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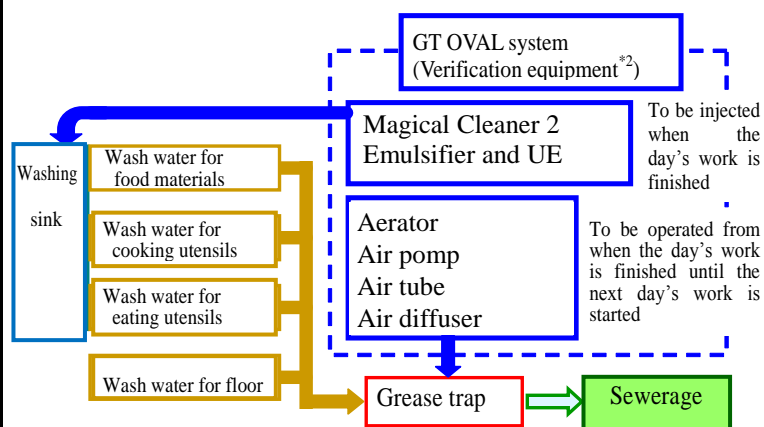
### ○ Overview

Technology intended for verification / environmental technology developer	GT OVAL system / BEST PLAN Co.,Ltd.
Demonstration institution	Saitama-ken Environmental Analysis & Research Association
Period of the experiment for verification	December 8, 2010 to December 9, 2010 <sup>*1</sup>
Purpose of this technology	Pollutants in wastewater discharged from the kitchen were decomposed by enzyme through aeration. This technology is designed to remove oil and fat accumulated in grease trap and to improve odor. However, this technology operates as an aerator while the discharge of wastewater is stopped from when the day's work is finished until the next day's work is started.

\*1 : For verification test period, see the main section in the detailed part.

#### 1. Outline of the technology intended for verification

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



\*2: Model equipment was built to display the technology and was used in this verification experiment.

#### Principle

In the wastewater treatment method incorporating this technology, Magical Cleaner 2 (detergent with emulsifier and UE: UYAMA ENZYME)<sup>\*3</sup> emulsifies the water and fat, which is then decomposed by enzyme through aeration. This is a pretreatment device that operates as a grease trap during the hours while the kitchen is in use, and then operates as an aerator while the discharge of wastewater is stopped from when the day's work is finished until the next day's work is started. In addition, discharge of wastewater from the grease trap is stopped during aeration. Therefore, wastewater doesn't outflow through aeration.

\*3 : UE is made from the sugars and extracts of tropical fruits such as pineapple.

## 2. Outline of the verification experiment

### (1) Outline of the location for performing the verification experiment

Project type and scal	School cafeteria, Total floor area : 500m <sup>2</sup> • Number of seats : 350
Name / Address	Shukutoku university Mizuhodai Campus • 1150-1, Fujikubo, Miyoshi-machi Iruma-gun, Saitama
Influent quantity into the equipment intended for verification *4 (Box plot *5)	Influent quantity Average 7.67m <sup>3</sup> /day 

\*4 : This indicates the volume of influent entering the grease trap.

\*5 : For the box plot, see “How to Read the Box Plot” (for Reference) (Page 35 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	GT OVAL system	
	Size and weight	Magical Cleaner 2 and aerator Capacity of grease trap: 0.288 m <sup>3</sup> (length 1.2 m × width 0.6 m × depth 0.4 m)	
Design conditions Category	Object Water treatment capacity per a day	Biochemical oxygen demand (BOD)	Suspended solids (SS)
		Chemical oxygen demand (COD)	n-hexane extract content (n-Hex)
	Treatment object	Treatment is performed by the grease trap (0.288 m <sup>3</sup> capacity) in combination with aeration.	
	Item	Reducing rate of water quality concentration	BOD, COD and n-Hex is 60% or more. SS is 70% or more..

## 3. Results of the verification experiment

3.1 The water quality verification items of the daily water quality tests (For the weekly water quality test, see the Main Part in the Detailed Version.)

