

APPARENT LOSS INTERVENTIONS IN ETHEKWINI MUNICIPALITY

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1. Introduction

The Infrastructure Leakage Index for the eThekwini municipality for the period 1 July 2006 to 31 January 2007 is 7.7 and the percentage water loss is 31.2%. The Non-Revenue Water Department, in conjunction with other departments, is conducting many programmes and interventions in line with international best practice to reduce the real and apparent losses.

This paper covers in detail the interventions that have been launched to reduce apparent losses and the interventions to reduce real losses are listed for completeness.

System Input 822395 kl/day	Authorised Consumption 633649 kl/day	Billed Authorised Consumption 568135 kl/day	Billed Metered Consumption 522135 kl/day	Revenue Water 568135 kl/day	
			Billed Unmetered Consumption 0 kl/day		
	Water Losses 192222 kl/day	Unbilled Authorised Consumption 65514 kl/day		Unbilled Metered Consumption 6114 kl/day	Non-Revenue Water 257736 kl/day
				Unbilled Unmetered Consumption 59400 kl/day	
		Apparent Losses 37749 kl/day		Illegal Connections 18424 kl/day	
				Metering Inaccuracies 19325 kl/day	
Real Losses 154473 kl/day		Mains Leaks 47250 kl/day			
		Reservoir Overflows / leaks 1500 kl/day			
		Service connection leaks 105723 kl/day			

Figure 1: IWA Standard Water Balance for the eThekwini Supply System

2. Real loss interventions: -

- \$ Council has approved the expenditure of R550m to relay all 100mm and 150mm AC mains in the Unicity over a five-year period as these mains have a high burst frequency and contribute to a significant amount of water loss. Phase one of this programme (R110m) is due to commence in July 2007.
- \$ Active leakage control. A total length of 16020km of water main has been checked to date and 28193 leaks have been identified and repaired. This work is done on a contract basis and this contract also provides for step testing and correlation.
- \$ Work is underway to install prv's (pressure reducing valves) to lower the pressure in the Durban CBD. The pressure will be initially lowered in the off-peak periods only and will be more aggressively reduced over time to progressively assist to reduce losses. It is estimated that when the prv's are commissioned that this project will save R1m pa and at the final settings, the saving will be R5m pa.
- \$ The average zone pressure in Umlazi area is being lowered from 48m to 40m and this will reduce the non-revenue water in Umlazi by 20%. Once completed, this initiative will be progressively rolled out to all areas that have high night flows. Savings are estimated at R6m pa.
- \$ Advanced pressure control is being rolled out to 50 existing prv zones. Savings are estimated at R5m pa.
- \$ Active maintenance is conducted on all pressure reducing valves > 50mm.
- \$ Advanced warning devices have been installed on some critical prv's to alert when pressure reducing valves have failed. (A pilot project based on GSM linked to sms and email)
- \$ Forced plumbing repairs are being conducted in houses in former R293 areas with arrears over 60 days and where consumption is greater than 1.5kl/day.

3. Apparent Loss Interventions: -

1. Analysis and change out (where required) of the top 1000 consumer meters to improve the accuracy of the billed volume. All top 1000 consumer meters will be less than 10 years old by July 2007 and the top 200 consumer meters are currently all less than 5 years old.
2. Rectification of billing data and installation of meters to previously unmetered consumers. The Water Services Department is concluding the installation of 12000 domestic water meters in the Inanda, Umbumbulu, Folweni and Fredville areas.
3. Site visits are being conducted to properties to verify that all identified non-domestic consumers do in fact have water meters. Minor contracts have been awarded to fast track the installation of non-domestic water meters where required.
4. All old unmetered standpipes in informal areas will be metered by July 2007. In addition, the pressure downstream of the meters will be reduced and any leaks on the connection pipe from the water mains to the standpipes will be repaired.
5. A project is being conducted in Amaoti to use Community Service Agents and caretakers to increase billed revenue (formal area) and reduce the water losses (informal area).
6. Site visits are being conducted to properties where water has been disconnected for non-payment or tampering. Visits are also being made to properties where there have been reports of illegal connections.
7. The 65 Umgeni Water sales meters where the bulk purchases are recorded are being examined and processes are in place to ensure that the all the conditions and requirements of the Bulk Water Sales Agreement are being adhered to.

