


Addis Ababa Water and Sewerage Authority



Physical water loss

NRW The Big Picture

System Input Volume	Authorised Consumption	Billed Authorised Consumption	Billed Metered Consumption	Revenue Water
		Unbilled Authorised Consumption	Unbilled Metered Consumption	
		Unbilled Unmetered Consumption	Unbilled Unmetered Consumption	
		Unauthorised Consumption		Non-Revenue Water
	Accounted Losses		Leakage On Overflows At Storage Tank	
		Real Losses	Leakage On Transmission And Distribution Main	
			Leakage On Service Connections Up To Point Of Customer Meter	


Physical Losses (leakage)

Leakage is the:

Water escaping from the distribution network before reaching the customer

This is usually in the form of leaks from the:

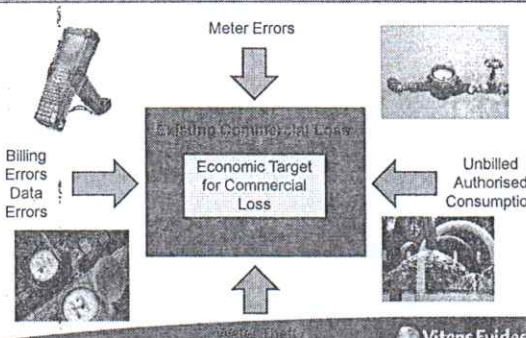
- Transfer and distribution pipes;
- Joints and fittings including air valves, hydrants etc;
- Service reservoir floors and walls;
- Reservoir overflows; and
- Service connections up to the point of customer boundary or meter.



Physical losses

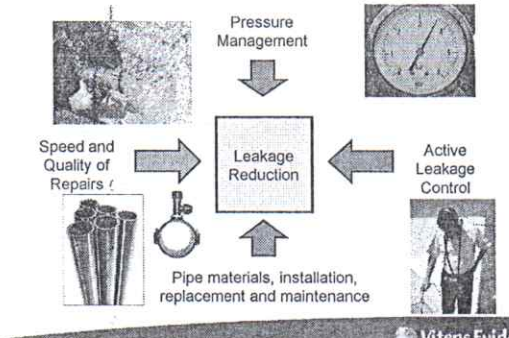
- Leaks on the main pipes
- Leaks on customer connections.
- Leakage occurs through holes or cracks in the main pipes or at pipe joints, which will leak water constantly over a 24-hour period.

Apparent Losses



The diagram shows a central box labeled "Economic Target for Commercial Loss". Arrows point towards it from "Billing Errors Data Errors", "Meter Errors", "Existing Commercial Loss", and "Unbilled Authorised Consumption".

Physical losses




The diagram shows a central box labeled "Leakage Reduction". Arrows point towards it from "Speed and Quality of Repairs", "Pipe materials, installation, replacement and maintenance", and "Active Leakage Control". An arrow points away from "Leakage Reduction" to "Pressure Management".

Extracts – Updating DMA O&M Manuals


Suggested DMA Manual Contents:

1. Asset data and location drawings
2. Schematic of the pipe network
3. Operation and maintenance schedule
4. Flow and pressure graphs
5. Baseline NRW and pressure, and latest NRW
6. Leakage step test procedures and results
7. Leak locations and leak reports
8. Health, safety and environmental risks



ALR

Awareness, Location, Repair




ALR

This concept states that any loss occurring from leaks, overflows, faulty customer meters, or other sources will have three stages as shown in the diagram below.

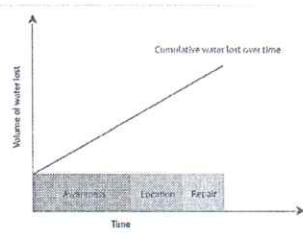

- Awareness time—time required for the utility to become aware of the leak
- Location time—time required to locate the leak
- Repair time—time required to repair the leak

Many losses occur because of poor or limited maintenance, so in addition to reduce ALR, an important element in the NRW strategy is maintenance!!!!!!