The verification items of the daily water quality tests (conducted from Dec. 8, 2010 to Dec. 9, 2010) are shown in the following Tables (1) and (2). Table (1) shows the water quality concentration during and before aeration. “15:00\*” indicates the concentration before treating the wastewater, and “9:00 next morning\*” is after treating the wastewater. Table (2) shows the reduction ratio found from the water concentration at 15:00 (10 minutes after the influent was stopped and the aeration was started) and at 9:00 the next morning (after aeration of 18 hours and 30 minutes). This average reduction ratio for the water quality concentration is not based on the total influent volume (daily average of 7.67 m<sup>3</sup>), but instead is based on the wastewater (0.288 m<sup>3</sup>) in the grease trap, in which the influent contaminants, except soluble substances, are concentrated.

①:Water quality concentration during and before aeration in the daily water quality test(Unit: mg/L)

Test schedule	Wastewater treatment details/ water sampling location <sup>*1</sup> Sampling time	BOD		COD		SS		n-Hex			
		Influent	Third chamber <sup>*1</sup>	Influent	Third chamber <sup>*1</sup>	Influent	Third chamber <sup>*1</sup>	Influent	Third chamber <sup>*1</sup>		
the daily water quality tests	Day 1 <sup>*3</sup>	(i) 14:30	—	816	—	330	—	787	—	320	
		The diluted solution of “Magical Cleaner 2” is added. (Diluted influent is present.) <sup>*2</sup>									
		(ii) 15:00*	—	715	—	275	—	590	—	220	
		Next morning 9:00*	—	217	—	93.3	—	60	—	58	
				Influent	effluent	Influent	effluent	Influent	effluent	Influent	effluent
	Day 2	(iii)	9:00 <sup>*4</sup>	—	(217)	—	(93.3)	—	(60)	—	(58)
			9:00~10:00	96.4	150	39.0	63.7	37	41	11	43
			10:00~11:00	110	67.8	76.1	38.6	27	28	5	6
			11:00~12:00	194	184	132	110	63	60	21	20
			12:00~13:00	242	218	174	121	71	71	23	29
13:00~14:00			636	524	407	297	211	143	98	97	
	14:00~15:00 <sup>*2</sup>	336	391	244	248	97	142	72	85		

②:Reduction ratio of the water quality concentration in the wastewater during aeration on the first day of the daily water quality test

the daily water quality tests	Wastewater treatment details/ water sampling location <sup>*1</sup> Sampling time	BOD		COD (Mn)		SS		n-Hex	
		Treated wastewater (mg/L)	Reducing rate (%)	Treated wastewater (mg/L)	Reducing rate (%)	Treated wastewater (mg/L)	Reducing rate (%)	Treated wastewater (mg/L)	Reducing rate (%)
Day 1 <sup>*3</sup>	(ii) 15:00*	715	— <sup>*5</sup>	275	— <sup>*5</sup>	590	— <sup>*5</sup>	220	— <sup>*5</sup>
	Next morning 9:00*	217	69.7	93.3	66.1	60	89.8	58	73.6

\*1: (i), (ii) and (iii) in the “wastewater treatment details/water sampling location” are as follows. “3rd chamber” in the table indicates the third chamber of the grease trap (see Figure 4-2 on Page 18 of the Main Part in the Detailed Version).

- (i) There is no influent while aeration is performed for agitation. The treated wastewater is sampled in the third chamber of the grease trap.
- (ii) There is no influent during the aeration process. The treated wastewater is sampled in the third chamber.
- (iii) This stage is before starting aeration, when influent is present. The influent is sampled in the influent inlet of the grease trap. The effluent is sampled by siphon in the grease trap’s third chamber (outlet of the effluent).

\*2 : For details on the diluted solution of “Magical Cleaner 2”, see Table 4-3 (on Page 16 of the Main Part in the Detailed Version). On the second day of the daily water quality test, the diluted solution of “Magical Cleaner 2” was injected at the same hour as on the first day and was present in the wastewater when each water quality concentration was measured.

