

Decentralized Wastewater Treatment System -DEWATS Bohol Provincial Capitol Compound

1 General Data

Type of Project:

Wastewater Treatment Plant

Project Period:

Start of planning: 02/2007
Start of construction: 06/2007
Start of operation: 07/2008

Project Scale:

Provincial Capitol Compound

Address:

Tagbilaran Capitol Compound,
C.P. Garcia Avenue,
Tagbilaran City, Bohol, Philippines

Planning Institution:

Provincial General Services Office,
Provincial Government, Bohol

Executing Institution:

Provincial General Services Office,
Provincial Government, Bohol

Supporting Agency:

Basic Needs Services Philippines, Inc.
(BNS-Phils.)
Bremen Overseas Research and
Development Association (BORDA)
DILG-GTZ Water & Sanitation Program

2 Objective of the project

The objective of the project is to treat the waste water of the Provincial Capitol Compound in order to reduce the pollution in the storm drains that is caused by untreated waste water. This project will be a showcase to promote the establishment of decentralized wastewater treatment facilities (DEWATS) in all municipalities of the Province.

3 Location and general conditions

Bohol Province, an island 700km south of Manila, consists of 47 municipalities and 1 city. The DEWATS facility is located in the public park of the Provincial Capitol at the center of Tagbilaran City.

Nearly 50% of the land in Bohol is used devoted for agriculture, while the Bohol Investment Code plans to boost

agricultural value addition. Endowed with the bounties of nature, including the unique Chocolate Hills and one of the world's smallest primate, the tarsier, the tourism industry is also seen as an engine for economic growth.

The Province of Bohol has a population of about 1,2 million (NSO Census 2007), with an annual population growth rate of 2.92%. About 59% of the total population of Bohol have access to safe drinking water supply which is either provided by Level I, II or III facilities while the remaining 41% rely on unsafe water sources (PW4SP Study, 2003). There is no centralized sewerage to take care of the disposal of the sanitary wastes from septic tanks and other liquid wastes from industries and other sources in the province. In addition, proper water treatment and purification is not regularly practiced in most of the municipalities. Based on the results of the PW4SP Study in 2003, the overall percentage of households having approved types of toilet facilities in the whole province is 79%. The remaining 21% comprise the underserved (or with unapproved toilet facilities) and unserved (or those without toilet facilities). Incidence of water-borne diseases in the province was prevalent for the past six years (2001-2006) with diarrhea and gastro-enteritis being the leading causes of morbidity.

Untreated sewage, domestic wastewater and industrial wastes flow into the drainage system, canals or water bodies or percolates into the ground. Wastewater seeping underground may infiltrate into leaking water pipelines and when system pressures are low this may cause contaminated water to reach the taps.

Tagbilaran City, the location of the DEWATS facility, is comprised of 15 barangays with an estimated population of 95,000 (OCPDC estimate for 2007). 41 % of the population live in the four urbanized barangays. The resulting population density poses a direct challenge not only on demands for water supply but also on sanitation and

sewerage.

The Provincial Government of Bohol through the Provincial General Services Office (PGSO) implemented the DEWATS facility to treat effluent from the septic tanks of the Provincial Capitol Compound. The compound has about 600-700 occupants including those working at the commercial building within the compound. The average wastewater discharge is 34 m³ per day.



Figure 1: View of the aerobic treatment modules: planted gravel filter (PGF), indicator/polishing pond (IP). (Source: BORDA)

4 Technologies applied

The DEWATS facility is comprised of 5 components.

Raw wastewater from the capitol compound buildings is collected in a settling tank. Here, the sludge settles at the bottom of the tank while the scum is separated from the process. In the settling plant, big solids are separated from the wastewater by settling at the bottom, while lower density material (water, FOB) rise and move to the anaerobic filter, the second stage of the treatment process. The anaerobic filter acts in the same way as the settling plant, only with the aid of filtering agent, such as porous rocks. Wastewater then passes onto the anaerobic baffled reactor which reduces the organic pollution load (measured as BOD and COD) from 20% to 85%.