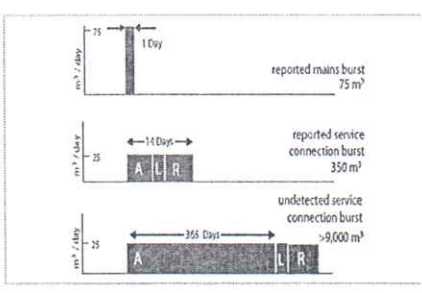

This is critical to maintaining good asset condition and reducing the incidence of new leaks, meter failures and other problems.



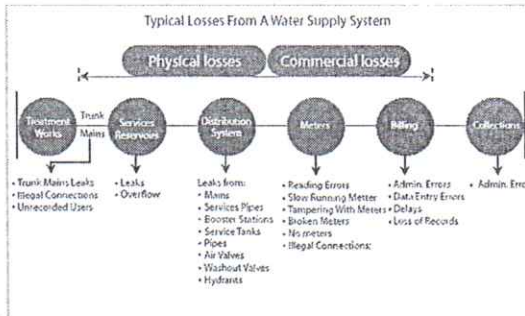

Awareness, Location, Repair

Awareness, Location, Repair





Typical Losses From A Water Supply System

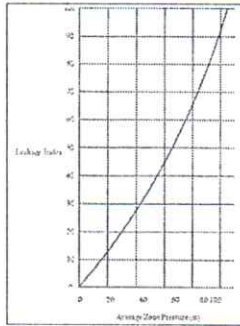



ALC

Active leakage control



Pressure and Leakage Relationship




- The relationship between pressure and leakage is almost linear
- A 10% decrease in pressure can produce a 10% decrease in leakage
- Reducing pressure is the most cost effective method for reducing leakage

Preventative maintenance in practice


Inspection of valves

The procedures for the checking of the different valves:

- Check if the valve can easily be found
- Check if the valve can easily be closed and opened
- Check if the valve is not leaking
- Check if the valve is not corroded



Repaint if necessary
Open and close the valve five times to flush dirt (coarse grime)




Methods of Maintenance: Preventive & Curative


- > Preventive maintenance comprises all activities undertaken to check and solve a malfunction in the distribution network including house connections
- > Curative maintenance, sometimes called "repair," is conducted to get assets working again

Examples of curative maintenance are:

- > Repair a leaking valve
- > Repair a leaking Fire hydrant
- > Repair a leakage in a pipeline



By preventive and curative maintenance can be determined if replacements are necessary.





Methods of Maintenance: Preventive & Curative

- > Preventive maintenance comprises all activities to prevent malfunction of the distribution network including house connections
- > Preventive maintenance is conducted to keep assets working and/or extend the life of the assets

Examples of preventative maintenance are:



- > Checking the accessibility and functioning of valves
- > Checking the soil coverage of the network (normally done during leak repairs or other maintenance on the network)

Preventative maintenance in practice

Before we do preventative maintenance or inspections a number of conditions must be met:

- > The location of all appendages is stored in an electronic database (like GIS)
- > The appendage must be accessible.
- > The appendage must be clearly visible.
- > The appendage must be clean.
- > The nearby surroundings of the appendage must be clean. (no bushes, weeds or litter).
- > The box of the appendage is not broken.
- > The box is covered with a steel or concrete lid.
- > The box is clean (no weeds or litter inside the box).


Activities for Operations & Maintenance

Repair and Maintenance of the network

- > Regular maintenance of the network
- > Maintenance of appendages (Valves, Fire Hydrants, ect..)
- > Maintenance of distribution pumps and booster stations
- > Repair leakages
- > Flush and clean pipelines based on a schedule



Investments

- > Replacement and extensions of the network in including house connections




Tips

- Use only new materials, no re-use!
- Why?
- Repair will not be sustainable


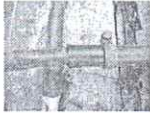



- How?
- Bring new materials or let someone bring them




Tips

- Be decisive of renovation of household connections
- Why?
- Every coupling is a potential leak and can lead to repairing the same leak year after year





- How?
- If a leak is found with old HDPE or on a connection with more than one coupling → renovate!



