

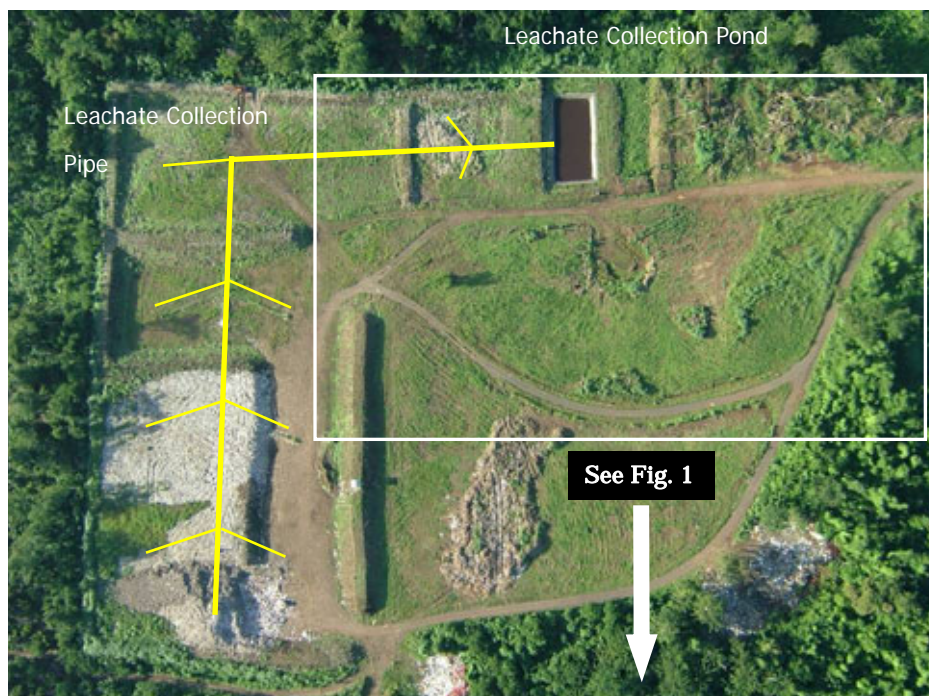
# Tafaigata Landfill Rehabilitation Project

## 1. Overview

The Tafaigata landfill has been transformed using the Fukuoka method (Semi-Aerobic Landfill Structure) funded by JICA (Japan International Corporation Agency)

The 1<sup>st</sup> phase is complete and includes the setting up of leachate collection pipes, leachate collection pond, and boundaries (see Pic. 1, 2). The 2<sup>nd</sup> phase includes the setting up of Leachate Treatment Facilities (see Fig.1)

Project cost: US\$400K (consultant supervisor not included)



