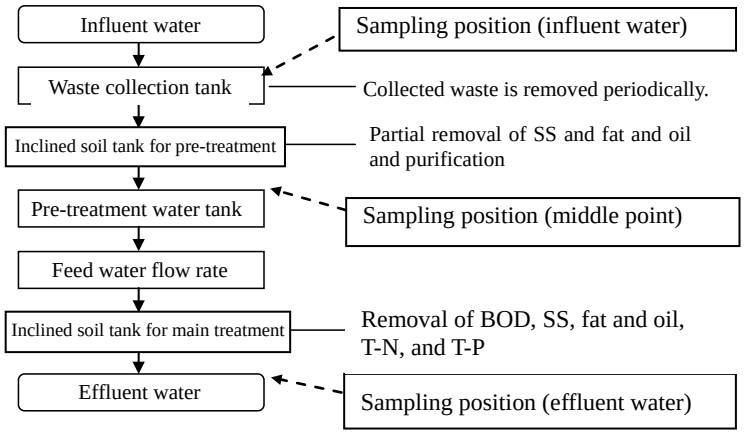
○ Overview

Target verification technology/Environmental technology developer	Advanced treatment apparatus using an inclined-soil chamber for kitchen wastewater / Yonden Consultants Inc.
Verification organization (executing the test)	Center for Environmental Science in Saitama (Saitama-ken Environmental Analysis & Research Association)
Verification test period	September 29, 2004 through March 3, 2005
Objective of this technology	(1) Partial removal of SS and fat and oil and purification (2) Removal of BOD, SS, fat and oil, nitrogen, and phosphorus

1. Summary of target verification technology

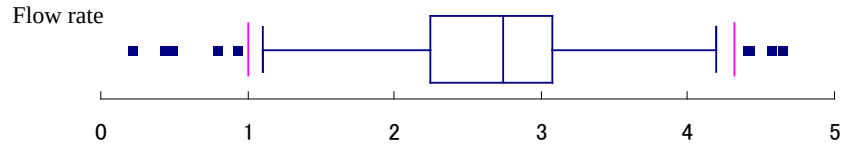


Principle

The purification carrier (Kanuma soil and Bora soil) is deposited to fill an inclined thin-layer container, to which wastewater is fed for infiltration downward, thus purifying the wastewater. Removal of BOD, SS, fat and oil, T-N, and T-P is possible, since they are comprehensively subjected to physiochemical purification methods, such as filtration, adsorption and biological purification processes, which mainly consist of the decomposition of organic substances.

2. Summary of the verification test

○ Summary of the verification-test site

Type of business establishment	Production of boxed meals
Scale of business establishment	About 250 portions/day
Location of site	2241-1 Oaza Yamada, Chichibu City, Saitama Prefecture
Amount of wastewater during the verification-test period (m³/day)	

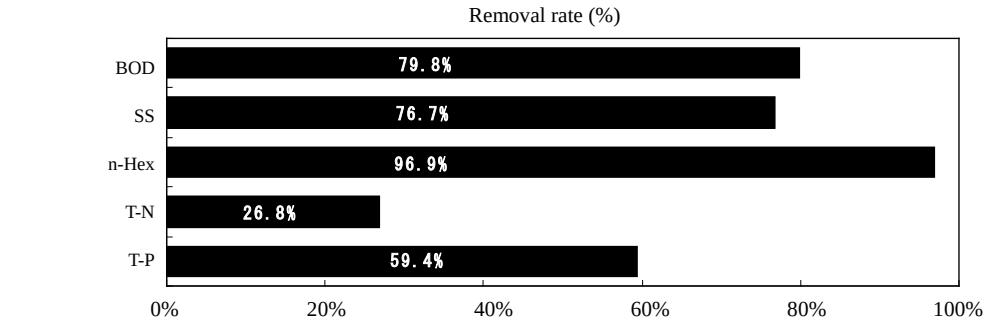
○ Specifications and processing capacity of the target verification apparatus

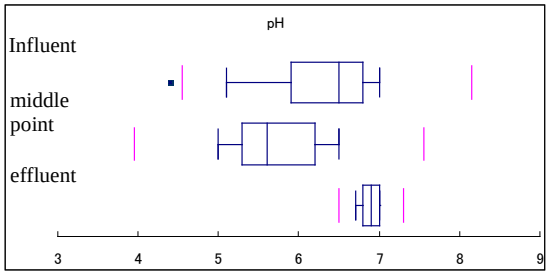
Division	Item	Specifications and processing capacity
Outline of apparatus	Model	Inclined soil tank method
	Dimensions and weight	W5,700mm × D1,360mm×H2,100mm, 6,200kg (when filled fully)
Design conditions	Target substances	PH, BOD, SS, n-Hex, T-N, T-P
	Daily wastewater flow rate	Max. 5.4 m³/day
	Influent-wastewater quality	(pH)5.8 - 8.6, (BOD)600mg/L, (SS)300mg/L (n-Hex)300mg/L, (T-N)40mg/L, (T-P)10mg/L
	Processed wastewater quality	(pH)5.8 - 8.6, (BOD)90mg/L or less, (SS)60mg/L or less (n-Hex)30mg/L or less, (T-N)10mg/L or less, (T-P)1mg/L or less

