AUS-iot
Automated Utility Systems

Case Study

Western Cape

Water Loss Study - Estate, Apartment Block & High Rise Buildings

Background: The need for urgent action with regard to water conservation has been highlighted in 2018 by the city of Cape Town, located in the Western Cape province of South Africa. The city experienced one of its worst prolonged periods of drought. The reality of the situation was that the water supply to the city of 4 million inhabitants would run out, if no effective water conservation strategies were implemented. This event was referred to as Day Zero.

Part of the City of Cape Town's strategy to avert Day zero was to minimise all water losses and to implement fair and equitable daily water rationing. The rationing was legislated at 50 litres per person per day.

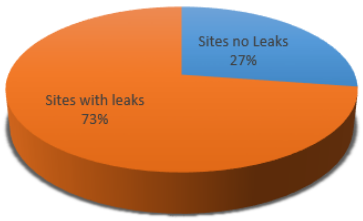
Requirements: In situations of extreme drought and water conservation a number of priorities exist, all are dependent on current and accurate data being available:

- Minimise water loss.
- Rapidly identify water loss events.
- Fairly manage the allocation of the water.

All the above are covered in this case study. These strategies are reliant on smart metering and can be implemented both through smart meters or plug in type devices.

Data: The need for accurate and current data at meter level is imperative to successfully apply these strategies. This can best be illustrated using the 50 litre per person per day allocation. Based on this water restriction, in a Dwelling housing 4 people, an 8.3 litre/hr leak would completely exhaust its daily allocation without any human consumption. This case study has been based on daily meter readings from 2028 metering points located in 25 separate sites. Based on this the overall statistics were:

Sample	2028	Meters
Period	445	Days
Sites	25	
Leaks	15	Sites
Bursts	8	Sites
Total water used	199696	m^3
Total water lost	1436	m^3
Lost water	0.72	%



The data analysis was limited to meters with a leak flow greater than 10 litres/hr.

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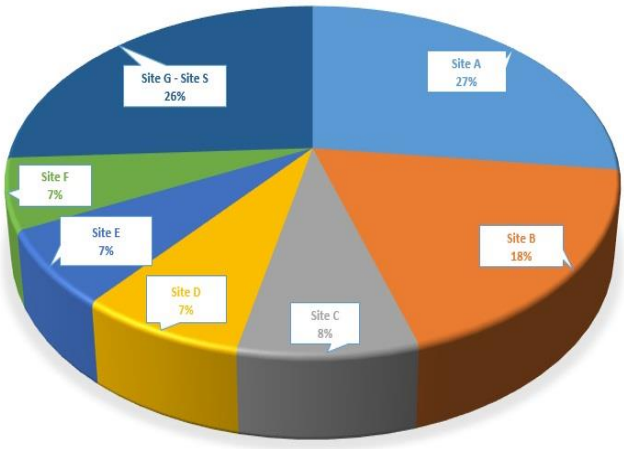
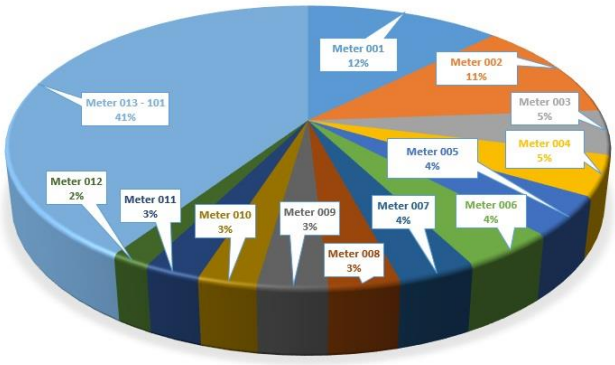
Key Insight: Analysis of the data drawn from the 25 sites provided a number of key insights, these have been listed below and are:

- The bulk of the water lost was confined to a limited number of sites.
- Water loss due to burst accounted for a third of all water lost
- The bulk of the water lost to bursts, 54% occurred in bursts with a duration of 6 days or longer.
- A small number of Dwellings (0.74%) that experienced bursts, accounted for disproportionate high percentage (34.5%) of the burst water lost.
- The bulk of the water lost to leaks, 61%, was due to a small proportion of the Dwellings with leaks, 12%.
- 5.5% of the installed base experienced leaks, however only 12 Dwellings of the installed base accounted for 60 % of all the leak water loss.
- The bulk of the water lost occurred in Dwellings that had experienced multiple leaks, more than 10 leaks in the 443 day review period.
- Half the leak water lost was as a result of leaks that had a duration of less than 6 days.
- To achieve a 50% reduction in water lost to leaks, the customer needed to address the cause of the leak within 48 hours.

