The Challenge of Reducing Maynilad's Non-Revenue Water
(Manila, Philippines)

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1. INTRODUCTION

Non-revenue water (NRW), poses a very big challenge to many water utilities today. Reducing if not totally eliminating non-revenue water remains the primary concern not only in the Philippines and the Asian region but also world-wide, especially in these times where sources of drinking water supply is rapidly declining.

Better and more efficient water supply management is needed to optimize existing water resources by means of reducing the volume of water being lost through pipe leaks, meter under-registrations, illegal connections and other un-authorized withdrawal or use of water from the system.

This paper intends to show how Maynilad, the private water operator of the West Zone of Metro Manila (Philippines), has faced its great NRW challenge: to reduce its huge volume of water losses equivalent to 1,500,000 m3/day in 2007, to improve level of service of its existing customers and to supply additional 2.5 million people still without access to piped water.

Maynilad's NRW management team, supported by Miya's world class experts, has started to get physical and commercial losses in the system under control. The target is ambitious: the volume of NRW shall be reduced by 500,000 m3/day in less than four years.

2. BACKGROUND OF MAYNILAD

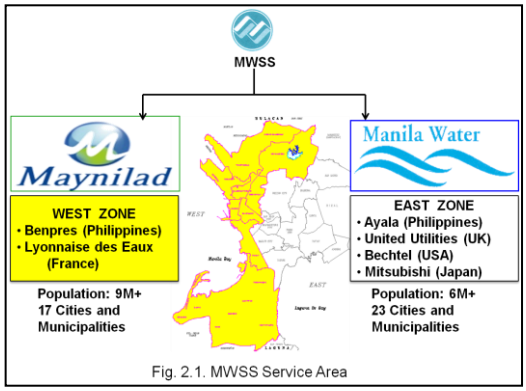

Fig. 2.1. MWSS Service Area

Metropolitan Waterworks and Sewerage System (MWSS) a government owned corporation providing water and sewerage services to the whole of Metro-Manila was privatized in 1997 and was divided into two (2) concession areas.

The 1997 privatization was in response to the then pressing needs which were: 1) poor level of service, 2) high non-revenue water and, 3) the need to develop other water sources to meet the growing demand. A huge investment was required to answer these needs.

The West Zone concession area which covers western portions of Metro- Manila (17 cities and municipalities) having 9 million plus population was awarded to Maynilad under the joint consortium of Benpres Holdings (Philippines) and Lyonnaise dex Eaux (France).

The East Zone concession area which covers the eastern portions of Metro-Manila (23 cities and municipalities) having 6 million population was given to Manila Water, a consortium of Ayala (Philippines),United Utilities (UK) Bechtel (USA) and Mitsubishi (Japan).

The two concessionaires, who were each granted 25 years to manage each concession network, will act as agents and operators of MWSS responsible for operation and maintenance ,service expansions and new investments.

However, the impact brought about by the Asian financial crisis compounded by the effects of El Nino, led to the early termination of the concession contract in the West Zone.

In 2004-2006, Maynilad was taken back by the government and placed under MWSS control and also prepared the way for its second privatization.

In 2007,after a successful public bidding, the operation of Maynilad was awarded to the joint consortium of Metro Pacific Investment Corp. (MPCI) And D.M. Consunji Inc. (DMCI), two (2) of the best Filipino owned companies in the Philippines

In 2009, MWSS agreed to extend the concession agreement with both Maynilad and Manila Water by 15 more years to 2037 from 2022, the original expiry date.

3. PROFILE OF MAYNILAD

3.1. Service Area

Maynilad covers an area of 540 square kilometers with approximately 9.3 million people. Raw water supply comes from Angat Dam in Bulacan, located north of Metro Manila, which provides 96% of its total supply while the remaining 4% comes from Laguna Lake, located South east of Metro-Manila and from few deepwells supplying the fringe areas in the south portions of the concession.

It has three (3) water treatment plants with a total combined capacity of 2500 MLD : the La Mesa Treatment Plant-1 (1500 MLD),one of the biggest in Asia, and La Mesa Treatment Plant-2 (900 MLD) which are both located in Novaliches,Quezon City, and the recently built Putatan Water Treatment Plant (100 MLD),located in Muntinlupa, which uses a micro-filtration and reverse osmosis system.

