Promoting Innovations in Wastewater Management

Making Sanitation a Sustainable Business

Case Study Applying Innovative Solutions for Cost-effective Wastewater Management

In order to get a clearer understanding of the merits of a particular technology, life-cycle cost analysis needs to be conducted for a better understanding of its cost-effectiveness.

Photos: M. Ebarvia (2x)

Paco Sewage Treatment Plant
Technology: Johkasou - moving bed biofilm reactor

Congressional Sewage Treatment Plant
Technology: Sequencing Batch Reactor

Challenge

With population growth and rapid urbanization, more and more highly urbanized centers around the globe are hard-pressed to keep up with the ever-increasing demand for clean water and efficient management of wastewater. For governments and water service providers alike, the task at hand presents the challenge of finding ways—innovative solutions—to address such problems.

In the Philippines, the Metropolitan Waterworks and Sewerage System (MWSS) is mandated to supply and distribute potable water as well as operate and maintain sewerage systems within the metropolitan area. Overwhelmed with problems ranging from poor service coverage to inefficient customer service, MWSS underwent a major overhaul with its privatization in 1997. This move by the government aimed to improve water and wastewater services in Metro Manila. Under the privatization scheme, Metro Manila was divided into the west and east zones with Maynilad Water Services, Inc. (MWSI) winning the concession in the west zone.

With the enactment of the Clean Water Act in 2004, MWSS, through its concessionaires, was expected to fast track the provision and expansion of sewerage and sanitation services in Metro Manila. This entails, among others, applying innovative technologies in wastewater management that are cost-effective, adaptive, and responsive to the needs and conditions of the metropolis.

Case Study

This case study presents the efforts of the Philippine government in dealing with the wastewater management problem particularly in Metro Manila. It especially highlights MWSI—the concessionaire currently operating in the west zone of the metropolis, and the innovative technologies used by the company to provide cost-effective solutions to hurdle issues on wastewater management in order to provide efficient services to its constituents.

Initiative

MWSI employs a three-pronged approach to provide wastewater management and treatment solutions to its constituents—separate sewer systems, combined sewer-drainage systems, and septage management. As of 2012, MWSI's current wastewater management program includes operation of six sewerage systems, comprising of about 490 kilometers of sewer pipes laid, and a combined capacity to treat wastewater volume of about 470,000 m^3/day. MWSI utilizes technologies that involve screening/grit removal, lagoons/oxidation ponds, and extended aeration. There are also decentralized wastewater treatment systems, including 12 sewage treatment plants (Figure1.fac).For septage management, MWSI has a single septage treatment plant which has a design capacity of 250 m^3/day, at 8 hours of operation per day, and maximum capacity of around 450 m^3/day (16 hours of operation). MWSI has 25 vacuum tankers to collect and transport septage to its treatment facility. Additionally, seven mobile dewatering units (MDUs) are used for desludging activities.

Given the highly urbanized and densely populated area it operates on, MWSI had to consider a range of limiting factors in choosing technologies to treat and manage generated wastewater. These factors may pose problems especially during project implementation and operations. Key challenges include infrastructure for collecting sewage, land acquisition for treatment plants, future nutrient removal requirements, compliance concept for water utilities, and sustainability of current wastewater tariff. Considering the parameters by which MWSI chose its wastewater management technologies, the water utility determined these technologies to be the most effective to conduct their wastewater management operations– sequencing batch reactor (SBR), moving bed biofilm reactor (MBBR), conventional activated sludge (CAS), and STM®-aerotor.