Apparent Loss Intervention #1 – Improve the meter accuracy of the bulk consumers

A detailed analysis of the Top 200 water consumers in the municipality was carried out by consultants Restor (Africa) (Pty) Ltd in 2005/06. The water meters were logged and changed out where the meter was suspected faulty or the meter was older than 5 years. In some cases the size of the meter was changed if the flow rates were not within the accuracy range of the meter.

This intervention gained an extra R9.8m for the Department and an additional R22m in back billing. The back billing account was raised where a large consumer was found to have a meter that was severely under-registering by 66%.

After the Top 200 meters had been analysed in detail it was decided to fast track the project and ensure that all consumer meters in the top 1000 bracket were less than 10 years old. This phase is almost complete and the next 1000 will be done thereafter.

All of the meters that have been removed have been tested and another output

from this exercise is to use this information together with the billing history to determine the optimum age and recorded flow at which a meter should be changed to ensure that the meter measures the flow as accurately as possible.

Apparent Loss Intervention #2 – Unmetered domestic properties

In the years 1996-2000 the area of jurisdiction of the Water Department grew 1000% and many areas previously run by the NPA and Kwa-Zulu Government were absorbed. Water loss management contracts were run in these new areas and some 12000 consumers were found to have water on site but no meters. The Water Services Department is now concluding the installation of these domestic water meters in the Inanda, Ntuzuma, Kwamashu, Umbumbulu, Folweni and Fredville areas. It is estimated that this project will collect an additional R20m pa in revenue.

Apparent Loss Intervention #3 – Unmetered non-domestic properties

Using recent aerial photography and the billing database, our staff is checking the entire Unicity to identify non-domestic properties where there are buildings but no connections. Inspectors are sent to site to determine one of three outcomes: -

1. The property is abandoned or vacant;
2. The property has a water meter. The billing database is then updated with this information and we ensure that the customer is being billed correctly;
3. The property has water on site but no meter. In this case the inspector gets an application form signed by the customer and then a meter is installed. Minor contracts have been let to fast track the installation of the water meters where required.

185 meters have been identified so far in the last 3 months and it is estimated that this will collect an additional R4m pa in revenue. When we are certain that all non-domestic consumers are metered and being billed correctly, then our focus will turn to the domestic properties. The same methodology will be utilised to ensure that all our consumers are being billed.

Apparent Loss Intervention #4 – Meter all standpipes

Contracts have been awarded to ensure that all standpipes in the Unicity are metered. The Contractor is issued with aerial photography that also shows all the water infrastructure and existing standpipes. The Contractor locates these standpipes and also searches the immediate area to check for other standpipes that have not been recorded in the GIS. The Contractor then traces the connection pipe to the point that it ties into the water main and installs a water meter. All leaks that are found on these connection pipes are repaired as well. A mini-prv is

installed in the meter box to reduce the pressure at the standpipe to 2 bars. The positions of all standpipes and meters are recorded with a GPS and the GIS is updated. A list of the top 100 standpipe consumptions is given to the Operations Department regularly for investigation and correction.

The benefits of this programme are several: -

- \$ The water sales volume is increased.
- \$ The water loss is reduced by lowering the pressure and repairing the leaks.
- \$ The areas can now be better managed through known flow information.
- \$ The GIS information is improved.