Maynilad distribution network comprises of 5,575 kilometers of pipes of different materials,17 pumping stations,18 reservoirs. Approximately,40% of its pipe network is more than 30 years old.

It has 12 business area offices that operate within specific boundaries catering to the needs of over close to 1,000,000 customers; thus, making it the largest water utility in the Philippines.

Its service coverage currently stands at 91% with the balance mostly comprising of the still un-served expansion areas in the South which are currently served by private groundwater wells.

3.2. Customer Base

Majority of Maynilad customers are domestic users (residential and semi-business establishments) which account for 94% of the total services while the non-domestic users (commercial and industrial establishments) account for the remaining 6%.

In terms of water billed volume, domestic users account for 79% of the total sales while non-domestic at 21%.Revenue wise, it is a close sharing of 57% and 43% respectively for domestic and non-domestic users.

It is clearly evident that the non-domestics users, which are mostly situated in the Central Manila area and in the commercial and industrial zones of the concession, which provide almost half of the total revenue must be given utmost attention. Currently, the top 1000 large accounts of Maynilad are being given much priority in terms of water meter management and customer service.

The remaining expansion or new areas in the South to be covered by Maynilad in the coming years are mostly made-up of domestic customers.

Table 3.2.1: Maynilad Customer Base

Customer Type	Service Connections		Annual Billed Volume		Annual Revenue	
	No.	%	MCM	%	MP	%
Domestic	849,461	94	2295	79	6,434	57
Non-Domestic	54,221	6	79	21	4,854	43
Total	903,682	100	374	100	11,288	100

4. MAYNILAD'S NON-REVENUE WATER

In the early 80's, the MWSS under foreign assisted Manila Water Supply Rehabilitation Projects I and II (MWSRP-I and MWSRP-II) had implemented various NRW reduction programs. It applied the concept of zone/district metering which aimed to rehabilitate major portions of its distribution network to reduce high NRW and improve its level of service.

Significant results were attained in the early stages of the program, thru massive replacements of old pipes, meters, appurtenances and others. However, improved level of NRW did not last long enough primarily due to the lack of supporting programs and right organizations to monitor and sustain the improvements made.

At the initial stage of Maynilad operation under private management, zone/sub-zone metering once again implemented in various parts of the system. Similarly, NRW target levels were achieved in areas where NRW reduction programs were carried out, but the eventual gains deteriorated after a period of time due to lack of sustainable programs.

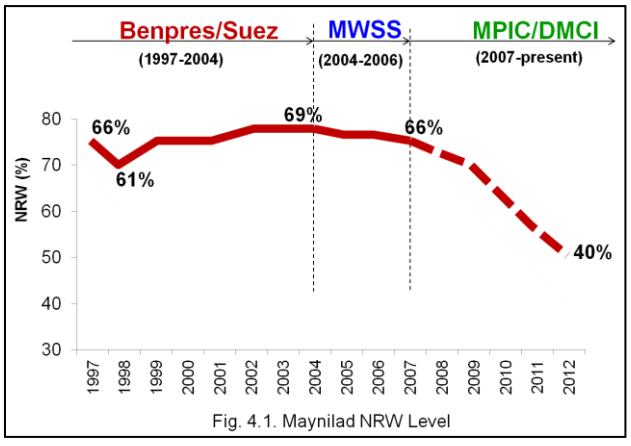

Fig. 4.1. Maynilad NRW Level

Just after few years, this concept of NRW reduction was abandoned, and the program shifted to massive system wide leak repairs and meter replacements which eventually were not able to produce significant NRW reduction.

Other NRW related projects were also carried out by various groups in Maynilad, however, most of them were poorly managed and not well coordinated within the organization. Evidently, there was no direct and full time ownership of the program. That is, many were involved but hardly a few were directly responsible. It was very evident that there was a lack of clear direction where the management wanted its NRW program to proceed.

Ten (10) years after privatization, from 1997 until 2006, there were no significant changes in the system wide NRW level of Maynilad, except only in 1998 when it reached 61%. It was however, mainly caused by very low system input volume due to forced supply reduction brought about by the El Nino phenomenon.

Under the MWSS take-over and operation in 2004-2006, no considerable accomplishment was made during the period in terms of reducing the level of NRW and improving the level of service.

