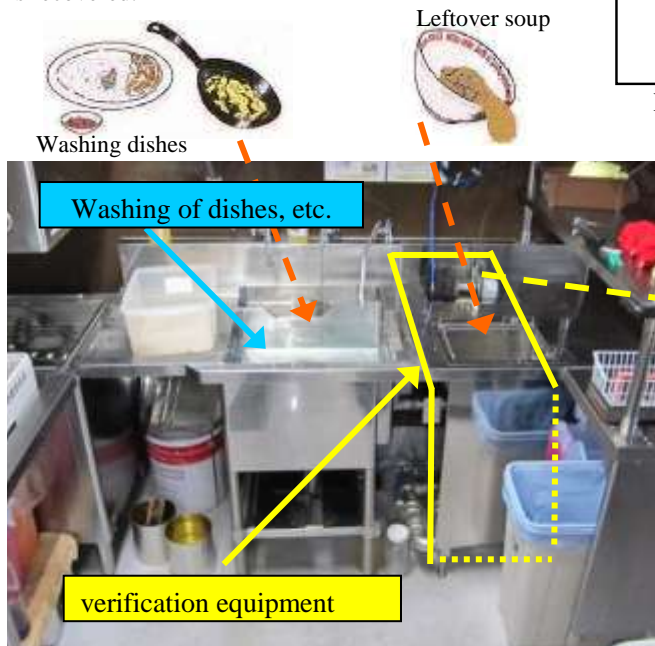
○ Overview

Technology intended for verification/verification applicants	Sink-type oil separating recovery equipment for small restaurant in the suburbs (installation of septic tank) Greaseco DS-2 750-500 / Daitogiken Co.,Ltd.
Demonstration institution	Saitama-prefectural Environmental Analysis & Research Association
Period of the experiment for verification	December 17, 2012
Purpose of this technology	This verification experiment was conducted for the technology for oil separating recovery equipment installed in restaurants in the suburbs which discharge wastewater treated in septic tanks to public water areas. This equipment can be combined with kitchen sinks in restaurants such as ramen shops which discharge a large amount of oil, and can separate and recover oil contained in leftover ramen soup and water used for washing dishes, thus reducing pollution load and the load to the septic tanks.

1. Outline of the technology intended for verification

Flow diagram, Principle

This verification equipment (within the yellow frame) separates oil contained in wastewater discharged after draining leftover ramen soup and washing dishes while the oil content is high. The oil in wastewater is separated from the water by the difference in specific gravity, and floating oil is recovered.

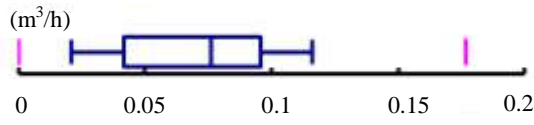


The setting condition of the place for performing the verification experiment and outline of the equipment.

※The equipment indicated only outline.

2. Outline of the verification experiment

2.1 Outline of the location for performing the verification experiment

Project type	Ramen restaurant
Project scale	Number of seats: 29, Operating hours: 7:00 to 21:00 (kitchen work: 6:00 to 22:00), Regular holidays: none
Address	429 Kotachi, Saitama-shi, Saitama
Influent quantity into the equipment intended for verification ⁽²⁾ (Box plot ⁽³⁾)	<p>influent quantity (m³/h)</p> <p>0.974 m³/day</p> <p>Leftover ramen soup</p> <p>194 bowls of leftover ramen soup</p>  <p>(2) : For influent quantity, see Section 7.1 “Results of Monitoring Items” of the detailed version (Page 18 of main part).</p> <p>(3) : For the box plot, see “How to Read the Box Plot” (for Reference) (Page 19 of the main section in the detailed part).</p>

2.2 Specification and performance of the equipment used for verification

Category	Item	Specifications and water treatment capacity
Outline of the facility	Model	Greaseeco DS-2 750-500
	Size and weight	Body of equipment for verification experiment W500mm × D750mm × H800mm · 48kg
Design conditions	Object	n-hexane extract content (n-Hex)
	performance	The maximum drainage volume during the verification experiment period was 100 L/h. See the product information on page 4 of the digest version for the maximum throughput of the verification equipment.
	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 model equipment of this technology was installed in November 2011 in the place where the verification experiment was conducted, and survey data for the six months from April 2012 were obtained to check the performance of the equipment. The average quantity of tap water used daily (the entire restaurant) was 3.95 m³, and was almost constant every day of the week based on the survey of the past 141 days (±0.14 m³). In addition, a supply unit test was conducted for leftover ramen soup and wastewater discharged from the washing sink, which were the main influents into the equipment for the verification experiment, to check the pollution load. Since the existing data were taken very recently and there was no fluctuation in discharged water quantity among the days of the week, the verification experiment was conducted for one day.

