Water Loss / Water Age

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TOPICS

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- Non Revenue Water
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Introduction

- Safe drinking water plays a crucial role by promoting good health, food production, and manufacturing and support of virtually all aspects of life.

- Drinking water utilities have done an outstanding job of meeting these needs by providing safe water directly to homes, businesses, institutions, and industrial facilities.

Introduction

- Today's water utilities encounter numerous challenges in providing safe drinking water for human consumption.
- By improving efficiencies in supply and revenue recovery, utilities can better serve their customers, improve a utility's financial standing, and be better positioned to make vital upgrades to the vast and aging water infrastructure in community water supply systems.

Introduction

- Abundant water resources could be readily and reliably tapped to supply our communities.
- Unfortunately, that condition no longer exists in many regions due to a climate change and other environmental stresses.
- For many of today's water utilities, the amount of water they have today is likely the greatest volume they will ever have.
- Today's water utilities must ensure they are accountable in their practices and highly efficient in their operations

Introduction

Water Age

Water Age

WHAT IS WATER AGE

- Water age refers to the time it takes for water to travel from it's source to consumers and is influenced by distribution system flow velocities and pipe lengths.
- Residence time in reservoirs is probably the most important contributor to age.

Water Age

Gives an idea of the oldest areas of water in the system

The age of the water affects chlorine levels

Chlorine decay = Bacterial Growth

Areas of low demand create low velocity = increased water age

Water Age

Water age is a simple surrogate for evaluating some water quality issues in your distribution system

Tanks are a major contributor to water age

Hydraulic modeling is a valuable tool for examining water age

Hydraulic modeling can be used to identify problem areas and evaluate solutions

Water Loss

Water Loss

- Water loss control represents the efforts of water utilities to provide accountability in their operation by reliably auditing their water supplies and implementing controls to minimize system losses

Real Water Loss Vs Apparent Water Loss

- Utilities incur real losses from pipeline leakage and apparent losses when customer water consumption is not properly measured or billed.

Water Loss

- All drinking water utilities have water losses, however, the extent varies from system to system.
- Unfortunately, most water utilities do not regularly account for (or audit) their supplies to quantify these losses or identify the cost burdens the losses impart upon the system.

Water Loss

- Losses in utilities include the physical escape of water from the pressurized piping system as a leakage occurrence known as real losses.
- Losses also occur due to inaccurate metering of customer consumption, theft of service, and the utility's own errant billing and accounting practices; all of which are collectively known as apparent losses.

Water Loss

- Old and poorly constructed pipelines, inadequate corrosion protection, poorly maintained valves and mechanical damage are some of the factors contributing to leakage.
- One effect of water leakage, besides the loss of water resources, is reduced pressure in the supply system.
- Raising pressures to make up for such losses increases energy consumption.

Water Loss

- In general, a 10% is normal.
- But a loss of more than 20% requires attention and corrective actions.

Non Revenue Water

Non Revenue Water

- Non-revenue Water includes the real plus apparent losses, along with unbilled authorized consumption, which represents water used in miscellaneous activities such as fire-fighting.

- In other words, Non revenue water comprises the volume utilities lose from their water supply infrastructure and the unbilled volumes associated with lost revenue from a portion of the supply that reaches the customer, plus the authorized unbilled usage

Non Revenue Water

Non Revenue Water

Non Revenue Water

- Uncontrolled Non Revenue Water results in numerous negative impacts to water utilities and communities.
- Where water resources are limited, leakage represents a waste of precious water and energy resources when water is produced, but not delivered to a customer.
- Constrained water resources could result in limits being placed on new commercial or residential development in water-short regions