In 2007, when the MPIC-DMCI started its operation the NRW level was at 66% and recognized the magnitude of the problem and realized the golden opportunity in recovering this huge volume of water being lost in the system which was a staggering 1500 MLD. They set an ambitious target of 40% NRW level at end of 2012.

The new management team of Maynilad believed that to be viable, NRW level must be reduced significantly and operational efficiency must be improved.

This basically involved significant investments on the following:

- NRW management program
- Rehabilitation of pump stations
- Re-commissioning of reservoirs
- Improvements in existing primary distribution lines
- Construction of new distribution facilities (Pumps, Boosters, and Primary lines)

5. MAYNILAD'S CAPEX PROGRAM

5.1. General Program

The thrust of Maynilad's CAPEX Program was to deliver the commitments in the Concession Agreement and address the concerns which prompted the privatization of its Operation; and these are to (a.) provide water to areas that were previously un-served (b.) improve the service level in the system and deliver uninterrupted water supply with sufficient pressure to customers (c.) and reduce the high volume of Non-Revenue Water.

5.1.1. Long Term CAPEX Program

Over the remaining 30 years of the Concession (2008-37), Maynilad commits to invest 3,962 Million USD to improve water services to its customers. A significant component, almost 37% of the total budget, of this investment is dedicated towards managing NRW in the system.

The integration of NRW Management in the Investment Plan is needed to ensure the company's viability. Without NRW Management, development of new water sources will need to be accelerated and larger distribution lines will be constructed as an allowance for the large water loss in the network.

To avoid this situation, water loss in the system would have to be constantly managed and monitored. Unfortunately, NRW management requires substantial upfront investment, as such,

majority of investment equivalent to almost 69% will have to be spent in the first 15 years (2008-22) of the Operation. The remaining 31% is allocated in the next half of the concession term (2023-37).

Table 5.5.1.1. Maynilad's CAPEX Program (Total Concession Period)

Maynilad CAPEX Program	In Million USD						Total
	2008-2012	2013-2017	2018-2022	2023-2027	2028-2032	2033-2037	
Total CAPEX	941	1,075	1,078	727	724	506	5,051
Water CAPEX	852	979	918	461	459	293	3,962
NRW Management & 3R	496	393	209	136	126	103	1,465
Operations Support	256	377	452	250	222	150	1,707
Water Sources	99	208	256	74	111	40	790
Wastewater CAPEX	87	91	156	262	262	209	1,068
Sewerage	77	59	115	221	221	176	868
Sanitation	10	33	41	42	41	33	200
Natural Calamity Mitigation	2	4	4	4	3	3	21

5.1.2. Short Term CAPEX Program

Up to 2012, Maynilad plans on significantly improving service coverage with vast expansion plans to cover more areas in Cavite, Las Pinas and Muntinlupa in the South, and North Caloocan, Valenzuela and Commonwealth (QC) in the North. The plans are geared to increase coverage target and meet or exceed the 92% commitment.

Parallel to increasing its service coverage, Maynilad will also improve the service levels in the areas that it is currently serving. From previous 56% of the customers receiving 24 hours water availability, the goal is to ensure that all served customers have continuous water supply by the end of 2012. Same plans will also apply to water pressure in the distribution.

The investments related to this improvement will greatly improve reliability of water services in the West Concession.

Table 5.1.2.1. Maynilad's Service Obligation Targets

Service Obligation Targets	2008-2012 Targets				
	2008	2009	2010	2011	2012
Water,Sewerage & Sanitation Coverage					
Water	78%	81%	85%	90%	92%
Sewerage	9%	8%	8%	11%	14%
Sanitation	22%	31%	39%	45%	51%
Water Availability & Pressure					
24-Hr Water Availability	56%	69%	83%	96%	100%
Water Pressure-7 psi min	57%	64%	85%	95%	100%
Water Service					
New Water Service Connections	44,321	52,491	69,549	88,125	31,825

Billed Services (Year End)	747,828	800,319	869,868	957,993	989,818

6. NRW Management Program

To meet the service obligation commitment of Maynilad, resources have to be optimized and properly allocated. NRW reduction and re-allocation of recovered water loss was a more viable option compared to the development of new and large water sources.