Pic.1 Phase 1 /April 2005



Pic.2 Leachate collection and gas venting pipe

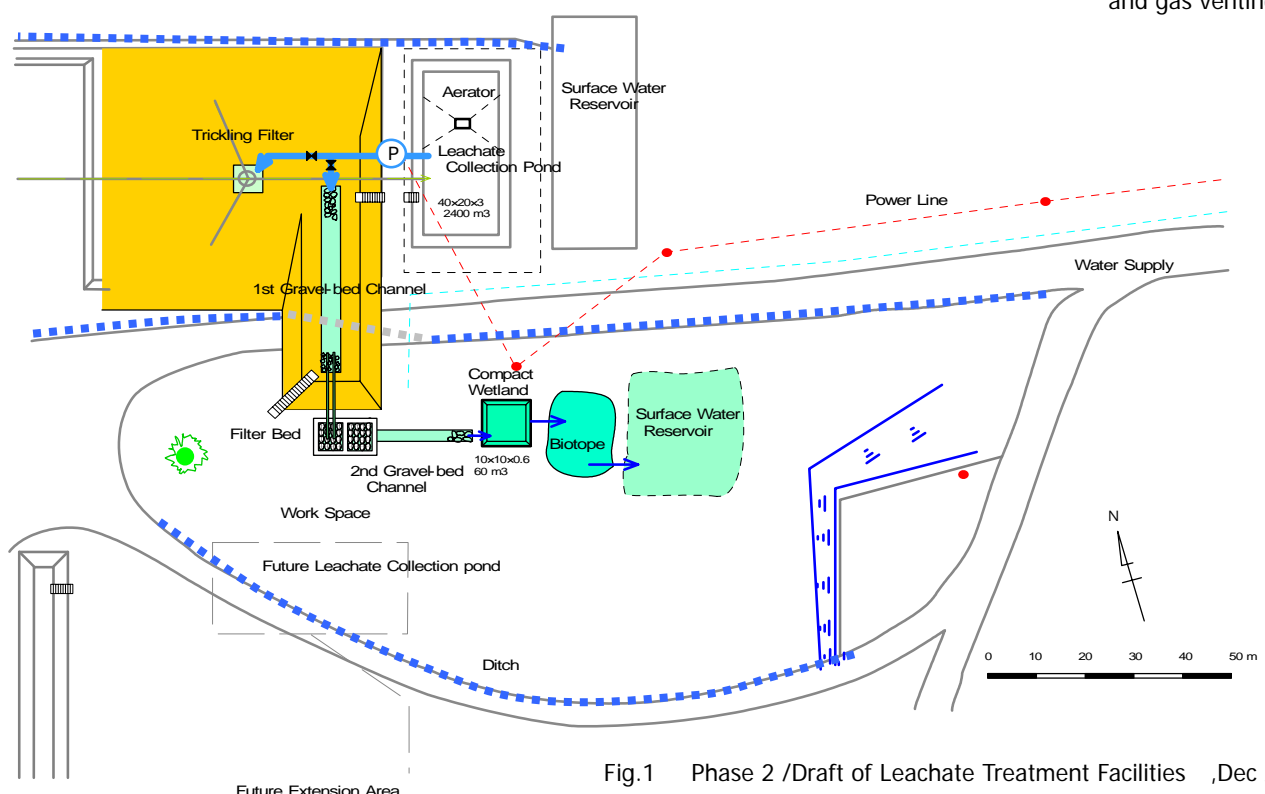


Fig.1 Phase 2 /Draft of Leachate Treatment Facilities ,Dec /2005

## 2 . What is the Fukuoka Method ?

Fig.2 **Anaerobic** Landfill structure (Conventional type)  
Tafaigata landfill before 2003

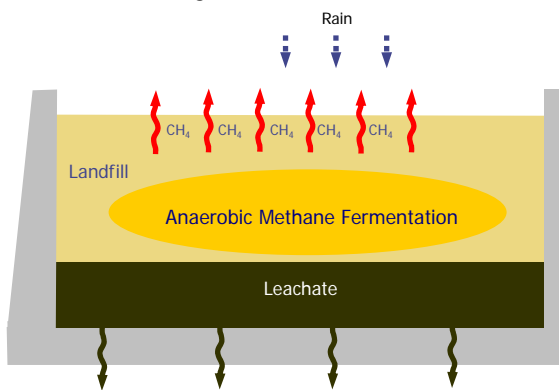
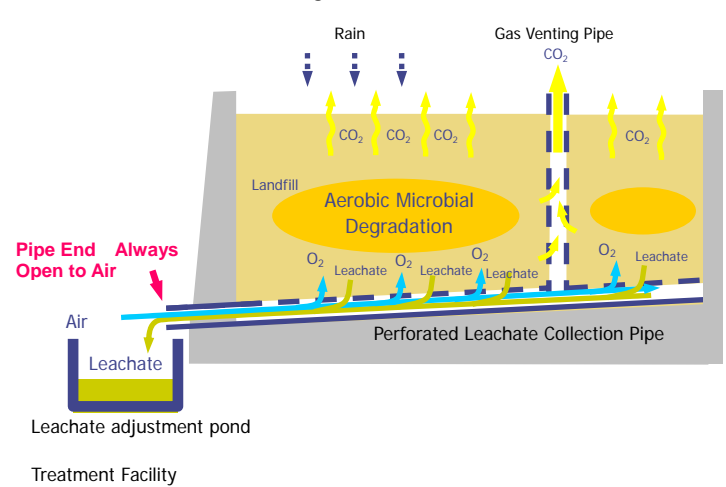


