

DOMESTIC SEWERAGE SYSTEM

*Shigenori HIWATASHI, *Isao ISHII

*Mitsunori TANAKA and *Etsuko OKABAYASHI

家庭用下水処理システム

樋渡 重徳 石井 勲

田中 光徳 岡林 悦子

[KEYWORDS] :

BOD (Biochemical Oxygen Demand), Uneven-shaped plastic containers, Recycle, Ecosystem, DO (dissolved Oxygen), Construction costs.

[ABSTRACT] :

In many communities where on-site sewage disposal systems have created pollution problems and health hazards, the automatic response has been a demand for the installation of central sewers. Demand is satisfied despite a recognition that the responsibility for the pollution problem primarily occurs in a relatively small number of domestic sewage sources within the community. However, there is a more fundamental problem that lies not simply in an inadequate system, but in a flawed system.

We propose that waste be purified on the premises of the user. The water, thus treated, would flow into a trench and from there back into the natural water-cycle via brooks, rivers and the sea. In this way, water returns more quickly to its natural state than using conventional systems. Such a method is our on-site closed-looped system called the 'Domestic Sewerage System' now being used in small and medium size communities, factories and recreational facilities throughout Japan.

TECHNICAL INFORMATION IN BRIEF

Current policies of liquid waste management have come under close scrutiny from environmentalists and concerned citizens.

We feel the problem of sewage disposal should be tackled from both an environmental and a consumer standpoint. The 'Domestic Sewerage System' is such a method.

Dai-ichi Technical University has constructed a simple purifier, capable of purifying household waste to the level of BOD (Biochemical Oxygen Demand) 1 mg/l.

This device simply mimics and accelerates nature efficient self-purifying action within one system without causing adverse effects on the environment.

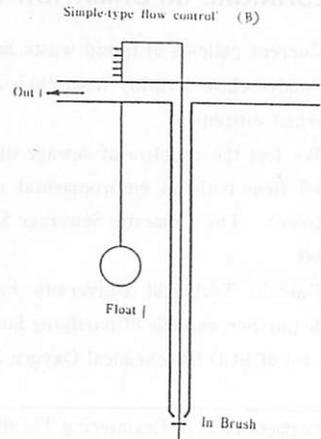
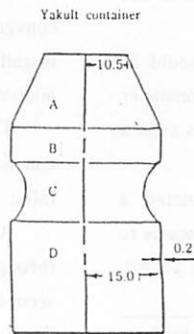
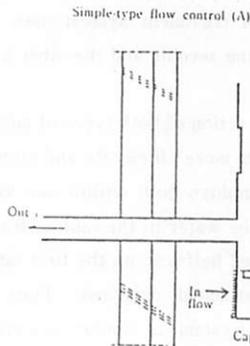
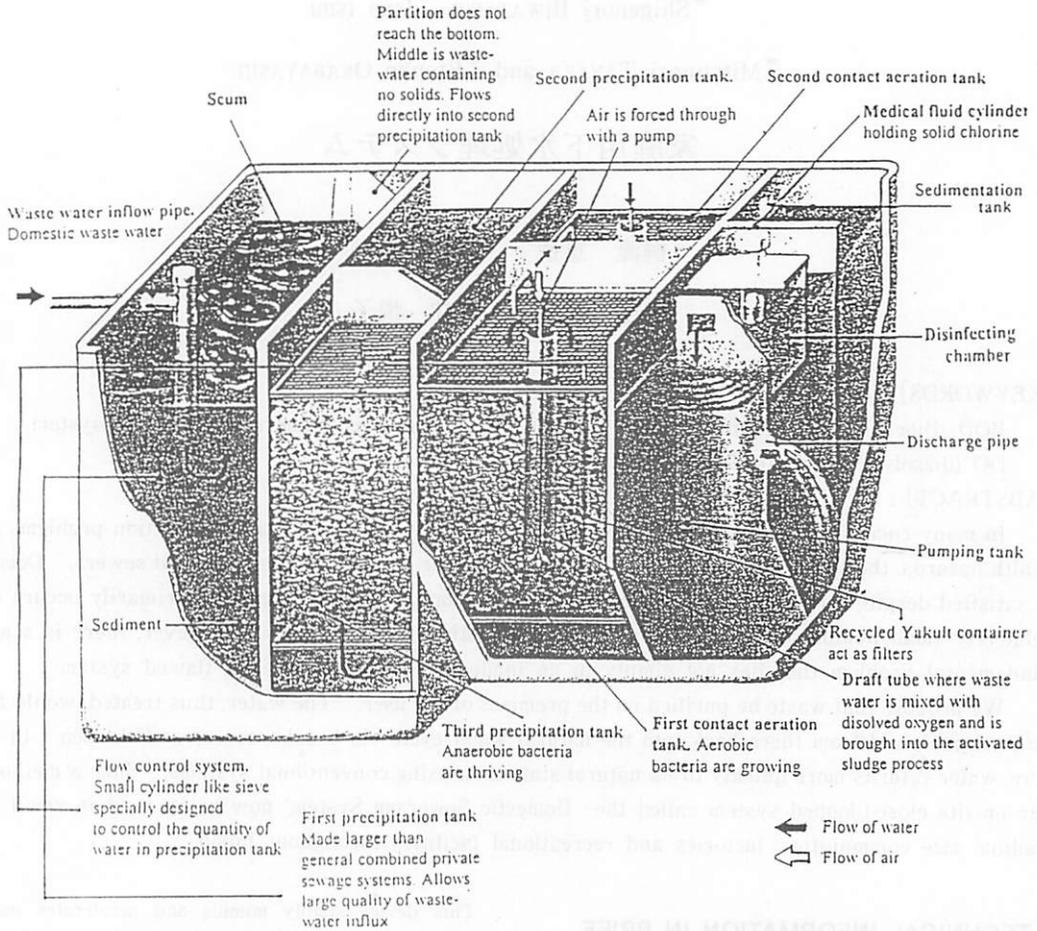
The following is a simplification of the system. A conventional type of treatment system uses separate installations, one using aerobic and the other anaerobic microorganisms.