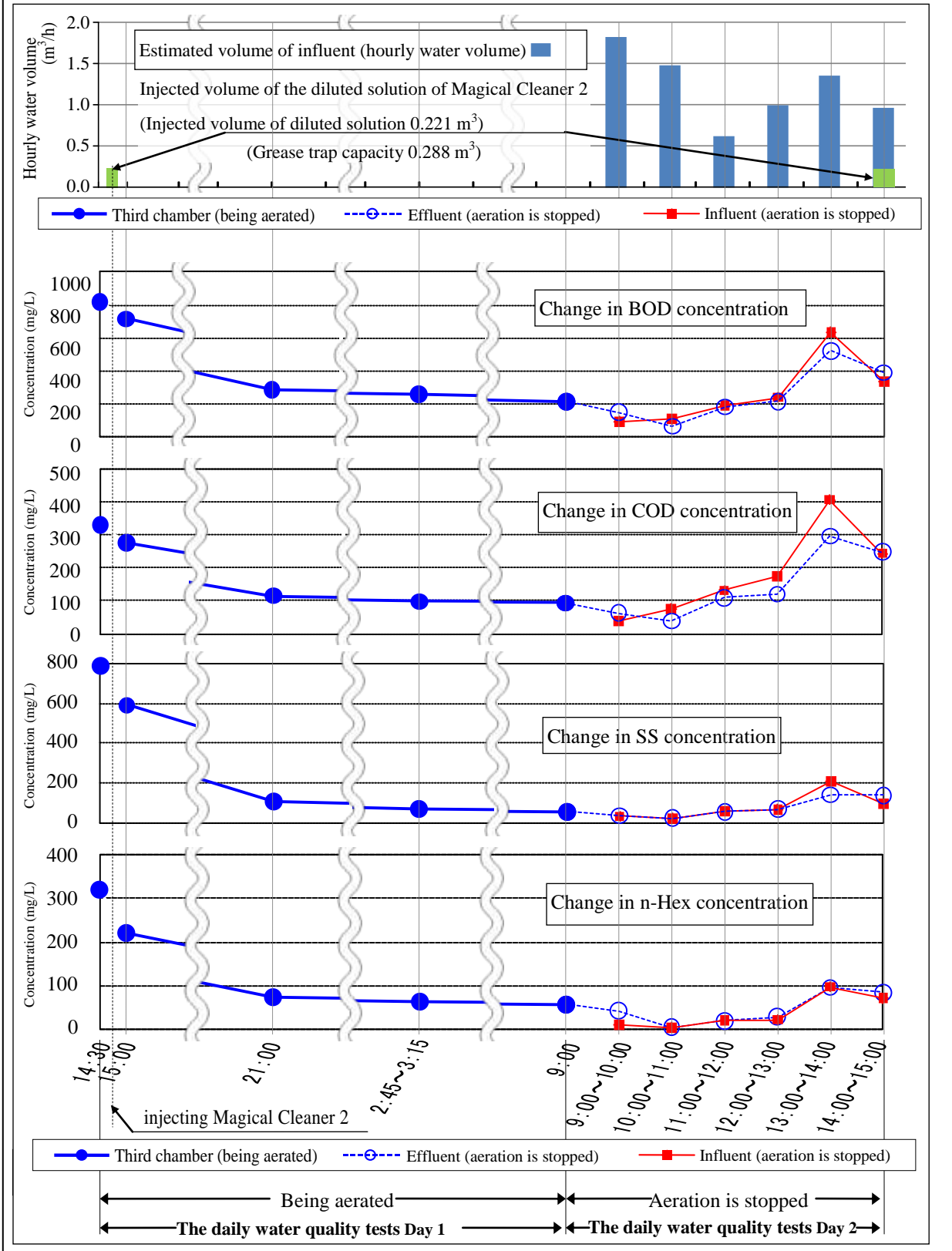
\*3 : The daily water quality test on the first day was ended at 9:00 the next morning.

\*4 : Measurement of the effluent in the daily water quality test on the second day was started at 9:00 the next morning when the treated wastewater was measured.