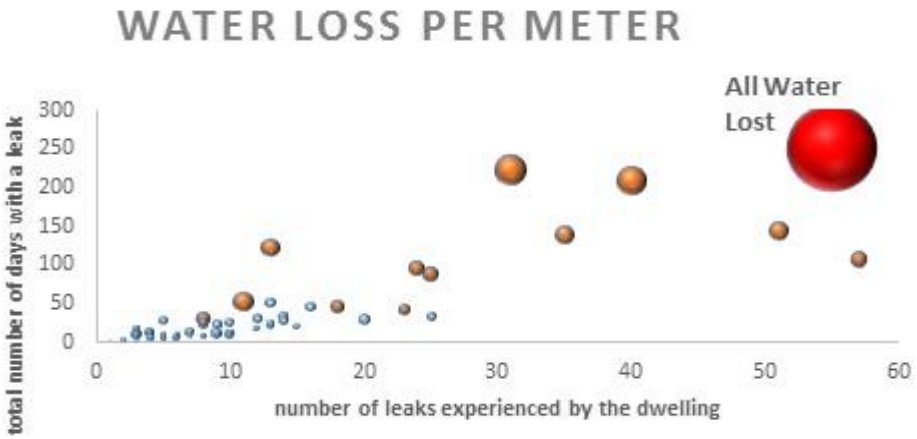
Leak Water Loss by Site: Analysis of the leak water loss data indicated that 6 sites accounted for 74.4% of the water lost, these 6 sites only constituted 27.2% of the installed base. The insight provides a clear indication of where the water conservation strategies would best be applied.



Leak Water Loss by Meter: Analysis of the leak data at meter level indicated that 101 meters had presented leaks, of these 12 meters accounted for 59.3% of the water lost. This information aids in the water conservation strategy as extremely targeted response strategies can be setup. These strategies not only result in significant water savings, they also improve customer satisfaction and can dramatically reduce labour costs.



Leak Characteristics: Detailed analysis of the leaks in terms of their volume lost, duration and frequency is depicted in the plot below. The analysis clearly indicated that the bulk of the water lost was due to a few meters that each had multiple leaks, resulting in many days of the water loss. The Red depicts the total water lost to leaks, Orange depicts the 12 worst meters with leaks, the Blue depicts the remaining 99 meters with leaks. The total number of meters covered in this review was 2028.



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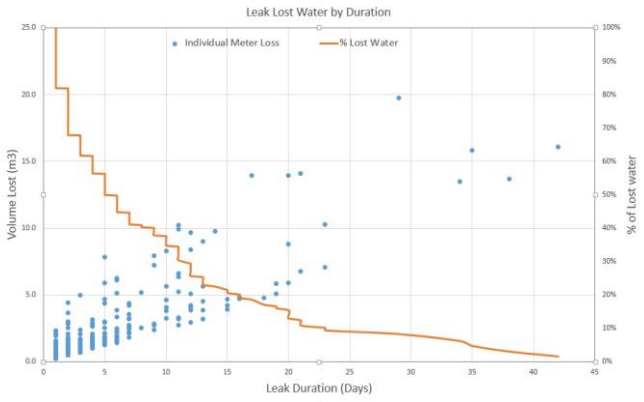
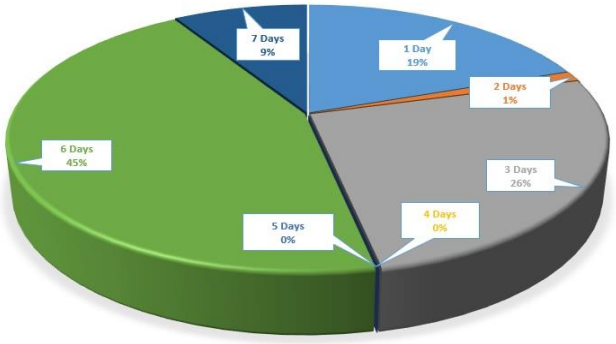
Leak Duration: Analysis of the data indicated to effectively address leaks within the system, the response time to detect the leak was critical. From the data 50% of the water lost to leaks occurred in leaks that had a duration of less than 6 days. The longest recorded leak was 42 days. Note this data only addresses leaks of 10 litres/hr and greater.

