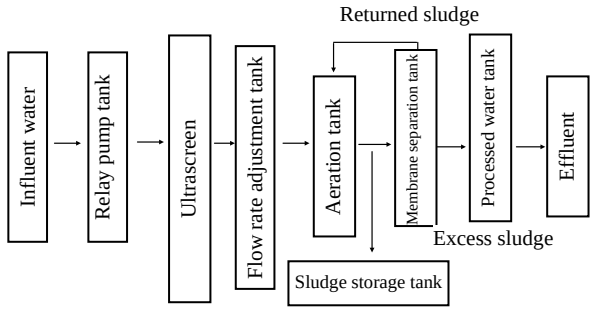
○ Overview

Target verification technology/Environmental technology developer	Membrane separation activated sludge method / KUBOTA Corporetion
Verification organization (executing the test)	Kagawa Prefectural Government (Kagawa Prefectural Research Instiute for Environmental Science and Public Health, Shikoku Instrumentation CO., LTD.)
Verification test period	September 24, 2004 through February 18, 2005
Objective of this technology	General treatment of organic wastewater

1. Summary of target verification technology



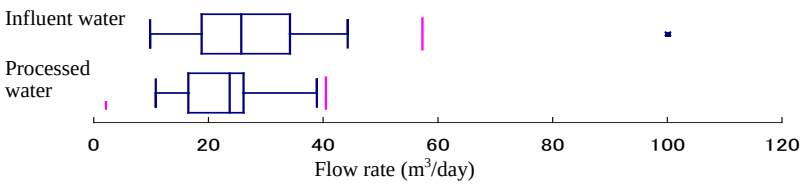
Principle

Organic substances in the wastewater are decomposed by activated sludge in the aeration tank. Subsequently, activated sludge and processed water are separated by a microporous membrane of 0.4 μm, thus producing processed water.

The facilities at which the verification test was conducted had been operated with a wastewater treatment system using the activated sludge method. The facilities are characteristic in that they used conventional equipment as it had been and a membrane separation tank was additionally installed to establish today's modified water treatment system.

2. Summary of the verification test

○ Summary of the verification-test site

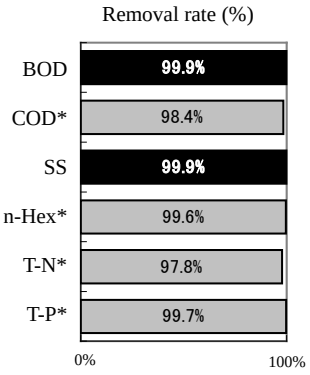
Type of business establishment	Production of soy sauce
Scale of business establishment	Soy sauce production of 300 KL/month
Location of site	5379 Fuchuu-cho, Sakaide City, Kagawa Prefecture
Amount of wastewater during the verification-test period	

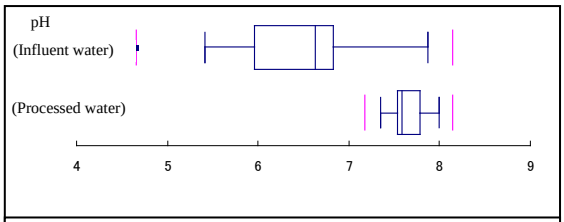
○ Specifications and processing capacity of the target verification apparatus

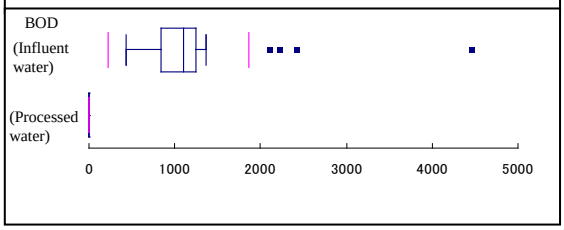
Division	Item	Specifications and processing capacity
Outline of apparatus	Model	Activated sludge method water treatment apparatus (a membrane pack/MT60 is used in the water)
	Dimensions and weight	W12,700mm × D12,400mm × H2,854mm, Approx. 15,000 kg
Design conditions	Target substances	BOD, SS
	Daily wastewater flow rate	35 m^3/day
	Influent-wastewater quality	(BOD)400 mg/L, (SS)950 mg/L, (pH)5.8 - 8.6
	Processed wastewater quality	(BOD)10 mg/L, (SS)5 mg/L, (pH)5. - 8.6