Fig.3 **Semi-Aerobic** Landfill structure (**Fukuoka Method**)  
Tafaigata landfill from 2003 onwards



### Condition

Rubbish dumped on the ground or in a hole stagnates with leachate in an anaerobic condition.

### Characteristics

1. Emits an offensive odor and high nutrient leachate.
2. Aggravates Global Warming through the generation of Methane gas ( $\text{CH}_4$ )
3.  $\text{CH}_4$  Gas has a 21 times stronger effect than Carbon Dioxide ( $\text{CO}_2$ )
4. Long term decomposition is required under anaerobic conditions before land can be reused.
5. Odorous and unsafe waste pile discourages constraint tipping area

Local materials can be used for leachate collection pipes such as bamboo, waste tyres, etc .



Pic .3 using bamboo / China



Pic .4 using waste tyres / Mexico



Pic .5 Nakata landfill / Japan

**Fukuoka Method is the standard method of landfill in Japan**

### Function

Leachate collection and gas venting pipes are set up, which provide fresh air automatically into the rubbish layer using convection effect of heat generated by fermentation in the rubbish.

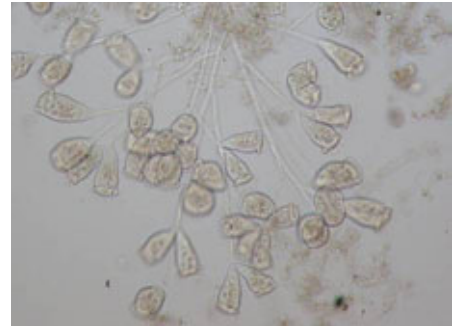
### Characteristics

1. Immediate removal of leachate and flow of air makes landfill in aerobic condition. and that makes leachate cleaner and less smell than conventional landfill.
2. Generation of Methane gas ( $\text{CH}_4$ ) is low and thus effective for prevention of Global Warming and reduction of fire risk.
3. Fast stabilization and easy maintenance
4. Cost effective using local materials such as bamboo, waste tyres, waste drums for pipes ( see Pic.2,3)

### 3 . Leachate Treatment System

#### Outline of Treatment System

Tafaigata Leachate Treatment Facility will mainly be set up employing **natural cleansing methods/effects** such as Gravel-bed Channels, Compact Wet Land, etc.. This Eco-friendly system also requires less energy for operation and minimum maintenance.