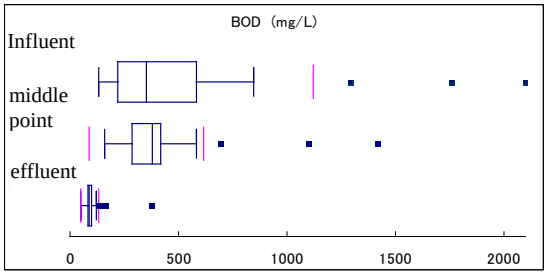
3. Results of the verification test

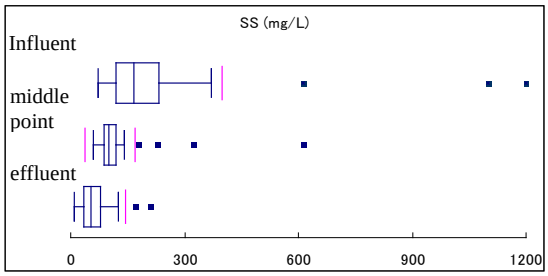
○ Verification items concerning water quality

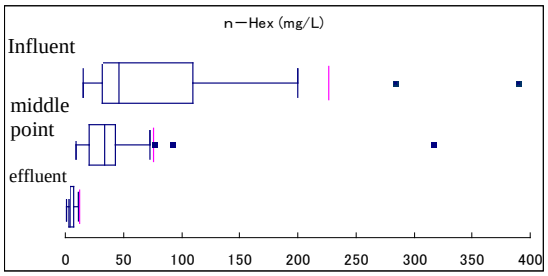
Item	Unit	Verification results (Lower adjacent value through upper adjacent value, and median)					
		Influent		Middle point		Effluent	
pH	-	5.1 - 7.0	6.5	5.0 - 6.5	5.6	6.7 - 7.0	6.9
BOD	mg/L	134 - 845	350	160 - 580	378	50 - 120	86
SS	mg/L	73 - 370	168	59 - 142	100	10 - 125	52
n-Hex	mg/L	15 - 200	46	9 - 73	34	1 - 11	4
T-N	mg/L	5 - 34	12	8.4 - 35	14	4.6 - 16	10
T-P	mg/L	0.6 - 10.0	4.1	1.6 - 11.5	5.4	0.4 - 3.4	2.1

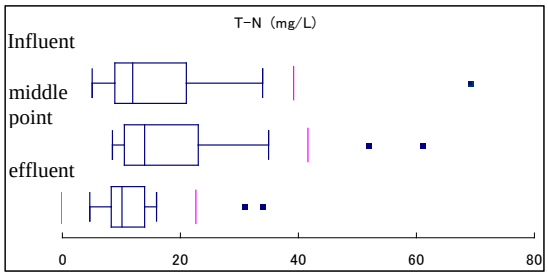


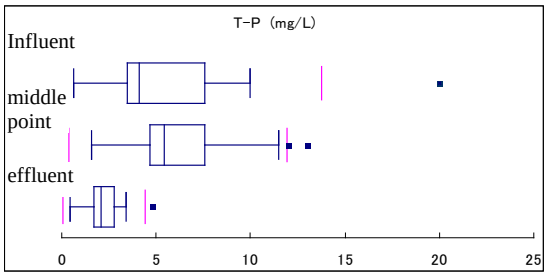












Note 1: The removal rates are calculated from the results of periodical tests. Removal rate = (Total pollution load of influent water – Total pollution load of processed water)/ Total pollution load of influent water

Note 2: Number of influent water data = 25 for each item, Number of middle point water data =25 for each item, Number of effluent water data=25 for each item

○ Items concerning environmental impact

Item	Verification results
Amount of generated sludge	Because the microorganisms having proliferated remain inside the tank, there is no sludge to be removed.
Amount of generated waste	Raw garbage (kitchen refuse): 0.4 kg/month
Noise	At 1 m: 52 dB Near the site boundary (at 10 m): 47 dB (including environmental noise other than the facilities)
Odor	Odor intensity: 2 to 3 Odor concentration: 32 to 10 or less Odor suppression measures should be taken. (For the detail, refer to the quantitative findings column.)

