

Project Summary

Organization:

Maynilad Water Services, Inc.

Solution:

Water and Wastewater

Location:

Malabon City, Philippines

Project Objective:

- Increase the service level in the water supply network of Malabon City's Tinajeros DMA.
- Find a more cost effective solution than total pipe replacement.

Products used:

WaterGEMS and its Darwin Calibrator module

Fast Facts

- The pipe network of a DMA in Malabon City experienced high head loss, preventing water from being supplied within the prescribed service level.
- Various solutions were considered and implemented, but they did not yield significant improvements.
- Upon repair of a leak identified using WaterGEMS, pressures significantly improved and reduced the non revenue water of the DMA.

ROI

- Leak repair cost only USD 1,160 – an amount equivalent to less than 1 percent of total pipe replacement, which was originally considered.
- The billed volume increased by 200 cubic meters per day.

Cost-effective Leak Identification using WaterGEMS

Maynilad Uses Hydraulic Modeling to Pinpoint Hard-to-find Leaks and Increase Service Level

Maynilad Water Services, Inc. (Maynilad) is the water and wastewater service provider for the West Zone of the Greater Metro Manila Area of the Philippines.

Tinajeros is one of the 1,345 district metered areas (DMAs) in Malabon City, one of the 17 cities and municipalities in the West Zone. It serves 2,183 water service connections which are composed largely of residential customers. However, this DMA had long been tagged as a problem area: although it had two inflows with high pressure, potable water could still not be supplied to customers within the prescribed service level. The pipe network experienced high head loss which made it impossible to achieve the minimum service level of five meters of pressure throughout the day.

The Tinajeros DMA pipe network is relatively old, particularly its asbestos cement pipe feeder line which was laid in 1984. Total pipe replacement, a five-month project estimated at USD 1.7 million, was unfeasible. Using WaterGEMS, Maynilad was able to implement an alternative solution that was both effective and more efficient.

Challenges and Inconclusive Results

Increasing the pressure from the supply source was one way to address the service level problem. However, because of high losses in the pipe system, increasing the pressure would also increase non-revenue water (NRW). Maynilad also tried to split the DMA into two pressure zones by locating the balancing points, which did not significantly contribute to the improvement of service levels.

Leak detection was conducted and hundreds of service pipe leaks were reported, however, their repair did not contribute to the improvement of pressure in the area. Moreover, years of roadway upgrades meant that the pipes were also buried under two meters of concrete pavement--making it particularly ineffective to detect water leaks using sounding equipment. Using sounding equipment became even more difficult due to the existence of drainage lines parallel to the pipe network. These challenges pushed Maynilad to look for other, more innovative solutions.

Maynilad considered total pipe replacement to solve the issue. However, time and budgetary constraints from design through to construction made this alternative not feasible. The initial cost for total pipe replacement of over USD 1.7 million could not be justified for only five million liters per day (MLD) of recoverable NRW.

Maynilad then started gathering data and conducting field analysis. Pressure profiling was done to determine where the pressure drop occurred. Spot pressures were gathered from the source up to the extreme portion. However, this study did not yield any significant results because the pressure started to drop just 30 meters from the source and then continuously dropped as it reached the other end of that network section.

Finding the Optimal Solution

The last solution was to build a hydraulic model of the DMA and calibrate it according to the existing condition of the network. Supply and pressure management made through the calibrated hydraulic model was useful in the discovery of leakage in the system.

Maynilad used Bentley's WaterGEMS software for the analysis and design of water distribution systems. The water company also used WaterGEMS' genetic algorithm-based Darwin Calibrator module for automated model calibration for detailed sonic leak detection. Using the Darwin Calibrator, potential locations of water leakage were identified. Compared to conducting repeated test pits or excavations to check whether a leak detected through sounding was actually occurring, the use of hydraulic modeling significantly narrowed down field investigation.

With the WaterGEMS study, a leak was pinpointed in the location indicated by the model. Upon excavation, it was discovered that an entire six-linear-meter section of the 200 millimeter asbestos cement pipe was busted longitudinally, causing the huge pressure drop in the area.

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*– Enrique M. Eguia,
Head of Network Hydraulic Modeling,
Maynilad Water Services, Inc.*

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The cause of the leak is on this 200 millimeter pipe.

Remarkable Network Improvements and Savings

The leak repair contributed a very significant increase in pressure by 6 meters (8.6 psi) and billed volume by 200 cubic

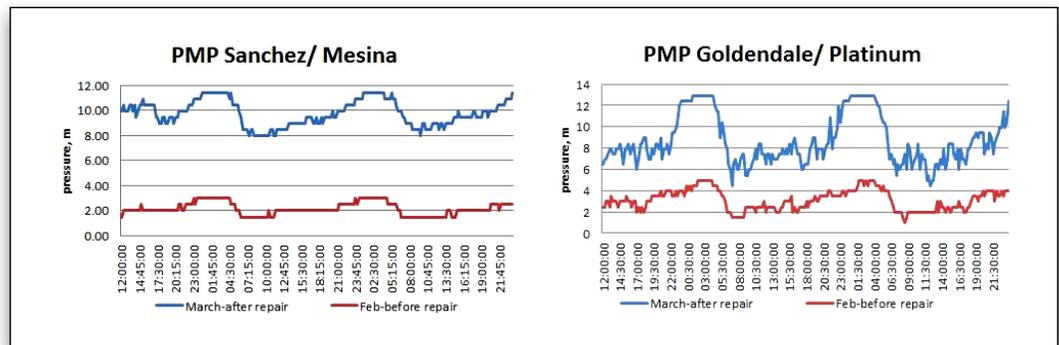
meters per day (0.2 MLD). It also reduced NRW by almost 1900 cubic meters (1.9 MLD).

The improved service level in the area means that customers are now satisfied with the availability of supply and pressure that is being delivered through their taps.

The hydraulic model was manually calibrated, and rerun through automated calibration using the leakage hotspots feature of WaterGEMS’ Darwin Calibrator, which took only three days. Leak repair only took two days and cost USD 1,160 – an amount equivalent to less than 1 percent of total pipe replacement.

In comparison, total pipe replacement would have required five months from design to implementation, incurring higher design and construction costs. This project saved Maynilad from spending over USD 1.7 million, the cost associated with total pipe replacement.

This study became the pilot project for using calibrated hydraulic models to find hard-to-detect leaks in areas with very deep pipelines.



Pressure increase at critical points after the repair.

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