Non Revenue Water

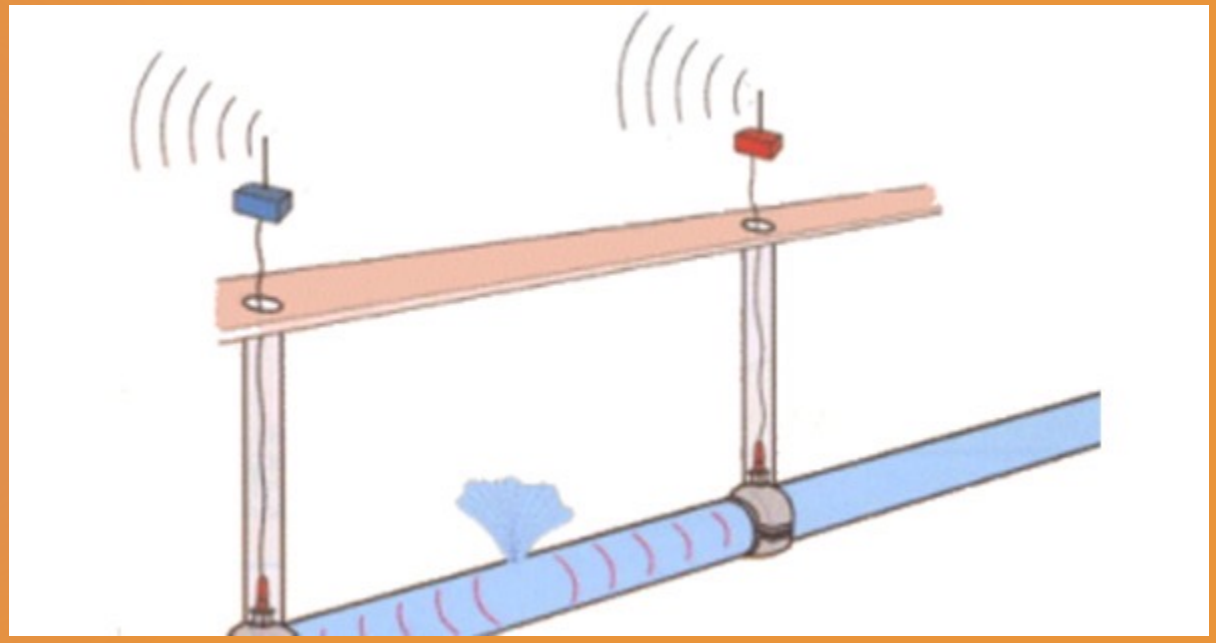
Leak Management

Leak Management

- Damaging water leaks and large breaks are increasingly visible, can be very costly, and can compromise the confidence that communities, elected officials, and the media place in the water utility.

Leak Management

- Fortunately, leakage management practices and technologies can be used to help recover treated drinking water that may have been going to waste for many years.



Leak Management

Leak Management

- Apparent losses mean water utilities do not realize all of the revenue needed to reinvest in system upkeep and renewal

Leak Management

- By minimizing apparent losses, however, utilities can bring in additional revenues that help fund system renewal one of the greatest needs confronting water utilities today.

Cost of Water Loss

Cost of Water Loss

- The cost of producing drinking water varies from utility to utility due to the quality and availability of the source water, size of the system, geography, energy costs, and other factors.

Cost of Water Loss

- Water utilities typically withdraw water from an available water resource such as a river, lake or groundwater source.
- Water is then treated to regulatory standards, pumped through an underground piping distribution system, and finally supplied to customers.
- Water utilities may also purchase treated water from neighboring systems.

Cost of Water Loss

- Most utilities include a water meter on the customer service line to measure the supply of water and record a quantity that is the basis for the monetary charge included on the regular customer water bill.

- Unfortunately all utilities incur inefficiencies, or losses, in both supply and customer-related functions of their operations.

Cost of Water Loss

- The cost impacts, such as the quantities of losses, are hidden from utilities and their customers.
- The paying customers ultimately bear the financial burden of a utility's inefficiencies, whether or not water rates are set to cover all costs.

Cost of Water Loss

- Likewise, water utilities set customer rates and charges that are specific to their own cost of doing business, and these charges vary widely.
- When a utility experiences leakage in its water distribution system, the losses drive up production costs while forcing the water utility to withdraw more water from its sources than its customers need.