The treatment from the anaerobic baffled reactor results in an odorous wastewater discharge due to the absence of oxygen. Thus, oxygen is introduced to the wastewater in the next treatment step, the Planted Gravel

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Filter. By passing through the gravel and the plant roots, wastewater comes into contact with oxygen. The last treatment step is a polishing pond to finalize the aerobic process. It can also function as an indicator pond to monitor wastewater quality after treatment. The gravel filter is planted with common reeds for sub surface treatment and landscape purpose. Aquatic plants were also introduced into the indicator pond.

The five components can be designed in such a way that they can be contained within the available space while blending with the landscape.



Figure 2: View of the anaerobic treatment modules: settling tank (ST), anaerobic baffled reactor (ABR) and anaerobic filter (AF). (Source: BORDA)

5 Further project components

The Provincial Governor of Bohol would like to showcase this facility to promote the implementation of DEWATS facilities in all municipalities in the province to comply with the Clean Water Act (R.A. 9275).

6 Project History

This DEWATS facility is one of the many environmental projects of the Provincial Government of Bohol. It effectively treats wastewater generated from the entire Provincial capitol compound.

As stipulated in the Executive Order No. 15 Series of 2007 by Governor Erico B. Aumentado, the Provincial Government of Bohol is “Strengthening its initiatives to prevent water pollution by enforcing the installation of waste water treatment facilities for hotels, resorts and restaurants and such other industries which require usage of water volume in commercial quantities, urging the use of recycled water and for other purposes.”

In 2006, the City Government of Tagbilaran started to implement the

road concreting and installation of storm drainage along the main road of Carlos P. Garcia (CPG Avenue) as part of its infrastructure program with funding from the National Government.

However, it was found out that the wastewater from the provincial capitol compound is flowing directly to the storm drain along CPA Avenue. Because of this, the Office of the Governor was flooded with negative comments from the print media and radio about the issue on wastewater.

The Provincial General Services Office (PGSO) was tasked by the Governor to look for low-cost technology options that will treat the capitol’s wastewater problem. The DILG-GTZ Water and Sanitation Program through its partner, the Bohol Integrated Water Resources Team (BIWRMT), introduced the DEWATS approach to the Head of PGSO and its staff. The support from the Sangguniang Panlalawigan authorizing the Governor to enter into an agreement to construct the DEWATS facility with BNS-BORDA was paramount.

7 Costs

The construction cost for the DEWATS facility, including settling plant, anaerobic filter, anaerobic baffled reactor, planted gravel filter and polishing pond, is 2.7 million pesos.

Operation and maintenance cost is almost zero since no mechanical part is installed. Electricity cost may be calculated when a pump is introduced.

8 Operation and Maintenance

The wastewater treatment plant is operated and maintained by a technical team who attended OM training sessions carried out by BNS-BORDA

staff.

DEWATS only requires regular checking of chambers by opening manholes, cleaning of gravel filter from rubbish/plastic, cleaning of pond. The frequency will be determined through daily observation. However, removal of sludge (desludging) from the settling tank and baffled anaerobic reactor should be done every 2 years. Before removing the sludge, sludge thickness should be monitored.

The anaerobic baffled reactor does not require any sophisticated maintenance since it is not a chemical and mechanical system. 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, i.e. 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 at the bottom and will make it difficult to remove it.

Maintenance of the anaerobic filter is simultaneous with the regular monitoring of scum accumulation and desludging of the anaerobic baffled reactor. Other maintenance measures are back washing or flushing. This 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 wash should be done by emptying the water from the chamber and then washing the filter by spraying pressurized water from the manhole.