Apparent Loss Intervention #5 – Sustainable solution for Informal areas

A pilot project is being conducted in an area in Inanda called Amaoti to find a sustainable solution to provide water in informal areas and reduce the losses. Historically, Amaoti was served by standpipes but now approximately every third dwelling has an illegal connection. In the past, a heavy handed approach was used in informal areas and plumbers, together with contingents of armed security guards would swoop on these areas and remove all piping and fitting associated with illegal connections. There are however 250 000 informal dwelling in the Unicity, so even if 1000 dwellings were visited a day, it would still be a year before we visited them again. The reality was that the communities simply reconnected themselves within days of us removing their illegal connections. It was deemed that using the legal system to prosecute those responsible would be a drain on the police and court system and therefore not sustainable.

Council have recently approved the installation of the Ground Tank System to informal areas at no cost to the recipients. In Amaoti, this higher level of service is being installed and the old illegal connections are being removed. Caretakers (community service agents) are on site and educate the community to ensure that the new system is utilised properly. In this manner it is hoped that the communities will correctly use the free 200 litres of water supplied to them and not have a need to make illegal connections and vandalise the infrastructure. Part of the Caretakers duties is to take readings of the district and sub-district water meters and ensure that the readings reconcile with the ground tanks. The Caretakers are taking many messages to the community to build a spirit of cooperation between the community and the municipality. This is resulting in a higher number of leaks being reported by the community themselves.

It is estimated that losses will reduce by R4m pa through this intervention.

There is a small pocket of 500 RDP houses in the Amaoti area and the liaison staff are visiting the new consumers with a view to engendering a culture of payment. It

is felt that this pro-active approach will assist the consumers to manage their consumption and payment. The aim of this intervention is to assist these consumers to become regular paying customers from the outset, and prevent them from having their water supply restricted or disconnected due to non-payment.

Apparent Loss Intervention #6 – Site visits to “ex-customers”

Site visits are being conducted to properties where water has been disconnected in the past for non-payment or tampering to check that the consumer has not reconnected themselves. Visits are also being made to properties where there have been reports of illegal connections. Where illegal connections are found they are removed and then the property is flagged for another visit in 7 days. Where no illegal connection is found, then the property is flagged for a visit at progressively longer intervals. (30 days, 180 days, 365 days). Where an “ex-consumer” states that they are getting water from a neighbour, then the neighbours connection and meter is checked as well to ensure that no tampering has taken place.

A variation to this exercise will be conducted in the future to check on consumers that have their flow restricted. Staff will visit their premises and measure the actual water flow rate that the consumer is receiving to ensure that the restricting device has not been tampered with or removed.

Apparent Loss Intervention #7 – Accuracy and validity of purchase meters

There are 65 meters through which we purchase approximately 800Mgl of water from Umgeni Water every day. The Bulk Water Sales Agreement covers a number of issues relating to the accuracy and checking of these meters. A project is underway to check all of these installations to ensure that: -

- \$ The installation is of the required standard (meter, check meter, chamber, dirtbox, connected to monitoring system etc)
- \$ The meters are calibrated / checked at the frequency stipulated.
- \$ The meters are replaced when necessary.
- \$ All new installations are installed to the required standard.

The monthly cost of purchased water is in the order of R70m. This programme is to ensure that the highest accuracy possible is obtained for these meter readings as an overall one percent error represents an amount of R700 000 per month or R8 pa.

4. Conclusion

The issues surrounding the reduction of non-revenue water are numerous and complex.

Infrastructure attrition, Infrastructure Condition Factor (ICF) and the replacement of assets will become more of a focus for all Utilities as their infrastructure ages.

Technical solutions to the non-revenue water problem cannot be implemented in isolation, and the social issues must always be taken in to account.

The integrity of the data in the revenue systems in Municipalities must be improved and procedures strictly followed to ensure that the maximum revenue is generated.

The culture of payment (or lack thereof) must be an idea that is embraced by all citizens in order for us all to have a sustainable future. Stricter controls, not more lenient ones must be enforced to ensure that our consumers prioritise their payments for services rendered by the Municipalities.

All Water Authorities need to develop strategic plans to holistically embrace the many issues and solutions required to reduce the non-revenue water.