6.1. Objectives

The objectives of NRW Management Program are:

- Reduce physical losses by almost 500 MLD so that the anticipated demand can be met
- Reduce commercial losses to increase revenues
- Introduce a world class NRW management system so that the achieved reductions will be sustainable
- Prepare the ground for further NRW reduction after 2012
- In coordination with the business areas-to undertake social intervention and information on illegal connection, water service and water quality

NRW Management Program is an integral component of the Maynilad CAPEX Program and was a necessary complement to the over-all strategy of the organization. The program initially concentrated on the following key items to ensure its success:

- Hydraulic System Establishment
- District Metered Area (DMA)Establishment
- DMA Diagnostics and Leak Repair
- Selective Pipe Replacement
- Meter Management
- Instrumentation (Leak Detection and Data Logging)
- Capacity Building

The implementation of above items was critical in laying the ground work for an effective NRW reduction and management. During the course of the program implementation, additional activities were added to the above list and these included; Pressure Management, Primary Audit and Leak Detection, Hydraulic Modeling and Calibration, and DMA Data automation and management.

As of 2011, A total of 376 Million USD have already been spent on NRW Management Maynilad. Almost 86 Million USD more will be spent next year to further bring down the water losses.

6.2. NRW Targets

The short and medium term goals of NRW Management in Maynilad is to deliver NRW reduction in the system by establishing scientific systems and implementing technically sound and proficient strategies. This entailed significant investment at the beginning of its operating years under the new management. The large up-front investments will also pave the way to enable the Company to easily manage its system in the future.

Table 6.1.1 Maynilad's NRW Targets

NRW Targets	2007 (Actual)	2012	2017	2022	2027	2032	2037
NRW in MLD	1,506	1,051	649	705	609	540	603
NRW in Liters/ Connection/Day (lcd)	2,854	936	509	512	422	362	394
NRW in %	66%	40%	30%	29%	24%	20%	20%

The original approved term extension plan is currently in review, particularly the NRW reduction targets. It is expected that a more aggressive NRW target will be pursued by Maynilad over the next 15 years.

6.2. NRW Assessment

The system wide water balance in 2007 clearly shows that Maynilad NRW level is at 66% which is equivalent to a huge volume of 1500 MLD. About 75% of the total NRW is lost due to physical losses caused by deteriorated and poorly maintained pipes. Only about 25% of this volume is lost through commercial losses (meter inaccurracies, meter theft, illegal connections,etc).

If half of this total NRW is recovered, it would be sufficient to provide adequate supply to the entire population in the concession area until 2015.

Table 6.2.1. Maynilad 2007 Water Balance

<table>
<tr><td rowspan="6">System Input Volume
2,282 MLD
(+/- 3 %)</td><td rowspan="3">Authorized Consumption
786 MLD</td><td rowspan="2">Billed Authorized Consumption
785 MLD</td><td>Billed Metered Consumption
785 MLD</td><td rowspan="2">Revenue Water
785 MLD</td></tr>
<tr><td>Billed Un-metered Consumption
0 MLD</td></tr>
<tr><td rowspan="2">Unbilled Authorized Consumption
1 MLD
(+/- 22 %)</td><td>Unbilled Metered Consumption
Marginal</td><td rowspan="5">Non-Revenue Water
1,497 MLD
(+/- 5 %)</td></tr>
<tr><td>Unbilled Un-metered Consumption
1 MLD (+/- 22 %)</td></tr>
<tr><td rowspan="3">Water Losses
1,496 MLD
(+/- 5 %)</td><td rowspan="2">Commercial Losses
293 MLD
(+/- 20 %)</td><td>Unauthorised Consumption
202 MLD (+/- 29 %)</td></tr>
<tr><td>Customer Meter Inaccuracies and Data Handling Errors
91 MLD (+/- 14 %)</td></tr>
<tr><td colspan="2">Physical Losses
1,203 MLD (+/- 8 %)</td></tr>
</table>

A major aspect of Maynilad's NRW Management Program is the prioritisation of activities. Due to the large pipe network of the system, there is a need to properly assess and focus on areas that will provide a big impact on NRW reduction of the entire Maynilad. This will also ensure that resources are properly utilized.