Figure 4: DEWATS Construction

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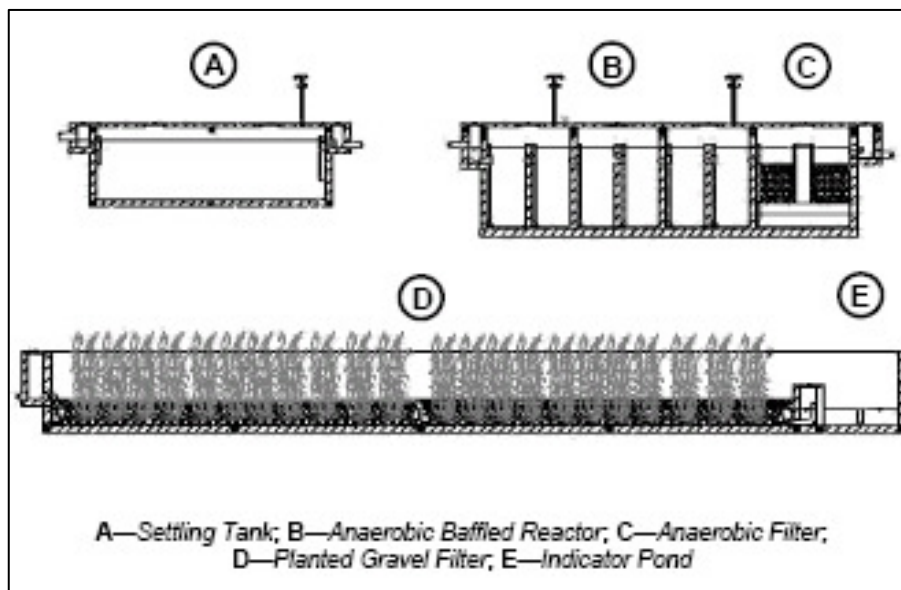


Figure 5: DEWATS Scheme
(Source: BORDA)

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 new one while the old filter should rest for about 3-6 months. The 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 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 facility has the capacity to treat 40 m³ of wastewater discharged daily. Sources of wastewater to be treated come from the old and new capitol buildings and surrounding stalls.

The facility in Tagbilaran consists of one settling tank (ST), an 8-chamber anaerobic baffled reactor (ABR), 1 chamber anaerobic filter (AF), 1 planted gravel filter (PGF) and 1 indicator pond (IP).

The average pollution concentration measured as biological oxygen demand (BOD₅), is 270mg/l. The expected effluent quality is ≤50mg/l. Treated wastewater will be directly discharged to a receiving body of water.

The DEWATS performance will be monitored by BNS-BORDA during the one year warranty period and effluent quality will be analyzed on a regular basis by DENR-accredited laboratories.

10 Practical experience and lessons learned, comments

The target group of the DEWATS project include 600-700 occupants including those working at the commercial building within the compound.

The in-house management of the DEWATS facility by the Bohol Provincial Government through the PGSO showcases the sustainable operation of a wastewater treatment facility at the local level. The facility will certainly reduce the amount of pollutants in the final discharge released to the environment. The effluent will pass the national standard based on the experience with other DEWATS in the country being installed.

The stakeholders in the province and the city of Tagbilaran accepted the DEWATS facility as technically viable in treating the wastewater from the capitol compound. The City of Tagbilaran and the media people have no more

complaints on the wastewater from the capitol compound being channeled to the storm drain of the City.

Instead, the media people praised the Provincial Government through the efforts of the Governor in showcasing the DEWATS facility throughout the province.

11 Available documents and references

BORDA, *Decentralized Wastewater Treatment Systems, Bohol Provincial Capitol Compound.*

12 Institutions, organisations and contact persons:

Project Management and Implementation

Provincial General Service Office
Bohol Provincial Government
Provincial Capitol Compound
CPG Avenue
Tagbilaran, Bohol, Philippines

Project Technical Assistance

BNS-BORDA Coordination Office
103 Minnesota Mansion,
267 Ermin Garcia St., Cubao,
Quezon City, Philippines
Email: Philippines@borda.de
Web: www.borda.de

DILG-GTZ Water & Sanitation Program,
5th Fl. DILG-WSSPMO,
Francisco Gold Condominium II,
EDSA corner Mapagmahal Street, P.O.
Box 1176 QCPO, Diliman,
Quezon City, Metro Manila
Philippines

Email: gtzwater@info.com.ph
Web: www.watsansolid.com.ph