Cost of Water Loss

- When utilities encounter apparent losses because of inaccurate customer meters, theft, or billing issues, the cost of these losses occurs at the retail rate charged to the customer for water service.
- Thus, utilities with relatively high water rates and charges suffer a relatively greater impact due to uncaptured revenue from their apparent losses.
- The combined annual financial impact of real and apparent losses in utility operations can reach millions of dollars for large water utilities

Water Audits

Water Audits

- Water utilities should track the annual volumes of water they manage, measuring not only the amount of water supplied to their customers, but also the water lost.

Water Audits

- The foundation of a water loss control program is the annual water audit.
- An audit is a systematic examination of records and financial accounts to check their accuracy and ensure the viability of the company or agency being audited.

Water Audits

- A water audit is a systematic examination of records and financial accounts to check their accuracy and ensure the viability of the company or agency being audited.
- Audits are common in the world of finance and accounting.
- Similarly, a utility water audit involves a review of records and data that traces the flow of water from its source, through the treatment process, into the water distribution system, and delivered to customer properties

Water Audits

- The water audit usually exists in the form of a worksheet or spreadsheet that details the volumes of water supplied, customer consumption, and loss volumes that occurred in a community water system annually.
- The standard water audit also tracks various costs and calculates a variety of performance indicators to assess the efficiency of the water utility.

Water Audits

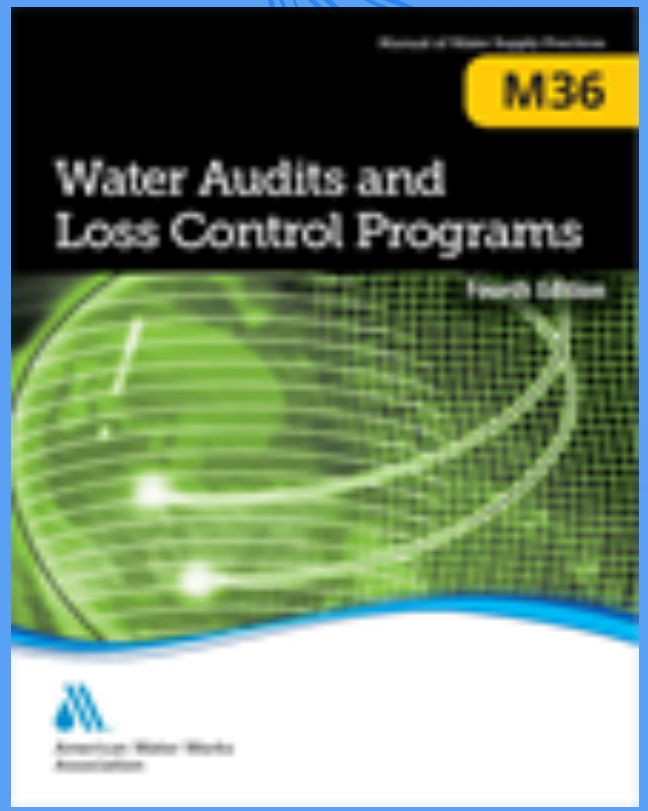
- An assessment of validated water audit data from 2013 for 246 water utilities found that the utilities collectively incurred apparent (customer) losses equivalent to 29.4 billion gallons (111 billion litres) of water, translating into uncaptured revenue of over $151 million for the year.

Water Audits

- With the development of the AWWA methodology and implementation tools, water utilities have available to them all they need to reliably audit their supply and distribution systems and assess their water loss standing.
- The water audit also provides the foundational data needed by the water utility to plan a cost-effective strategy to control excessive losses.

Water Audits

American Water Works Association



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Watermain Breaks

Watermain Breaks

- In planning a proactive leakage management program to control real losses, the water utility should determine the nature of leaks and breaks occurring in its system by carefully documenting information on the leaking assets:
- (water main piping, fire hydrants, customer service lines, etc.), the nature of repairs, and related information such as damages caused by leaks or breaks.