Pic.6 Bacteria used for treatment

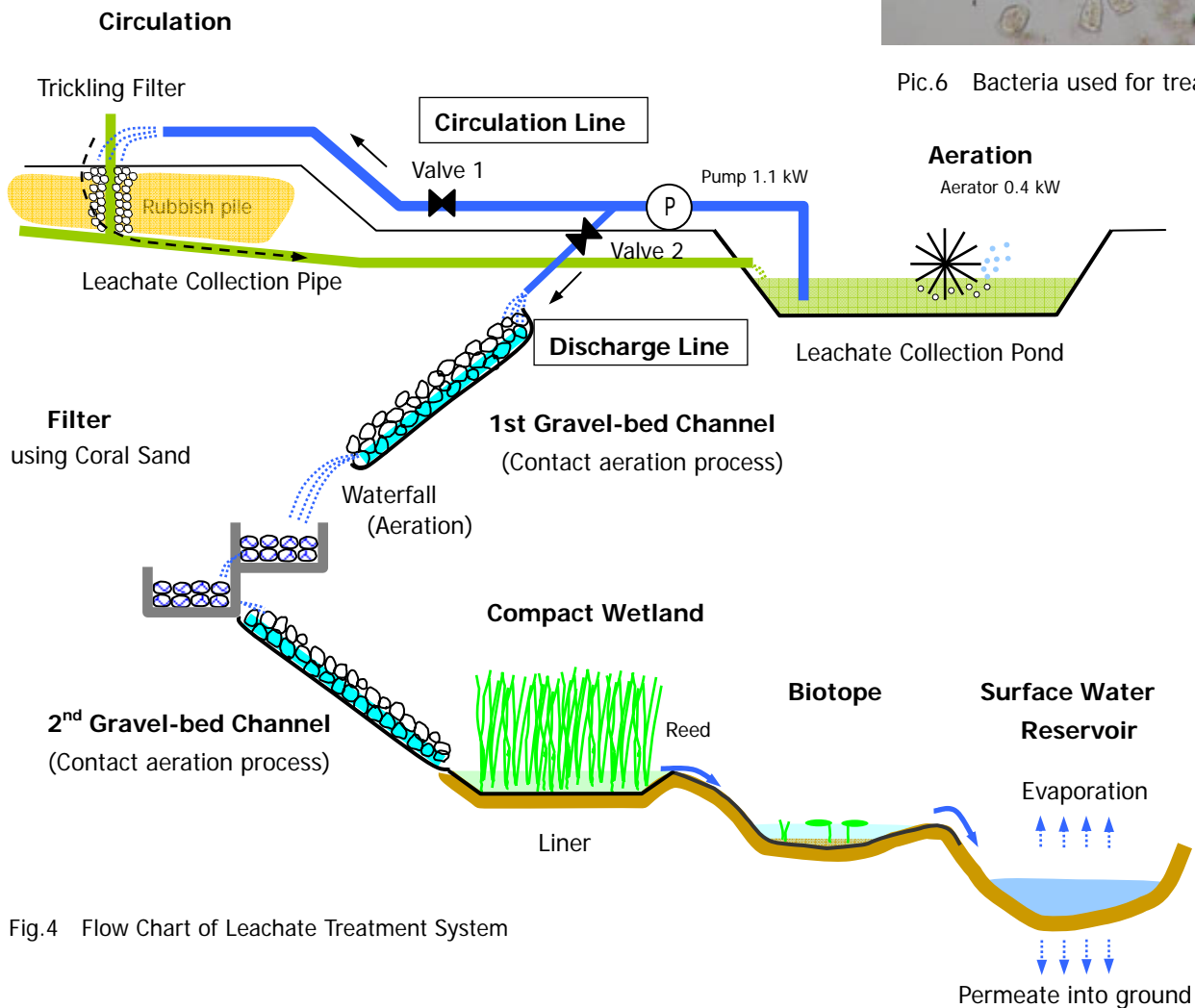


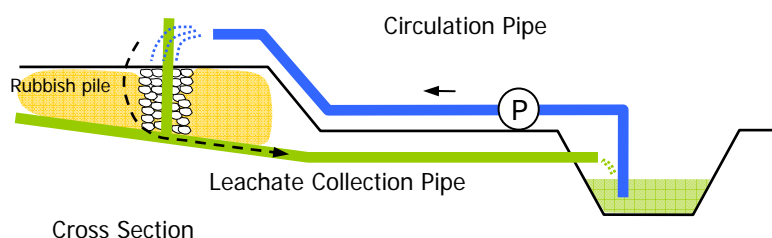
Fig.4 Flow Chart of Leachate Treatment System

#### Circulation Treatment

Circulation treatment (CT) is a leachate treatment system combining Trickling filters (TF) with the leachate collection pipe. TF is an aerobic treatment system that utilizes microorganisms growing on the rocks to remove organic matter from wastewater.