Materials and Appendages

**Valves
Hydrants
Water meters**

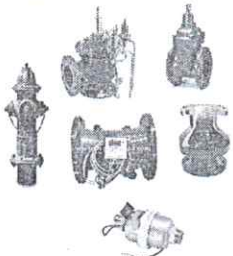



Preventative maintenance in practice Inspection of appendages


All network appendages need a regular inspection on their state of maintenance and functionality

The appendages that can be installed

- > Valves
- > Pressure reduce valves
- > Non return valves
- > Fire hydrants
- > Main water meters
- > Water meters house connections
- > Flush points

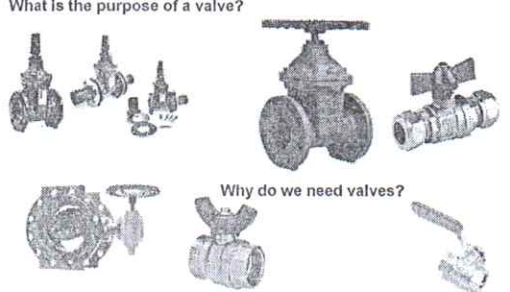



Valves




Types of Valves

What is the purpose of a valve?



Why do we need valves?



Vitens Evides

Valves

There are different kind of valves you can use in a distribution network

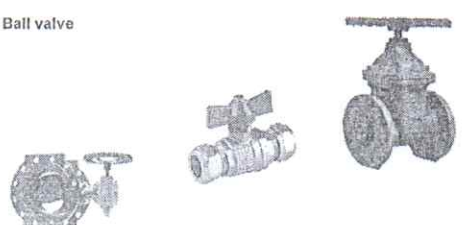
- Ball valve
- Gate valve
- Butterfly valve

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Valves and assets

What is the most common valve that we use in our total distribution network?

- Ball valve




Vitens Evides

Valve maintenance

How and why do we have to maintenance a valve?

- We must check if they working
- Check the visual state
- Can we operate them
- Will it fully open / close
- We check this by operating and listing with an acoustic device




Vitens Evides

Action on site

Closing a valve
This is an item which we easily forget. By closing a valve we often do not realize what kind of forces we create in the system. Especially in situations with high pressure and big pipes with big valves.

Water hammer

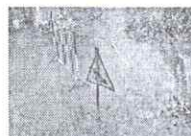


Vitens Evides

Valves and assest

What is the purpose of a valve?


- To close pipes in case of emergency
- To isolate area
- To change water flows
- To control your network




Vitens Evides

Wrap up

Valves are very important assets
 They need maintenance
 You control your network with the valves
 Incase of emergency you need to close them




Preventative maintenance in practice Inspection of pressure reduce valves




Pressure reduce valves

- > Check outlet pressure with a manometer when no flow is occurring
- > Check the filter on contamination. Clean filter if necessary
- > Check if the sealing ring, edge of nozzle and slotted ring are in good condition if necessary replace the entire valve insert
- > Re-check outlet pressure again.
- Adjust pressure setting PRV if necessary.





Preventative maintenance in practice Inspection of Non-return valves



Non-return valves




- > Check if the non-return valve is working
- > Remove all coarse grime and accumulated scale inside the non-return valve
- > Check if all moving parts inside the non-return valve are functioning according to specifications
- > Check if the non-return valve is not corroded
- > Repaint if necessary
- > Re-install the non-return valve
- > Make sure that the seals of the valve are in good condition
- > Check if the non-return valve is not leaking.

Preventative maintenance in practice Inspection of Fire hydrants

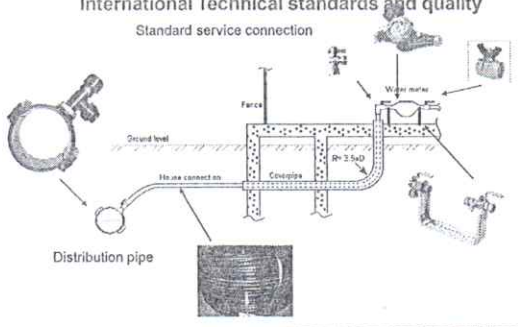

Fire hydrants (above ground)

- > Check if the caps on the couplings are functioning.
- > Check if the couplings for hoses on the fire hydrant are in good condition.
- > Open the fire hydrant completely and flush until clean water appears.
- > Repaint if necessary

International Technical standards and quality

Standard service connection

Use qualified material