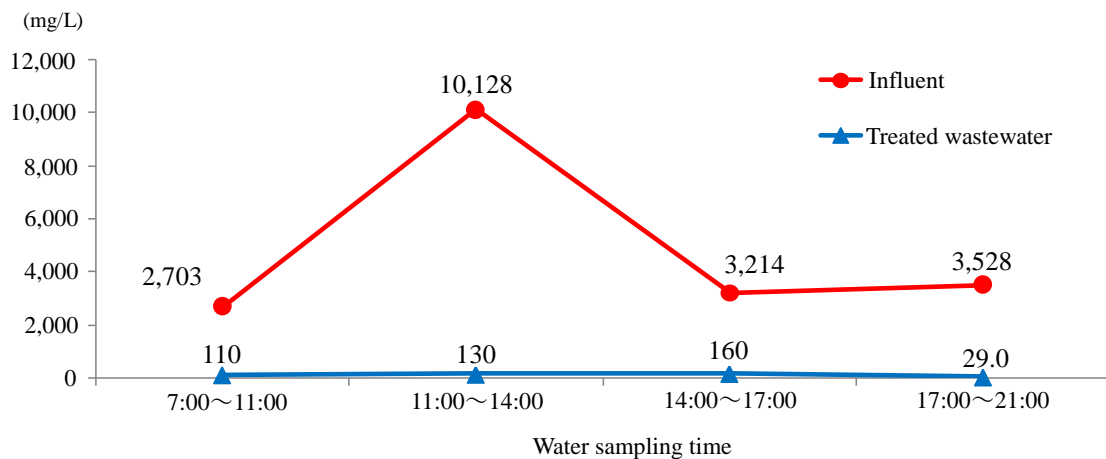
3.2 Water quality verification experiment

The wastewater where the verification experiment was conducted consists mainly of leftover ramen soup, which contains pork back fat, and washing sink overflow water after washing the dishes, and so contains a large amount of oil. The test results were assessed in terms of pollution load. The removal ratio of n-hexane extract content (n-Hex) was 98.0%, exceeding the verification target of 90% or more. The concentration of this substance in the influent during the verification experiment was 2,703 to 10,128 mg/L (average 4,893 mg/L) while that in the treated wastewater was 29.0 to 160 mg/L (average 107 mg/L). The concentration of influent was determined from the pollution loads in the respective time periods and the wastewater quantities.

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

Measurement value	Influent		Treated wastewater ⁽⁵⁾		Removal ratio
	Minimum to maximum value (Median)	Average value (Total amount)	Minimum to maximum value (Median)	Average value (Total amount)	
Pollution load (g)	514~3,145 (863)	1,346 (5,385)	7.39~41.2 (30.6)	27.5 (110)	98.0 (%)

(5) The quantity of treated wastewater was found by adding the quantity of leftover ramen soup to the quantity of washing-sink overflow water.



Change of n-hexane extract content (n-Hex)

※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 (Median)	Average value (Total amount)	Minimum to maximum value (Median)	Average value (Total amount)	
Pollution load (g)	605~3,781 (1,325)	1,759 (7,037)	202~504 (434)	393 (1,573)	77.6 (%)

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, ramen residues 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	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 2.8 kg/day (including water 1.4%)




(2) Used resources index

Item	Verification result
Amount of electric energy used	3.63 kWh (6:40~21:00 14 hours 20 minutes)
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	Check of water quantity in the oil-water separation tank	One person without any special skills is required.
Recovery of oil	Oil is recovered when the oil catcher is fully filled with oil and after the day's work is finished.	One person without any special skills is required.
Cleaning of the equipment intended for verification	Drainage of wastewater from the verification equipment and disposal of recovered oil	One person without any special skills is required.