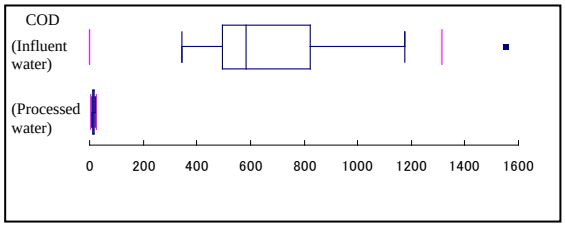
○ Verification items concerning water quality

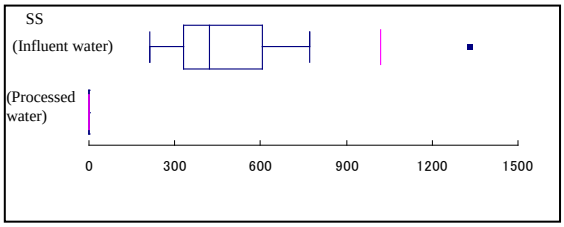
Item	Unit	Verification results (Lower adjacent value through upper adjacent value, and median)			
		Influent water		Processed water	
pH*	-	5.4 - 7.9	6.6	7.4 - 8.0	7.6
BOD	mg/L	430 - 1,400	1100	<0.5 - 1.5	1.0
COD*	mg/L	350 - 1,200	570	10 - 23	13
SS	mg/L	210 - 770	420	<0.5 - <0.5	<0.5
n-Hex*	mg/L	18 - 620	200	<1.0 - <1.0	<1.0
T-N*	mg/L	35 - 78	56	0.8 - 3.1	1.6
T-P*	mg/L	6.2 - 17	10	0.01 - 0.17	0.03

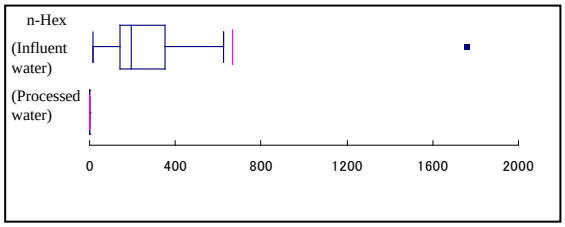


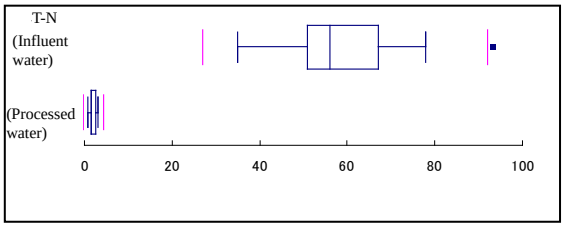


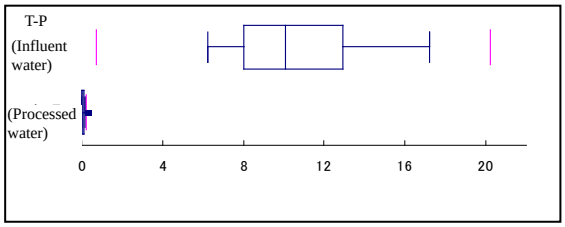












Note 1: The removal rates are calculated from the results of periodical tests. Removal rate = (Total pollution load of influent water – Total pollution load of processed water)/ Total pollution load of influent water

Note 2: Items marked with * are excluded from the target items which this particular target verification apparatus is assumed to remove

Note 3: Number of influent water data = 23　Number of processed water data=23. However, there are data which do not involve flow rate measurements; the number of influent water data is 19 and the number of processed water data is 19 for the calculation of the removal rate.