For the Maynilad system, it is clear that the areas of highest leakage are the older parts of the system in the center of the concession area while the areas where the supply is poorest and serves only part of the population are the North and South of the system

Analysis shows that 70% of the total volume of NRW which is 1000 MLD, is being lost in the Central Manila which has the oldest part of the distribution network. This is also where the commercial and industrial users are pre-dominant and where the huge concentrations of schools, universities, malls, condominiums as well as the informal dwellers are present.

The treatment plants are located in the North of the concession, while expansion and underserved areas are mainly located in the South. The North area includes high elevation area that reach 100 meters above sea level and is being supply through direct pump distribution from the treatment plant in La Mesa.

Essentially, supply coming from the North will have to pass thru Central Manila to be able to expand coverage further South. It is therefore apparent that there is an immediate need to improve the network condition in the Central Manila tol ensure that adequate supply reaches the South.

6.3. NRW Reduction Strategy

A large distribution network like Maynilad, with poor pipeline conditions, can not be managed efficiently with out breaking them into smaller areas.

Thus, the entire Maynilad network was divided into Hydraulic Systems/Zones (HS) and further down to smaller and more discrete District Metered Areas (DMA).

Subdividing the network into HS and DMA enabled Maynilad to efficiently carry out measurements and diagnose the specific sources of NRW. Diagnostics is carried out on established DMA, concurrently with water audit of the primary lines. Ideally, these steps will be carried out succeedingly on DMA after it is ensured that the network is discrete:

- Baseline flow and pressure measurements
- Extraction of billed volume data (from meter reading/ billing system)
- Computation of NRW level (for prioritisation)
- Minimum night use reading (initial step prior to developing baseline data)
- Flow and pressure analysis
- Identify source of NRW (Physical and/or Commercial?)
- Address source of NRW
- Pressure management
- Others (Asset management, Monitoring of pressure on critical points, etc.)

The availability of DMA flow and pressure measurements also makes it possible to conduct efficient audit on primary mains. Water loss in DMAs typically represents NRW on the secondary and tertiary distribution systems, and when accounted for, will result to enabling the teams to discern the losses in the primary mains. Accounting for losses in the primary main lines will also facilitate the planning for an effective campaign for primary leak and illegal connection detection and resolution.

6.4. Central NRW Team

To make sure that whatever NRW gains achieved are sustained, a specific group has to take the lead and responsibility for the implementation of the entire NRW management program ,from conceptualization, execution to maintenance and sustenance.

For this purpose, a dedicated Central NRW Team was created in 2008 giving them the full management support and leadership to lead the way in reducing Maynilad's high NRW level.

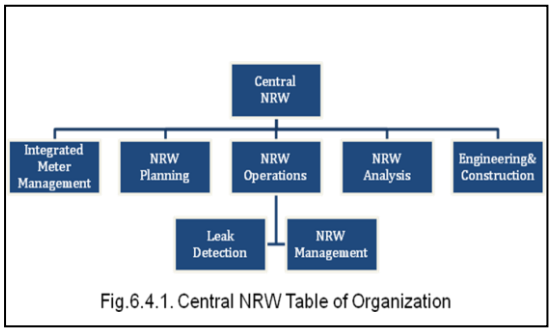

Fig.6.4.1. Central NRW Table of Organization

The NRW teams were placed across Maynilad's business area offices to manage day to day NRW operations and programs. To over-see and manage the whole program, there is the Central NRW core group that is based in the new office environment away from the old Maynilad headquarter. New and young engineers mostly coming top universities were hired.

Apparently, still a gap existed then in the transition towards enabling the young Central NRW Team to efficiently undertake the NRW management program. This was the lack of actual experience, expertise and updated technology in NRW management. A technical partner was needed and the services of world class experts in various field of NRW management were required.

6.5. Maynilad-Miya Partnership

*I*n the middle of 2008, Maynilad started looking into acquiring the services of a company that has proven experience and know-how on NRW management.

In March 2009, Maynilad formally engaged the services of Miya, an Arison Group company who is a leading global provider of comprehensive solutions for urban water loss. Miya's solution is based on best-practice methodology developed by International Water Association (IWA).