(4) Qualitative remark

Item	Remark
Remark on water quality	<p>The average concentration of n-hexane extract content (n-Hex) contained in the influent, which consists of the sink-tank overflow water and leftover ramen soup and flows into the verification equipment, was 4,893 mg/L. The concentration of that substance in the treated wastewater was only 107 mg/L. Since the removal ratio was 98.0%, very efficient treatment was verified even though the wastewater before treatment contained a high concentration of oil.</p> <div style="display: flex; justify-content: space-around; align-items: center;">    </div> <p style="text-align: center;">Overflow influent Leftover ramen soup Treated wastewater</p>
Operations required for initiation	After checking that the verification equipment was filled with the specified amount of water, the power switch was turned on.
Operations required for shutdown	The power switch was turned off and then the verification equipment was washed.
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. The operator could sufficiently understand the equipment and perform proper maintenance.
Others	The verification equipment can be installed even in a small space in a sink of a small restaurant and can efficiently remove even high concentrations of oil. Since no chemicals or high temperature is applied in the treatment process, the degeneration of separated oil is low and the recovered oil can be reused as a fatty acid substance. Therefore, the amount of waste treatment, pollution load to septic tanks and environmental load to public water areas can be reduced, and the resources can be recycled.

4. 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.

4.1 Product data

Items		Column to be filled in by the applicant for verification					
Name/type		Sink-type oil separating recovery equipment for small store in the suburbs (installation of septic tank) Greaseeco DS-2 750-500W					
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		W500mm×D750mm×H800mm・48kg					
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 1.2 years to date, without failure.)					
Time for initiation		The equipment can be used immediately after installation.					
Approximate cost (Maintenance is to be performed by the user.)		Expense item		Unit price	Quantity	Total	
		Initial cost			Total	1,930,000 yen~	
		Body type		1,850,000 yen~	1 set	1,850,000 yen~	
		Delivery cost		20,000 yen~	1 set	20,000 yen~	
		Installation work		60,000 yen~	1 set	60,000 yen~	
		Running cost (monthly)			Total	2,483 yen/month	
		Electric power consumption		22.8 yen/kW	3.63kWh/day	2,483 yen/month*1	
		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 14 hours a day for 30 days.					
Per 1 m ³ of treated wastewater (Actual verified quantity 50.7 m ³ /month: 1.69 m ³ x operation for 30 days)					48.0 yen /m ³		

4.2 Other information from the manufacturer

- The maximum throughput of “Greaseeco” is 1,500 L/h.
- “Greaseeco” has been certified by the Society of Heating Air-Conditioning and Sanitary Engineers of Japan Standard (SHASE-S217) as having a grease removal capacity of at least 99.5%.
- We installed the specified oil separator and the community wastewater treatment tank (tank for 50 persons, daily treated wastewater quantity 10 m³) for a ramen restaurant which serves 200 bowls of ramen noodles a day, then opened it. However, a foul odor was emitted and the water quality deteriorated within two weeks, and we had difficulties in dealing with the problem of fat load on the septic tank. When we treated the oily wastewater only by the oil separator and discharged the treated wastewater, the foul odor from the septic tank was slightly reduced and the water quality also slightly improved. Subsequently, two months after opening the restaurant, we installed a “Greaseeco” to recover oil, reduce the load on the septic tank and treat all wastewater in the restaurant, and found the following benefits.
- After installing the “Greaseeco”, 98% of the fat load in the wastewater was removed.
- The foul odor emitted from the the community wastewater treatment tank was reduced.
- The pollution of agricultural drainage, which was the final destination of the treated wastewater, was reduced.
- The quality of wastewater treated by the community wastewater treatment tank was improved as follows because the oil concentration of wastewater was reduced. Namely, BOD was 20 mg/L or less, n-hexane extract content (n-Hex) was less than 2.5 mg/L, and transparency was 30 cm or more. This improvement in water quality remains at present.
- Although the ramen restaurant disposes of a large quantity of oil, it is necessary only once a year to remove the sludge from the community wastewater treatment tank and dispose of it as general waste sludge.
- The oil separator can be operated and maintained by the restaurant itself, and so the restaurant operator has not asked a professional waste disposer to remove the sludge even once.
- The restaurant recovers 40 pails of oil (600 kg in total) as recyclable resources from the “Greaseeco”.