○ Items concerning environmental impact

Item	Verification results
Amount of generated sludge	8.9kg/day(dry), 60.6kg/day(water content 85.3%)
Amount of generated waste	Screen residues: 0.3 kg/day (dry) and 2.0 kg/day (water content: 84.0%)
Noise	65.3 dB(including environmental noise other than the facilities)
Odor	Odor index: 14 Odor concentration: 23 Odor intensity: 3 (six grade odor intensity measurement method) Odor offensiveness: 0 (nine grade odor offensiveness measurement method)

○ Items concerning used resources

Item		Verification results
Electricity consumption		128kWh/day
Consumption of wastewater treatment chemicals, etc		Ferric chloride solution: 3.5 kg/day
Consumption of other materials	Membrane cleaning chemicals	Oxalic acid: 4.7 kg/year 12% sodium hypochlorite: 38 kg/year
	Membrane equipment consumables	Replenishment of membrane cartridges (Replacement was not conducted during the verification test period.)

○ Items concerning operation and maintenance performance

Maintenance item	Maintenance time and frequency	Number of operators and level of operator expertise required for maintenance
Daily inspection	10 min (Once a day)	One operator. No particular expertise is required.
Removal of excess sludge	30 min (a few times per week) 2 to 4 removals per month can be applied if a sludge storage tank is used.	One operator. No particular expertise is required.。
Membrane cleaning	180 min (twice a year)	One operator. No particular expertise is required.

○ Qualitative findings

Item	Findings
Water quality findings	Influent water : Brown with some turbidity Processed water: Light brown and transparent (Measured on Feb. 18, 2005)  Influent water Processed water
Period required for startup of the target verification apparatus	Not verified, because the facilities had been operated.
Period required for stoppage of the target verification apparatus	Not verified, because the facilities had been operated.
Reliability of the target verification apparatus	Stable during the verification test period. However, the operation was interrupted once as the facilities were flooded by the typhoon.
Restoring from a trouble state	Operational failures may be restored in accordance with the Operating Manual and Maintenance Manual. However, troubles with the membrane must be solved by a special servicing establishment.
Evaluation of O&M instruction manual	Nothing in particular needs to be improved.
Others	○ The high-grade quality of the processed water, which can be reused, is maintained. ○ A remote-controlled monitoring system is provided within the facilities and the special servicing establishment is responsible for checking the operating conditions twice a day and notifying and restoring the system in the event of failure.

(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.		Activated sludge method water treatment apparatus (membrane pack/MT60 is used in the water)
Name of manufacturer (distributor)		KUBOTA Corporetion
Contact address	TEL/FAX	TEL：03-3245-3665（+81-3-3245-3665） FAX：03-3245-3407（+81-3-3245-3407）
	E-mail	–
Dimensions/Weight		W 4,212mm×D 2,202 mm×H 2,854 mm 4,000kg
Necessity for pre- and/or post-treatment		Not required(Required depending upon the raw water quality)
Additional equipment		A raw water tank and flow rate adjustment tank are required.
Lifespan of target verification apparatus		About 15 years (depending on the maintenance condition) 3 to 7 years for the membrane cartridge
Startup period		1day

Approximate cost (yen)	Item	Unit price	Qty.	Total
	Initial cost (excluding the construction work of additional facilities)			14,685,000
	Main unit and installation work		One set	12,800,000
	Remodeling of existing wastewater facilities		One set	1,850,000
	Other expenses		One set	35,000
	Running cost (monthly)			204,090
	Sludge treatment cost	23,000yen/m^3	1.8 m^3	41,400
	Waste treatment cost	23,000yen/ m^3	0.06 m^3	1,380
	Electricity consumption	15yen/kWh	3,840kWh	57,600
	Water consumption	-----	-----	-----
	Water treatment chemical cost	67yen/ kg	110kg	7,370
	Other consumables			96,340
	Membrane cleaning chemical cost Oxalic acid and sodium hypochlorite		One set One set (annual cost/12 months)	340
	Membrane equipment consumables maintenance contract (including one special inspection once a year)		One set	96,000
	Maintenance commissioning cost	-----	-----	-----
	Per 1 m^3 of processed wastewater (Processed wastewater is assumed to be 700 m^3/month.)			292

○ Micellaneous information provided by the manufacturer

- The proliferation of filamentous bacteria or bulking specific to the activated sludge method does not affect the quality of the processed water.
- The apparatus can be installed additionally to the existing treatment system with ease and the changeover operation can be quickly accomplished.
- A remote-controlled monitoring system is provided as standard, operating conditions can be checked via telephone line from a distance.