Fig.6.3.1. March 2009 Signing of Maynilad-Miya TSA

Under the Technical Services Advisory (TSA) agreement between Maynilad and Miya, the latter will provide Maynilad's Central NRW Team with technical advice, training and assistance to ensure the effective implementation of its NRW reduction program. Miya will also provide a system for improving data capture and analysis for water loss management of Maynilad.

7. SIGNIFICANT RESULTS

7.1. Operational Highlights

As of October 2011, the NRW level of Maynilad is at 45.2 %, historically the lowest level that it has achieved since it was privatized in 1997.It has reduced at an average rate of nearly 4% per year since 2007.

The company's billed volume is expected to grow by 40% at the end of 2011 to 405 million cubic meter (MCM) from 287 MCM in 2007.This continuous growth in billed volume reflects how Maynilad is steadily improving efficiency by reducing water losses coupled with improvement in the level of service. Service level has gone upward in terms of water availability and pressure.

Table 7.1.1. NRW Volume Reduction

Year	2007	2008	2009	2010	2011
NRW Volume (MLD)	1507	1533	1448	1180	1035

The total volume of water loss recovered from 2007 to end of 2011 as projected will be 472 MLD. This was very instrumental in providing water supply to the additional 280,000 new services added to Maynilad customer base.

Table 7.1.2. Service Coverage

Year	2007	2008	2009	2010	2011
Service Coverage(%)	77.0%	82.0%	85.6%	87.7%	91.3%

Table 7.1.3. Water Availability

Year	2007	2008	2009	2010	2011
Customers with 24-Hr Supply (%)	47	58	65	71	82

Table.7.1.4. Water Pressure

Year	2007	2008	2009	2010	2011
Customers with 7-Psi Pressure(%)	53	67	79	86	95

Table 7.1.5. Billed Volume and Revenue

Year	2007	2008	2009	2010	2011
Billed Volume (MCM)	287	315	350	374	405
Revenue (MP)	8,025	8,487	10,161	11,288	14,018

7.2. Establishment of HS and DMA

As of October 2011,a total of 113 Hydraulic Systems and 798 District Metered Areas have been established, isolated and measured. The same has been established mostly in the priority areas where there is more potential for water loss reduction and recovery. These were in Central Manila, Pasay and Paranaque.

There are already 247 Pressure Management Areas (PMAs) established coinciding with HS and DMA boundaries. These PMAs contributed significantly on the leakage management activity and NRW reduction by controlling and or reducing the excess pressures and avoiding pressure fluctuations in the network.

7.2.1. DMA NRW Data

- Average no. of connection per DMA is 858
- DMA coverage in terms of total Maynilad service connection is 70%
- 56% of total Maynilad supply goes to these DMAs
- 69% of the total Maynilad billed volume comes from DMAs
- Average NRW level of 798 DMAs is 32%

7.3. Active Leakage Control

7.3.1. Leak Detection and Repairs

In 2009, Central NRW was assigned the full task of undertaking all leak repair works on the pipe network-from primary distribution to secondary and tertiary distribution system,including service pipes and meter verticals and pipe appurtenances. This was totally upgrading the initially assigned task of doing leak repairs on DMA only.

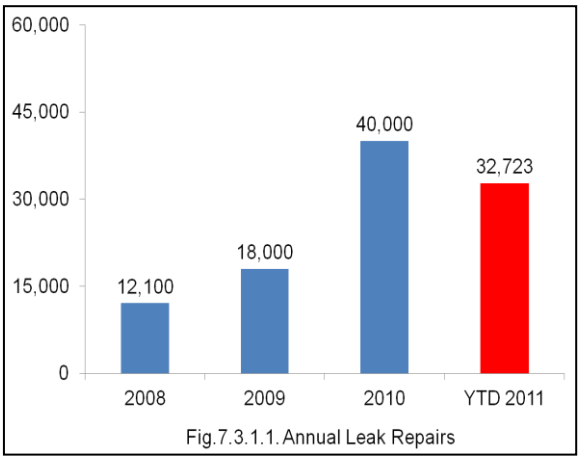

Fig.7.3.1.1. Annual Leak Repairs

Presently, Central NRW's Leakage Detection Management unit has 22 leak detection teams (LDTs) fully equipped with modern leak detection equipment and well trained by top global leak detection experts.

The LDTs are strategically assigned across Maynilad service area providing services to NRW Operations group and leak repair contractors.

