DEWATS, Manjuyod Public Market, Negros Oriental, Philippines

Decentralized Wastewater Treatment System -DEWATS

Manjuyod Public Market

Office of the Provincial Engineer, Negros Oriental

1 General Data

Type of Project:
Decentralized Wastewater treatment facility for a Public Market

Project Period:
Start of planning: 03/2007
Start of construction: 06/2007
Start of operation: 12/2007
(20 % utilized capacity as of 09/2008)

Project Scale:
Municipal Level

Address:
National Highway, North Road
Manjuyod, Negros Oriental, Philippines

Planning and Executing Institution:
Provincial Engineer's Office
Province of Negros Oriental

Supporting Agency:
Basic Needs Services Philippines, Inc. (BNS-Phils.)
Bremen Overseas Research and Development Association (BORDA)

2 Objective of the project

- To prevent the spread of disease and thus protect public health.
- To protect the natural environment, especially vital and scarce economic resources such as water.
- To reuse processed water for agriculture, cleaning vehicles, pigpens, etc., and conserving fresh water.
- To improve agricultural production, subsequently, the economy.

3 Location and general conditions

Manjuyod is a third class municipality consisting of 27 barangays. In relation to health, waterborne diseases, such as diarrhea, typhoid fever and acute gastro-enteritis are among the leading causes of morbidity. Other problems include clogging of waterways due to improper solid waste disposal. The uncontrolled dumpsite also exposes the nearby residents to waste pollution.

Figure 1: View of the anaerobic treatment modules: settling tank (ST), anaerobic baffled reactor (ABR) and anaerobic filter (AF). (Source: BORDA)

Domestic wastewater is the liquid component of waste removed from residences, businesses, and institutions. Wastewater from public markets is considered to be one of the major sources of domestic wastewater. Domestic wastewater generally includes wastewater from toilets, sinks, tubs and showers and kitchens, etc.. It may also include wastewater from small businesses and enterprises.

Public market wastewater must be treated and disposed of in a manner that minimizes potential harm to public health and detrimental impacts on the environment. This kind of wastewater is mainly composed of suspended solids, high levels of organic pollutants, fats, oil, and grease. When untreated wastewater is discharged to water bodies such as the sea, creeks, rivers and streams, it contaminates these waters with harmful bacteria, organic pollutants and nutrients and also causes foul odors.

Without a treatment plant, the discharged wastewater quality does not meet Philippine effluent standards.

4 Technologies applied

The wastewater from Manjuyod's public market is treated in a decentralized system (DEWATS) composed of 5 different components. The raw wastewater is first collected in a settling tank where the anaerobic process begins. Here, solid material settles at the bottom of the tank while the scum is floating on the surface and is separated from the waste water through a wall. Wastewater then passes onto the anaerobic baffled reactor which reduces the BOD/COD content from 20% to 85%.

Naturally the waste water from the anaerobic baffled reactor has a foul odor due to the absence of oxygen. Thus, oxygen must be introduced to the wastewater in the next treatment step. This is a planted gravel filter. By passing through the gravel and plant roots, wastewater comes into contact with oxygen. In the final step a polishing pond is installed to complete the aerobic process. It can also function as an indicator pond to monitor wastewater quality after treatment.

The five components can be designed in such away that they can be contained within the available space while blending with the landscape. In Manjuyod the settling tank, anaerobic baffled reactor and anaerobic filer are constructed underground.

Figure 2: View of the aerobic treatment modules: planted gravel filter (PGF), indicator / polishing pond (IP). (Source: BORDA)

The planted gravel filter will be planted with common reeds for sub surface treatment and landscape purpose. Aquatic plants will also be introduced into the indicator pond.

5 Further project components

The DEWATS facility is part of the relocation of the public market by the Manjuyod local government. The old public market lies in a private property and the local government decided to relocate it to a new site.

The transfer to the new public market has not yet been fully completed. Therefore the capacity of the DEWATS system has only be used by 20% so far.

6 Project History

As part of Manjuyod's development program it was decided to make Manjuyod cleaner and safer by building a wastewater treatment system for the Manjuyod public market.

Through information campaigns and meetings with experts of the DILG-GTZ Water and Sanitation Program the municipality learned about the services of BNS-BORDA. In the fourth quarter of 2006, the municipality signed a contract with BNS-BORDA Philippines to build a wastewater treatment plant for the Manjuyod public market using the Decentralized Wastewater Treatment System (DEWATS).