The synergistic action of both types of microorganism will purify water more efficiently and environmentally; our system employs both within one system.

After settling, the water in the tank is transferred through pipes situated half-way up the first tank into a second tank (see attached diagram). Thus far the 'Domestic Sewerage System' is similar to conventional methods except in the next phase, the purification stage

*Department of Civil Engineering, Faculty of Technology,
Daiichi Technical College

STRUCTURE OF THE 'DOMESTIC SEWERAGE SYSTEM'
BY: DAI-ICHI UNIVERSITY



where Yakult-containers (recycled drink containers) are used.

The bottoms of these empty Yakult-containers are removed and used as filter beds for aerobic and anaerobic microorganisms. These filters are dispersed randomly throughout the aeration tank. Air enters the tank from the tip of a blower pipe inserted in the centre of the draft tube. The pressure of the wastewater tank forces the water into the next tank.

This enables different organic processes to occur in different tank. While this process is occurring the water is circulating continuously at a rate of 0.5 cm per second.

There is a range of DO (Dissolved Oxygen) emission inside the Yakult-filters from zero to saturation.

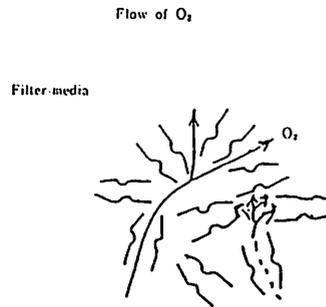
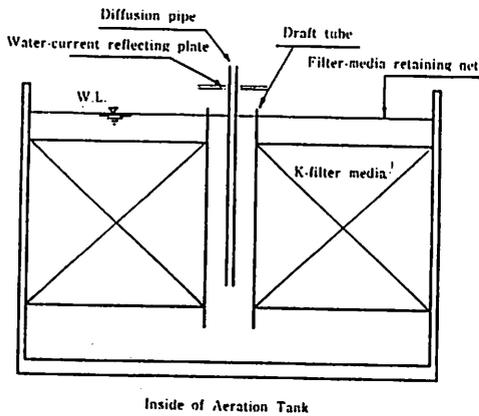
Thus, various types of microorganisms can multiply inside the filters; each tipe thriving best in the environment best suited to it. This aeration installation consists of two tanks. The first lowers and

removes the dissolved BOD and the second traps and oxidizes microscopic SS (Suspended Solids) which flow out of the first tank.

Though the volume of one Yakult-filter is only 65ml, its irregular shape produces a surface area far larger than conbentional filters. For example each household discharges one cubic metre of wastewater.

Our domestic sewerage system utilizes 8300 Yakult-filters per cubic metre, making the total area of the surface water covered, 28 metres squared.

The system using Yakult-filters has the same capacity as a circular setting tank six metres in diameter. The system is currently being used through-out Japan and Indonesia. Plans are now underway for its implication in Korea. We foresee that this simple, cost efficient and environmentally safe method of liquid waste management, with minimal sludge output, can effectively contribute to cleaner water around the world.



DIMENSION OF THE DOMESTIC SEWERAGE SYSTEM' BY NUMBER OF
PRESONS

#People	Length (mm)	Width (mm)	Height (mm)	Volume (cubic metres)
5	2 300	1 400	2 170	5.313
6	2 400	1 600	2 170	6.303
7	2 600	1 800	2 170	7.697
8	2 800	1 800	2 170	8.197
10	3 200	2 000	2 320	10.636
15	3 800	2 200	2 570	15.414
20	4 100	2 200	2 570	16.198
25	4 300	2 400	2 570	18.413

ELECTRIC POWER NECESSARY FOR BLOWER AND MOTER

#People	Energy Consumed (watts)
5	45
6	50
7	50
8	50
10	150
15	250
20	250
25	250

COMPARISON OF COST BETWEEN THE DOMESTIC SEWERAGE SYSTEM'
AND CURRENT WASTE WATER TREATMENT PLANTS (IN JAPAN)

	Domestic Sewerage System	Waste water Treatment Plant
Installation and Construction Costs (\$CAN/person)*	\$1 100-1 800 (based on five persons or more)	\$11 000-17 000
Effucnt Level (BOD mg/l)	1-3	10-20
Reduction of Nitrogen (%)	50	20

*Prices are based on Japanese costs, conversion is 1 \$CAN=90 Yen.

· Note : Maintenance costs for the system is negligible