\*5 : Although the water quality concentration of the effluent was measured at 14:30, the treated wastewater within the grease trap was diluted when the diluted solution of “Magical Cleaner 2” was injected. Therefore, for calculating the reduction ratio in the water quality concentration, the concentration at 14:30 was excluded from Table 6-3 (Page 32 of the Main Part in the Detailed Version) and the reduction ratio between 14:30 and 15:00 was not determined.

3.2 Change in volume of influent entering the grease trap and each water quality concentration in the daily water quality test

The following graph shows the change in volume of the influent entering the grease trap and each water quality concentration in the daily water quality test. The same time axis is used for the influx volume and each water concentration. In addition, Magical Cleaner 2 (150 ml) is diluted in the solution (0.221 m<sup>3</sup>) and injected into the grease trap from the washing sink. This diluted solution accounts for 77% of the grease trap capacity (0.288 m<sup>3</sup>). For the weekly water quality test, see the Main Part in the Detailed Version.



### 3.3 Operation and maintenance item

#### (1) Environmental impact item

Amount of sludge	No waste is generated in the wastewater treatment process. However, it is necessary to remove the oil globules and food residue from the strainer in the grease trap.
Noise	No abnormal noise was found compared with the surrounding noise (exhaust fans, etc.) in the kitchen.
Odor	In the organoleptic examination, when the exterior unit of the grease trap was normally used (when the grease trap lid was closed), the odor index was less than 10, the odor concentration was also less than 10, and we confirmed the absence of any unpleasant odors. Within the grease trap, the odor index was reduced to about 2/3 and the odor concentration was reduced to about 1/20 after the wastewater was treated.

#### (2) Used resources index

consumable stores	A total of 150 ml of Magical Cleaner 2 was used in four washing sinks a day.
Amount of electric energy used	Only the air pump used electric power, and the power usage was only 2.21 kW/day in the weekly water quality test.

#### (3) Operation and maintenance performance item


Maintenance item	Maintenance time per operation and maintenance frequency	Number of people and skill required for maintenance
Daily check	Magical Cleaner 2 is injected when the kitchen work is finished every day.	One person without any special skills is required.
Periodic check	<ul style="list-style-type: none"> <li>If a failure occurs, our engineer will fix it.</li> <li>Check the operation of the air pump and the timer setting.</li> <li>Remove the oil globules and food residue from the strainer in the grease trap about twice every month.</li> </ul>	No periodic inspection was required during the verification test period.

#### (4) Qualitative remark

Remark on water quality (sampled wastewater)


In the wastewater treatment using this technology, sediment was found before treating the wastewater, but almost no sediment was found after injecting Magical Cleaner 2 and aerating the wastewater for 18 hours and 30 minutes (daily water quality test).

Before treating the wastewater



➔

Aefore treating the wastewater



After injecting Magical Cleaner 2, the water was sampled in the third chamber of the grease trap at 15:00.

After injecting Magical Cleaner 2 and aerating the wastewater in the third chamber of the grease trap for 18 hours and 30 minutes, the water was sampled at 9:00 the next morning.

(4) Qualitative remark(continuation)

Remark on water quality (Conditions of grease trap)	<p>In the wastewater treatment using this device, the fat on the grease trap wall turned into oil globules and could be removed easily (daily water quality test).</p> <div style="display: flex; align-items: center; justify-content: center;"> <div style="text-align: center;">  <p>Grease trap Third chamber</p> </div> <div style="margin: 0 20px;">➔</div> <div style="text-align: center;">  <p>Air tube Grease trap Third chamber</p> </div> </div> <p style="text-align: center;">Before the device was installed                      After the device was installed (after aeration of 18 hours and 30 minutes)</p>
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Terms required for initiation	It is only necessary to set the timer to operate the air pump during the time from stopping the discharge of wastewater from the kitchen until restarting the discharge of wastewater the next morning.
Terms required for shutdown	The operation can be stopped immediately just by turning off the switch for the aerator after stopping the injection of Magical Cleaner 2.
Daily check • Periodic check	<ul style="list-style-type: none"> <li>• Basically, it is only necessary to inject Magical Cleaner 2 when the day's work is finished.</li> <li>• The air pump for the aerator of the device can be operated automatically by setting the timer, eliminating the need for daily manual operation.</li> <li>• It is necessary to open the grease trap lid and remove the accumulated oil globules and food residue from the strainer in the grease trap about twice every month.</li> </ul>
Reliability of the equipment intended for verification	No trouble occurred in the verification equipment during the experiment.
How to solve the problems	If the air pump fails or any other problem occurs, the applicant for verification will fix it.
Evaluation of the instruction manual of operation and maintenance	The instruction manual for operation and maintenance was easy to understand.
Others	Since the contaminants in the wastewater can be effectively removed repeatedly and odors are reduced, this device is well-suited for pretreatment of wastewater.