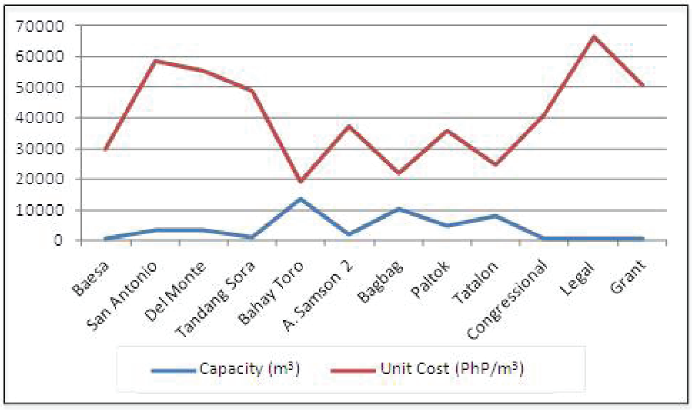
Assessment of MWSI's sewage treatment plants indicated that the modified conventional activated sludge has the least cost per volume of wastewater treated, as well as the largest estimated daily capacity of the four technologies presented. This is despite said technology having the highest construction costs and largest land area requirement. Nevertheless, it is suggested that in order to get a clearer understanding of the merits of a particular technology over others particularly in terms of the cost-effectiveness aspect, life-cycle cost analysis needs to be conducted. A life-cycle cost analysis puts forth a more accurate methodology to determine the most cost-effective option considering all cost items that may be incurred over the economic life of a particular technology.

Figure 1: Cost Comparison of Technologies Used by MWSI

Location	Year of Construction	Capacity (m^3/day)	Technology Applied	Cost of Construction (PhP)	Unit Cost (PhP/m^3)	Land Requirement (m^2)
Baesa	2012	390	STM Aerotor	11,571,359	29,670	287
San Antonio	2012	3,130	MBBR	193,443,263	58,442	605
Del Monte	2012	3,510	MBBR	193,636,526	55,167	574
Tandang Sora	2012	1,200	STM Aerotor	58,731,371	48,943	402
Bahay Toro	2012	13,400	Modified Activated Sludge Process	257,639,073	19,227	4,128
A. Samson 2	2012	1,900	STM Aerotor	70,470.283	37,090	917
Bagbag	2012	10,400	SBR	229,909,954	22,107	3,516
Paltok	2012	4,900	Moving Bed Bioreactor	175,833,728	35,884	1,091
Tatalon	2012	8,100	SBR	200,914,287	24,804	2,065
Congressional	2012	570	SBR	23,226,121	40,748	620
Legal	2012	410	SBR	27,297,300	66,579	460
Grant	2012	620	SBR	31,268,429	50,433	290

Source: Francisco Arellano. 2013. Technology Options for Wastewater Management: Powepoint Presentation.

Figure 2: Cost Comparison of Technologies



Source: Robert Domingo, ADB Consultant

Way Forward

- **Hard infrastructure coupled with soft infrastructure** should be pursued to provide a more integrated approach to ensure sustainability of the programs as well as optimize the environmental and health benefits. MWSI has earmarked in its future expenditure treatment plants and accessories, as well as refurbishment of existing water and wastewater networks and/or installation of new ones. It also intends to use a step-wise approach in scaling-up wastewater investments, which affords the same flexibility to identify innovative interventions.
- **Establishment of a pool of experts** to be more responsive to the growing sanitation needs should be the major objective for institutional strengthening and capacity development activities. From among its programs, MWSI established the Maynilad Water Academy in 2011 to create model training programs designed to advance innovative water and wastewater technologies through research and development activities. MWSI also engaged in twinning activities to share and explore innovative ideas and practices among industry leaders and professionals.
- **Engaging all relevant stakeholders and developing key partnerships** are paramount to the success of the wastewater program. The responsibility of ensuring sustainability is the concern of all and not just by one particular entity. In order to have an integrated approach to address the wastewater management problem, everybody should buy into the program. MWSI recognizes the value of establishing and maintaining close linkages with government agencies, LGUs and local communities; thus, partnerships have been made for easier and speedy implementation of its programs. Getting the media, NGOs and learning institutions involved help generate public awareness as well. Enhanced public awareness assists stakeholders to make informed decisions in terms of the sanitation approach to be adopted.

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