Various types of equipment have been tested and acquired and now being used by the LDTs in different field applications. Construction of Maynilad's leak detection training center in Manila, which includes an actual field laboratory simulating different types and sizes of leaks is set to be operational by start of 2012.

With more than 100 repair teams available (outsourced to accredited contractors), Maynilad was able to increase its annual total number of repairs from 18,000 in 2009 to 40,000 repairs starting 2010.

In February 2010, the Leak Repair Control Center (LRCC) was established under Central NRW division to monitor and centralize leak repair operations. The tasks of the LRCC are to consolidate all leak complaints, monitors contractors accomplishments and to analyze how to further improve job order management, increase leak repair output and reduce leak repair runtime.

7.3.2. Pipe Inspection of Large Diameter Pipes

Before, the impression was Maynilad's primary distribution system (PDS),large diameter pipes with 350 mm and above, have no losses, because there were no surfacing leaks and the capability and equipment to detect leaks were very limited and methods often used were obsolete.

It was further aggravated by the existing conditions we have in Manila: noisy environment, and heavy traffic which compounded the background noise being captured by the conventional leak detection equipment. What was making it more difficult was the unreliable and not updated pipeline maps.

In March 2010,Maynilad engaged Pressure Pipe Inspection Company,(PPIC) a Canada based company,for a Leak Location Services and Equipment Rental agreement, aimed to check,inspect,and locate leaks on Maynilad's selected PDS using the Sahara System-a state-of- the art leak detection technology that accurately detects leaks, pockets of trapped gas and structural defects in large diameter pipes.

It was the first actual application of this technology in the Philippines and in this region. Prior to the start of the project, four Maynilad young engineers, were sent and trained in Canada. Follow through training was done here in Manila as part of the service provided by PPIC.

The established DMAs on the SDS and TDS enabled Maynilad to measure water losses in the PDS. Maynilad has a total of 300 KM of PDS with size ranging from 300 mm DN to 3200 mm DN.Water audits of the identified segments were conducted and the volume of water loss was estimated to be substantial enough to supply adjacent expansion and underserved areas.

Subsequently, Sahara inspection was carried out and findings reveal significant losses due to leaks, illegal connections, unknown laterals, not decommissioned old pipes and other network anomalies.

To-date Maynilad is operating 2 units of Sahara, primarily in the high NRW areas of Central Manila and the operations are contributing significantly in the recovery of water being lost in the system. The number of leaks repaired on the PDS in 2010 has significantly increased four times it was in 2009.

Fig.7.3.2.1. Sahara Pipe Inspection in Manila

Table 7.3.2.1. Maynilad Sahara Operations Results

Indicators	2010	2011 YTD	Total
Total KM pipe surveyed	115	113	228
Leak locations detected	210	99	309
Recovered volume (MLD)	73	34	106
Average leak/KM	3.6	1	2.2
Average distance surveyed M/day	370	378	374

Table 7.3.2.2. Comparative Results Sahara Operations

Water Utility/Country	Length of pipe surveyed per day (M)	No.of leaks detected per KM
Thames Water/UK	746	1.6
WRC/Europe &North America	504	1.4
EPAL/Portugal	781	1.3
Lyden/Casablanca	688	0.7
Maynilad/Philippines	374	2.2

7.4. Integrated Meter Management

Integrated Meter Management is the group under Central NRW that handles the over-all control and management of all tasks pertaining to water meters,from residential, commercial, industrial and DMA meters except for the flow meters being used to monitor the flow in key primary pipe gauging points which currently being handled by the Telemetry group.

Before, several meter related tasks were done by various group in Maynilad resulting to uncoordinated and not properly programmed activities.There was evidently lack of concerted efforts and the resources were scattered (data loggers, service vehicles, meters,etc).

With the inclusion of the Integrated Meter Management (IMM) into the Central NRW Division, several improvements have already been effected, namely:

- Re-organized the existing meter management unit and injected new and young engineers.
- Acquired the services of world class meter experts to guide the new meter management team.
- Re-evaluated performance of the different brands of meter and reduced the number to only five quality brands from the previous 23.
- Special attention is being given to large account customer meters, which is the source of almost half of Maynilad's total revenue. Maynilad is shifting to a more advanced meter technology in this category to provide better service to the customers and to improve its monitoring and consumption analysis.
- Records show continuous increase in billed volume and revenue in the large customer meters top 1000 accounts.