#### 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.

##### ○ Product data

Items		Column to be filled in by the applicant for verification			
Name/type		GT OVAL system			
Manufacturer		BEST PLAN Co.,Ltd.			
Contact address	TEL/FAX	TEL088 (653) 0317 / FAX 088 (652) 7390			
	Web address	<a href="http://www.bestplan-t.com/">http://www.bestplan-t.com/</a>			
	E-mail	info@bestplan-t.com			
Necessity for pre-treatment and post-treatment		None			
Supplementary facility		If no power supply is available, electrical work must be performed.			
Life of the equipment		Six years for the body and the driving unit			
Time for initiation		The equipment can be used immediately after installation.			
Approximate cost	Expense item		Unit price	Quantity	Total
	Initial cost				
	Body type		252,000 yen	1 set	252,000 yen
	Delivery cost		840 yen/piece	2 set	1,680 yen
	Installation work (Basic 31,500 yen)		To be quoted separately	1 set	31,500 yen
	Total			1 set	285,180 yen
	Running cost (monthly)				
	Electric power consumption (To be operated on holidays also)		30 yen/kW	66.3 kW <sup>*2</sup>	1,989 yen
	consumable stores (Magical Cleaner 2) <sup>*3</sup>		10,000 yen/2L	1.26 L <sup>*4</sup>	6,300 yen
	•Cost for treating wastewater <sup>*5</sup> : ¥1,370/m <sup>3</sup> Breakdown (electric power: ¥329 Magical Cleaner 2: ¥1,041) •Cost per day: ¥366 Breakdown (¥1,989/30 days Magical Cleaner 2: ¥6,300/21 days)				

\*1:The number of days for operating the kitchen was calculated as 21 days a month.

\*2:Power usage per month = 2.211 kW (daily power usage<sup>\*6</sup>) × 30 days

\*3:The price of a 2-liter bottle of Magical Cleaner 2 is ¥10,000.

\*4:Monthly usage of Magical Cleaner 2 = 60 ml (volume per day recommended by the applicant for verification) × 21 days = 1.26 L

\*5:Monthly treated water volume = 0.288 m<sup>3</sup> (daily treated water volume: grease trap capacity) × 21 days = 6.05 m<sup>3</sup>

\*6:Quoted from Table 6-9 (on Page 41 of the Main Part in the Detailed Version)

○ Other information from the manufacturer

- This system decomposes fats and organic sludge by using an emulsifier, which mainly consists of the patented special enzyme and the fat extracted from several plants, in combination with an aerator.
- Since the system uses 100% natural materials, its environmental load is very low.
- This system was delivered through Gakken Holdings Co., Ltd. to more than 500 nursery schools across the country. It was introduced by the Kansai University CO-OP and is currently used by more than 15 national, public and private universities in the Kansai region. In addition, it is used by several cafeterias of the prefectural governments in the Chugoku and Shikoku regions and by a large supermarket chain of stores in the Kansai region. It has also been introduced by more than 2,000 hospitals, geriatric health service facilities, primary schools and school lunch centers across the country.
- Many of the users of this system say that “There are no more bad smells from the grease trap or having to clean it”, “The piping no longer becomes clogged” and “There is almost no slime due to wastewater”.
- This system not only cleans the grease trap, a part of the system, but it cleans the entire drainage system in the kitchen.