A Detailed Engineering Design (DED) was prepared by BNS-BORDA and submitted to the municipality on March 20, 2007. The total area of the proposed wastewater treatment plant is 400.80 m² with a total volume of 373.60 m³.

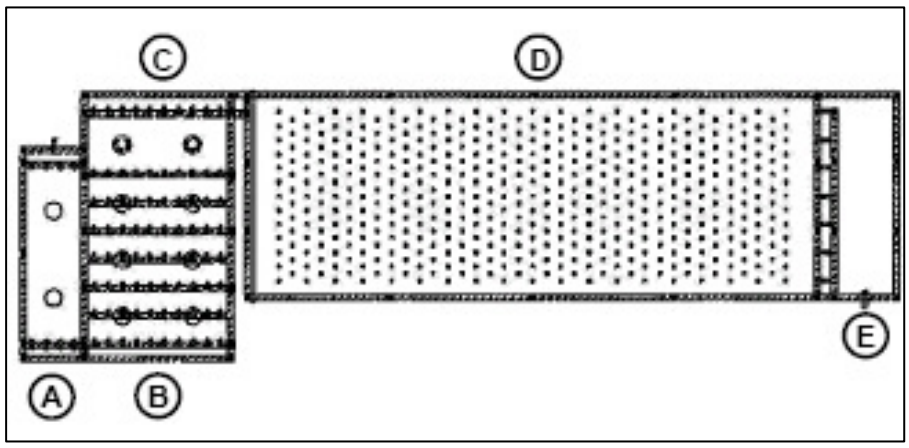

Figure 3: Treatment Plant layout. *A*–Settling Tank; *B*–Anaerobic Baffled Reactor; *C*–Anaerobic Filter; *D*–Planted Gravel Filter; *E*–Indicator Pond. (Source: BORDA)

Construction of the facility began in May 2007, and a site engineer was assigned to supervise the construction based on the design to ensure that the construction was carried out in accordance with the quality standards required for the DEWATS. Construction was completed on December 15, 2007.In January 2008, BNS-BORDA organized training for the Operation and Maintenance of the treatment plant for employees of the municipality.

This training shall help the operators to learn about possible accidents, physical and chemical hazards, and ergonomic, psychological and organizational factors that are important for the operation. Common problems that might occur due to poor operation and maintenance are leakage, short circuiting of the wastewater flow, clogging of inlet and outlet pipes, backflow of the wastewater and lastly the incorrect elevation.

As of now the BNS-BORDA office supervises the operation and maintenance of the Manjuyod Public Market treatment plant.

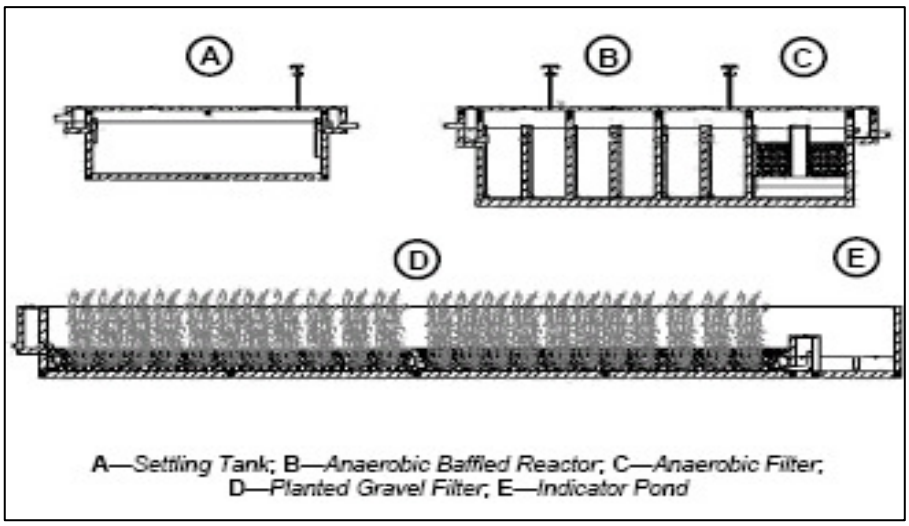

Figure 4: DEWATS Scheme. (Source: BORDA)

7 Costs

The cost of constructing DEWATS with the settling plant, anaerobic filter, planted gravel filter and polishing pond, is PhP 1.2 million.