- Limited the re-use of refurbished meters which was done before in replacing large account meters resulting to lost revenues.
- Continuously conducting R&D on new meter technology and automated meter reading.
- Conducting trial installations of different types of meter and evaluate their applications.
- Re-built the old meter test facilities

Fig.7.4.1 Maynilad New Meter Test Facility

Moving forward, Maynilad starts to implement periodic meter replacement program aimed to systematically replaced the existing old type and less accurate meters. Different types of meters will be installed based on its application in a particular area.

7.5. Capacity Building

To sustain an effective NRW Management plan, Maynilad made significant investment in the development of its personnel. An NRW Management Training and Certification Program (NMTCP) was put up to be able to address the need for continuous skill assessment and upgrading for the personnel.

The scope of the program is to evaluate the knowledge of personnel, provide training to bridge the gaps and ensure that they are kept up to date on the recent development in technology relevant to NRW management. Maynilad's partnership with Miya was especially crucial in this Program because it allowed the Maynilad access to very knowledgeable specialists in the fields of NRW Management. As a result, these specialists, most of which are members of the IWA Water Loss Taskforce, were able to craft and conduct comprehensive training modules covering the fields of: NRW Assessment, Meter Management, Leak Detection, Pressure Management, PRV Maintenance, Hydraulic Modeling, GIS and Data Management, and DMA Operation and Management.

Two new facilities, the Integrated Meter Management Building and the Leak Detection Training Center have also been constructed to ensure that the best possible venues are available to Maynilad personnel to learn and practice key NRW management activities.

To date, Maynilad is already a recognized leader in the field of NRW Management because of its significant achievements in the last four years. Part of the goal of this Organization is to also share its knowledge and expertise in the fields of NRW Management.

7.6. Data Management System

The availability of reliable information is critical in ensuring that decisions made by the management are sound and will yield the desired outcome. This also helps optimize resources, improve the confidence of decision and policy makers and expedite implementation of programs and target delivery. An important step that Maynilad took towards implementing a comprehensive NRW Management System is thru the use of Netbase.

Netbase is a NRW Management System that allows data integration of different data sources. What could take weeks of running and generating reports for several hundred DMAs only takes

a few minutes with the help of this system. It accesses data sources from several Maynilad systems, namely:

- Billing System (SAP)
- Geographical Information System - GIS (Manifold)
- Customer Service Information System
- DMA flow and pressure data (Various System of Loggers)
- Work Order System (SAP-EAM)

Due to the size of Maynilad's system, it was apparent early on that a system to automatically produce relevant NRW report is needed. It allows daily monitoring and tracking of nightflows into the DMAs so the result from previous measurement can be readily made which greatly improves the reaction time and prioritization of personnel in determining the need to carry out leak detection.

Maynilad's GIS also play an important role in the future programs on NRW Management. The availability of implemented leak repair works in this system will help the company prioritize and decide on future pipe rehabilitation projects. These data will also allow for a more pro-active maintenance work and rehabilitation plans to be effectively carried out.

8. PRESENT AND FUTURE CHALLENGES

Maynilad might have hurdled most of the initial challenges it faced in its early years of NRW management but still it has suffered few setbacks. It needs to see the lessons learned in every setback and make them part of the team's development.

These are the present and future challenges Maynilad is facing and will be facing to effectively implement and complete of its NRW program.

- Sustenance of improved level in NRW and level of service
- Quality data collection and management system
- Quality work implementation and supervision
- Working relationships with Local and National Government Units
- Working relationships with other Maynilad operations and support groups
- Capacity building and benchmarking with the best in the region
- Provision of right incentives to effect high level performance

9. CONCLUSIONS

- NRW reduction is a complex problem and not a simple program to implement
- Not only new technologies and international standards have to be adopted but right organization and effective management must be established
- Management full support and leadership is very critical
- The need to invest in the capacity building and the provision of right incentive to the staff-which is the best asset of the company
- Maynilad is still far from its NRW targets, but it is now more confident than before; and it is only a matter of time - it will surely be one of the best water utilities in the region in the field of NRW management.