Leachate from the Leachate Collection Pond is sprinkled to a TF surrounding a Gas ventilation pipe, and runs back to the Leachate Collection Pond again. By repeating this process, organic matter is gradually consumed by the bacteria until BOD is low directed into the chain of polishing systems.

Fig.5 Circulation Treatment



Pic.7 Trickling Filter



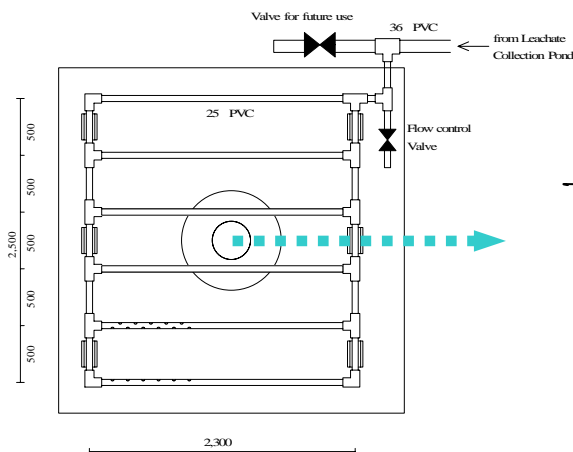


Fig. 6 Top view of Trickling Filter

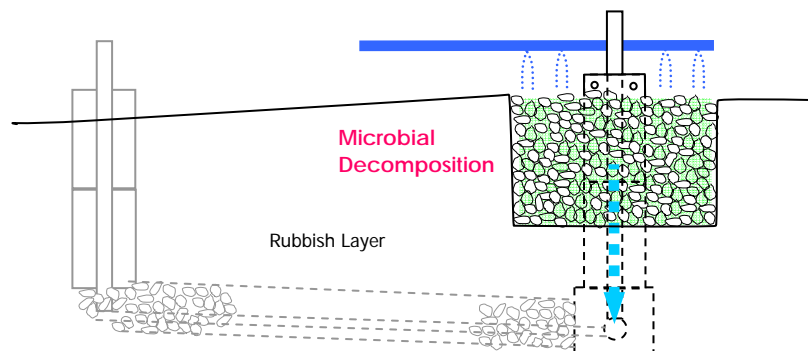


Fig. 7 Cross Section of Trickling Filter

### Aeration

Aeration provides oxygen for microorganisms to decompose organic matter in water.

### Gravel-bed Channel

The Gravel-bed Channel is one of the natural cleansing methods, and continues the process of the TF using aquatic organisms attached to the surface of gravel. When water flows between gravel, aquatic organisms decompose and absorb the polluting nutrients.

### Filtration

Local materials such as coral sand and coconut husk activated carbon will be used as filters to adjust pH and remove heavy metals and organic compounds in the leachate.

### Compact Wet Land

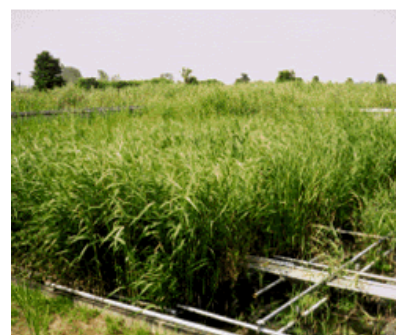
Compact wet land is another natural cleansing method as well using aquatic vegetation such as reed, which removes the strong nutrients Phosphorous and Nitrogen, to prevent any downstream eutrophication. Leachate is now clean enough for the natural environment.

### Biotope

Biotope represents the natural Ecosystem. In this system biotope shall be an indicator of treated water quality.



Pic.8 Aerator



Pic.9 Compact wetland



Pic.10 Image of biotope



Pic.11 Comparison of leachate

After 1 month operation, excessive nutrients are reduced, color is clear and no smell.