Operational and maintenance cost is almost zero since no mechanical part is installed. Electricity cost may be calculated if a pump is installed.

8 Operation and Maintenance

The wastewater treatment plant will be operated and maintained by a technical team. The DEWATS facility is an easy to operate system that only requires regular checking of the chambers of the settling tank, anaerobic baffled reactor and anaerobic filter by opening manholes, cleaning of the planted gravel filter from rubbish/plastic and cleaning of the indicator pond. Thefrequency will be determined through daily observation. However, sludge removal (desludging) in the settling tank and baffled anaerobic reactor should be done every 2 years. Sludge thickness should be monitored before desludging.

The baffled reactor does not require any sophisticated maintenance since no chemical and mechanical system is introduced. Weekly monitoring of scum and solid particles in each chamber by opening the manholes should be done. Removal of scum should be done when it starts to form a thick layer on the upper portion of the water surface. Scum should be put in a plastic bag and treated as solid waste to be disposed of in a sanitary land fill.

Desludging is done on a calculated basis. Sludge removal in the DEWATS system is designed to be done every 18-24 months. Longer intervals of desludging will compact the sludge

accumulated in the bottom and will cause difficulties during the removal process.

Maintenance of the anaerobic filter is simultaneous with the regular monitoring of scum accumulation and desludging of the baffled reactor. Other maintenance tasks are back washing or flushing which should be done whenever the filter becomes covered by bacteria that can cause clogging. This can be detected from the reduced performance of the treatment plant shown in the wastewater laboratory test. In this case, back washing should be done by emptying the chamber and then washing the filter by spraying pressurized water through the manhole. Dead bacteria will fall off and accumulate at the bottom of the chamber. The dead bacteria should be removed by using a vacuum pump (mostly utilized by sewage collectors). Spraying can be done several times until dead bacteria in the filter are removed. After years of operation, the filter material can also be replaced with a new one while the old filter material should rest for about 3-6 months. Resting period will bring back the performance of the filter and it will be ready to be used again.

Maintaining a planted gravel filter is like maintaining a garden when blended with the landscape. Once the plants are fully matured, cutting of old leaves and removal of old/dead plants should be done. Cleaning of the filter surface from falling leaves should also be done to ensure the flow of oxygen and ultra-violet rays of the sun to enter the gravel filter.

9 Design information and technical specifications

The DEWATS in Manjuyod has the capacity to treat 40 m³ of wastewater per day. Sources of wastewater to be treated are the wet market, fruit and vegetable market, restaurants, and the Municipal Health Office.

The whole system consists of one Settling tank (ST), an 8-chamber anaerobic baffled reactor (ABR), a 1-chamber anaerobic filter (AF), and one planted gravel filter (PGF). An indicator pond (IP) was constructed for monitoring effluent quality as well as as for aesthetic purposes.

The average organic pollution (measured as biological oxygen demand after 5 days: BOD5) is 600mg/l and expected effluent quality is less than 30mg/l. Treated wastewater will be directly discharged to the sea.

Figure 5: Construction of the DEWATS.
(Source: BORDA)

BORDA monitors system performance during the one-year warranty period. This includes assessing wastewater flow through the system, treatment plant capacity optimization, monitoring effluent quality and related technical assistance (e.g., troubleshooting). The effluent quality is also analyzed on a regular basis by DENR-accredited laboratories for submission to DENR to ensure that the BOD/COD effluent quality meets environmental standards before disposal to the coastal water.Practical experience and lessons learned,
comments

As of now the capacity of the DEWATS system in Manjuyod is only partially used because the transfer from the old to the new market has not been completed.

Setting up the wastewater treatment plant, aims to integrate an environmentally sound system of wastewater treatment for the new market, thereby providing hygienic surroundings and sanitary facilitities for the vendors and consumers going to the market. Its health impact to the residents around the new market is also a primary consideration.

The target group of the DEWATS project include 60-70 stall owners, 200-200 ambulant vendors, aside from customers and nearby residents.

10 Available documents and references

BORDA, *Decentralized Wastewater Treatment Systems, Manjuyod Public Market, Province of Negros Oriental.*

11 Institutions, organisations and contact persons:

Project Management and Implementation
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