○ Items concerning used resources

Item	Verification results
Electricity consumption	0.98 kWh /day (4.52 kWh/day is added when the heater is operated.)
Consumption of other materials	5 moth-proof plates/3 months, or 20 plates/year Kanuma soil: 720 L/year (renewed at the first replacement time and reused thereafter)

○ Items concerning operation and maintenance performance

Maintenance item	Maintenance time and frequency	Number of operators and level of operator expertise required for maintenance
Normal maintenance	60 min (twice a month)	One operator. No particular expertise is required.
Replacement of inclined soil tank	4 hours (twice a year)	3 operators (engineers of the target apparatus developer)

○ Qualitative findings

Item	Findings
Water quality findings	 Influent water Sampled at 10 AM on February 23 Transparency: 6.8 Odor: Odor of kitchen refuse Hue: Milky white with high turbidity  Effluent water Sampled at 10 AM on February 23 Transparency: 12.0 Odor: Weak odor of kitchen refuse Hue: Medium whitish-yellow
Period required for startup of the target verification apparatus	About one month (recorded in summer). One engineer from the developer conducted an operation of 60 min. four times in total.
Period required for stoppage of the target verification apparatus	The apparatus can be stopped immediately by stopping the pump installed in the waste collection tank.
Reliability of the target verification apparatus	The apparatus maintained normal operation throughout the verification test period.
Restoring from a trouble state	The maintenance manual is good and sufficient to restore normal operation. No particular operating procedure is necessary, excluding the inspection of the settings of the pump and timer.
Evaluation of O&M instruction manual	Nothing in particular needs to be improved.
Others	○ Suitable measures should be taken against the odor and sand flies, which are generated at the site. This is particularly applicable to the startup of the apparatus; it is necessary to use an inclined soil tank which has been well conditioned in a different location as necessary. Noise was not a problem. ○ The quality of the effluent water, with respect to median values, was satisfactory except for the phosphorus values, which exceeded the target level. We changed the soil tank to improve the phosphorus value, without, however, achieving any remarkable improvement. ○ The concentrations at the influent water and middle points were reversed in some cases. Because of variations in the quality of the influent water over a short period of time, the sampling time is responsible for the values at the influent water point, while the averaging in the pre-treatment tank was the cause of the reversed values at the middle point.

(Information for reference)

The information provided on this page has been submitted by the environmental technology developer, who is solely responsible for its contents. Neither the Ministry of the Environment nor the Verification Organization may be held responsible for the information.

○ Product Data

Item		Information provided by environment technology developer
Name/Model No.		Hanamizuchi for small-scale establishments
Name of manufacturer (distributor)		Yonden Consultants Inc.
Contact address	TEL/FAX	TEL 087-887-2250 / FAX 087-887-2255
	URL E-mail	http://www.yon-c.co.jp/tieup/hanamizuchi/ hanamizuti@yon-c.co.jp
Dimensions/Weight		W5,700mm×D1,360mm×H2,100mm, 6,200kg(when filled fully)
Necessity for pre- and/or post-treatment		When considerable solid waste is expected to flow into the facility, a waste collecting tank must be installed as a means of pre-treatment (which was done in this facility). For much improved water quality, an inclined soil tank must be installed as the means of post-treatment (which was not done in this facility).
Additional equipment		Waste collecting tank
Lifespan of target verification apparatus		20 years
Startup period		One month in summer or 3 months in winter

Approximate cost (yen)	Item	Unit price	Qty.	Total
	Initial cost			4,010,000 yen
	Equipment cost (main unit and additional apparatus)		One set	2,588,000 yen
	Civil engineering cost		One set	600,000 yen
	Others (Operation adjustment cost, etc.))		One set	822,000 yen
	Running cost (monthly)			25,958 yen
	Sludge treatment cost	-----	-----	-----
	Waste treatment cost	-----	-----	-----
	Electricity consumption	17 yen/kWh	24.5kWh/ month	416 yen
	Water consumption	-----	-----	-----
	Water treatment chemical cost	-----	-----	-----
	Other consumables			3,542 yen
	Kanuma soil	500 yen/bag	45 bags	1,875 yen
	Moth-proof plate	1,000 yen	5 moth-proof plates/once every 3 months	1,667 yen
	Maintenance commissioning cost			22,000 yen
	Normal maintenance	6,000 yen	Twice/month	12,000 yen
	Replacement of inclined soil tank	60,000 yen	Twice/year	10,000 yen
	Per 1 m³ of processed wastewater (Processed wastewater is assumed to be 65 m³/month.)			399 yen

○ Micellaneous information provided by the manufacturer

- The mud at the bottom of the existing wastewater intercepting chamber or commercially available earthworms is/are fed for seeding.
- The waste refers to kitchen waste collected in the waste collecting tank and is assumed to be disposed of by the business establishment.
- The inclined soil tank replacement cost includes the labor charge and expense associated with a transportation vehicle. The initial replacement of the tank requires fresh Kanuma soil. However, for the second and subsequent replacements, the inclined soil tank, which was removed during the previous replacement and whose function has been restored, may be reused.
- Five moth-proof plates can be used for 3 months.
- The amount of processed water is estimated to be 2.6 m³ × 25 days per month.