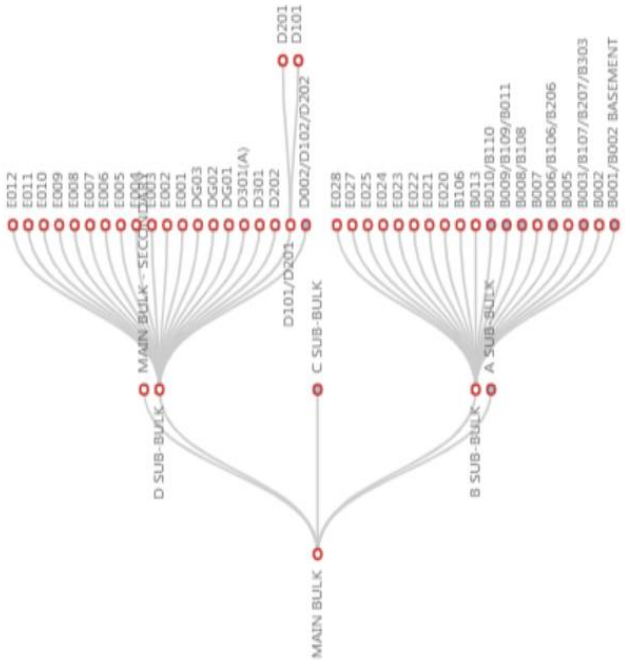


Burst Water Loss by Duration: The water losses attributed to water bursts, defined as the sustained flow of above 100 litres/hour indicated that these accounted for 1/3 of all water lost. The analysis provided the insight that with a rapid response mechanism, that allowed for bursts to be identified and addressed within 48 hours, the water loss to bursts could be reduced by 80%. This would constitute 27% drop in all of the water lost to both leaks and bursts.

Response times of a few hours is feasible.



System and Site Retic Losses: Too effectively address the losses within the reticulation, detailed water balances need to be performed. The sites covered in this case study did not have bulk and sub bulk meters installed, and as such water loss within the reticulation have not been addressed, only losses after the customer meter have been considered. Daily time synchronised water balancing is a key element to fully implement a water conservation strategy.



Allocation: If water rationing is required, then to gain customer acceptance requires a fair and equitable solution. A solution based on retrospective penalties tied to the customers billing is inefficient, both in terms of the customer relationship as well as the desire to stabilise the water usage. The solution needs to be real time and customer focused. This requires smart metering with daily monitoring, coupled to mobile phone notifications. Clearly penalties still have a role to play in those cases where there is blatant disregard for the water utilities strategy. However, the benefits of a solution that quickly and in a responsive manner informs the customer on a daily basis of their status allows them to quickly remedy any discretion.

Customer Relationship: A strong customer relationship enhances the ability to successfully implement strategies. To this end providing the customer with direct and real time information regarding their usage and billing, both current and historic engenders a better relationship. The information ensures reduced queries and disputes. This relationship is easily built using tools such as mobile phone apps and web portals.

Key take away: Based on the data obtained from the 25 sites reviewed in this case study, the core functional elements of the AMI system to effectively implement a water conservation strategies needs to include:

- Rapid detection of leaks and bursts events.
- Effective customer notifications.
- Daily meter reading data is required.
- Robust and accurate water balancing is preferred.
- Daily threshold notification allow for a fair rationing strategy.
- Enhanced customer relationship

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