Watermain Breaks

- Other information, such as average system pressure and costs to conduct leak detection work, better manage excessive pressure, and to renew water piping, should also be collected.
- With all of this data, the right combination of repairs should be in place to bring leakage down toward the economic level of leakage.
- Also the use of a Risk and Criticality Matrix

Watermain Breaks

- Utilities should also review their effectiveness in executing timely, lasting repairs of leaks and water main breaks and evaluate their policies that require their customers to arrange for repairs on leaking water service connection piping supplying homes and businesses.

Watermain Breaks

- Some utilities place the responsibility on customers to arrange for repairs of these lines, but these repairs are not always conducted in a timely and effective manner.
- This is an important consideration because often the majority of hidden leaks occur on customer service lines, rather than water mains.

Watermain Breaks

- Finally, water utilities should have an effective asset management program that provides for water distribution system renewal and rehabilitation at an appropriate interval to ensure the ongoing viability of the system.
- Such programs should explicitly recognize the monetary and resilience-related benefits derived from the activities that reduce real losses

Water Theft

Water Theft

- Provision of water service is not immune to the occurrence of unauthorized consumption.
- Some members of every community are willing to tamper with water meters or meter reading equipment or find other ways to obtain water service without paying (fully) for it.

Water Theft

- It is up to water utilities to review their policies for provision of water service to make certain that they are clear about what uses of service are proper.
- Utilities should also have a means to detect unauthorized consumption.

Water Theft

- Today's Advanced Metering Infrastructure (AMI) has outstanding capabilities to monitor customer water consumption and to detect tampering and unusual water usage patterns.
- Water utilities should have in place appropriate enforcement mechanisms to address offenders' behavior in a way that can recover revenue and disincentivize continued inappropriate use of water service.

Water Theft

- At the broadest level, efficient water utilities better sustain water resources, manage energy, and plan for future water supply infrastructure

Water Theft

- For example,
- a water utility whose water resources are marginally adequate to meet existing demands would do well to incorporate a water loss control plan within its strategy for sustaining water resource adequacy.
- Such approaches can be integrated with traditional water conservation programs to reduce or stabilize source water withdrawals going into the future

Halifax Water

Halifax Water

- Halifax Water was the first water utility in North America to employ the water audit methodology now advocated by AWWA.
- The utility has also become the North American leader in leakage management by innovating and employing extensive leakage and pressure management controls across its water distribution system

Halifax Water

- Halifax Water took a strong focus on leakage control and greatly advanced it by gaining training on the most progressive leakage control methods being employed across the world and implementing them in its system.
- Its water distribution system is now largely sectored into many District Metered Areas (DMAs) with supply flows monitored continuously and newly emerging leakage quickly detected and abated

Halifax Water

- Advanced pressure management has been employed to the extent possible, and the system is upgraded at an appropriate rate.
- Consequently, Halifax has driven down leakage by over 10 MGD, (45 MLD) worth $600,000 annually, to near the technical low limit and has been successful in maintaining this state.

Halifax Water

Halifax has focused on apparent losses by installing commercial bulk watering stations and disallowing use of fire hydrants for retail supply purposes.

Additionally, Halifax has launched an installation of an Advanced Metering Infrastructure (AMI) system that has been fully online since 2017.

Summary

Summary

- North American water utilities are instrumental in providing health and vitality to our communities by providing safe drinking water on a continuous basis and at an affordable cost.
- All water utilities lose a portion of their treated water to leakage and fail to fully recover all revenues due from their customers

Summary

- These inefficiencies of water and revenue loss collectively known as non-revenue water create a number of problems including wasted water and energy resources, damage from rupturing underground water distribution piping, additional financial hardships for cash-strapped systems, and many other negative impacts

Summary

- Water utilities have traditionally lived with losses, knowing intuitively that they exist, but viewing them as a seemingly unavoidable additional cost of doing business.

Thank you

Micheal S. Firlotte