

# Leak Detection Technologies

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# Leak Detection

- Leak detection is a process where a water system uses technology to track down suspected leaks in buried pipes and pinpoints their location

# Outline - Leak Detection Technologies

- Two methods of leak detection
- Most common method
- Pros and Cons
- Pinpointing suspected leaks
- Where are the advancements
- Ground penetrating radar
- Conclusions

# Two Methods – Leak Detection

- Passive & Active
  - Passive Leak Detection
    - Deployment of noise data loggers to listen for “noise” on main water lines
  - Active Leak Detection
    - Deployment of a survey crew with listening devices (microphones) to actively listen to hydrants, valves and meters
- Both Methods are Considered Proactive in detecting suspected leaks

# Most Common Method of Leak Detection

- Visual Observation
  - Technically an active approach to leak detection
  - However, more a “Managing Failure” technique
- Purpose of Leak Detection is to find leaks sooner – before they become visible or catastrophic



# Common Knowledge About Leaks and Leak Detection

- On metal pipes leaks typically start off small and enlarge over time resulting in a main line break (PVC typically breaks)
- Leak Detection is an attempt to detect leaks while they are small and before the pipe fails
- Leak Detection equipment is designed to listen for the noise “vibration” caused by small leaks
- Water savings is only realized if leaks are found when they are small and repaired quickly

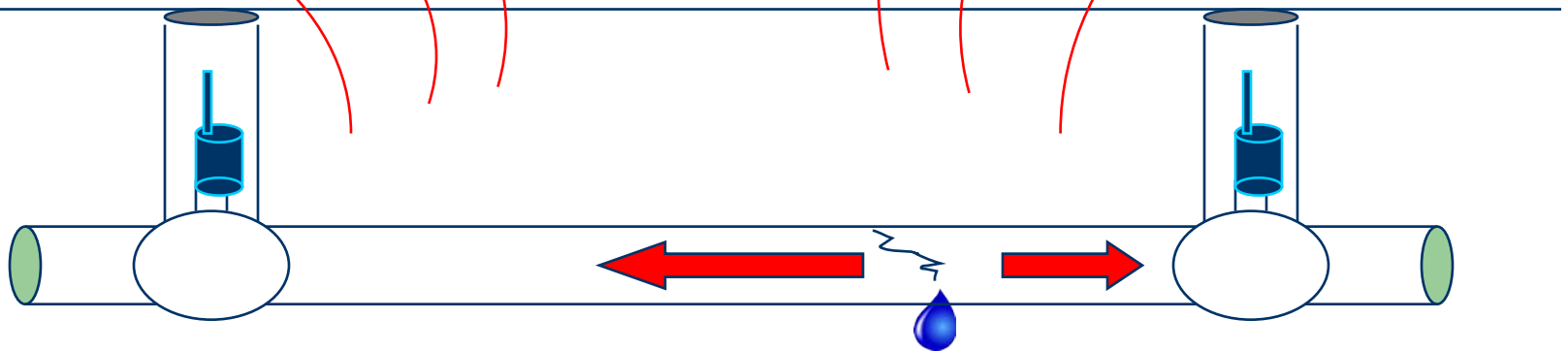
# Passive Leak Detection

- Noise Acoustic Data Loggers
- Based on similar technology – slightly different features
- Deployed primarily on valves
- Used for permanent or lift & shift deployment



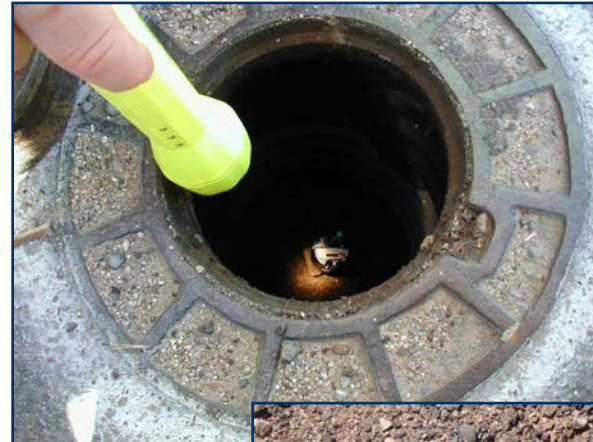
# Passive Leak Detection (continued)

- The “noise” travels down the pipe in both directions from a leak source.
- The loggers then detect the noise and switch into alarm mode
- ~~Loggers listen in both directions along the pipe, and the logger that reports a higher noise level is technically closer to the leak~~



# Passive Leak Detection (continued)

- Considerations
  - Pipe type
    - Plastic vs Metal
  - Condition of pipes
    - New vs Old
  - Distance between valves
    - Long vs Short
  - Condition of valves
    - Sediments, water, throttled, buried
- Dedicated Employee



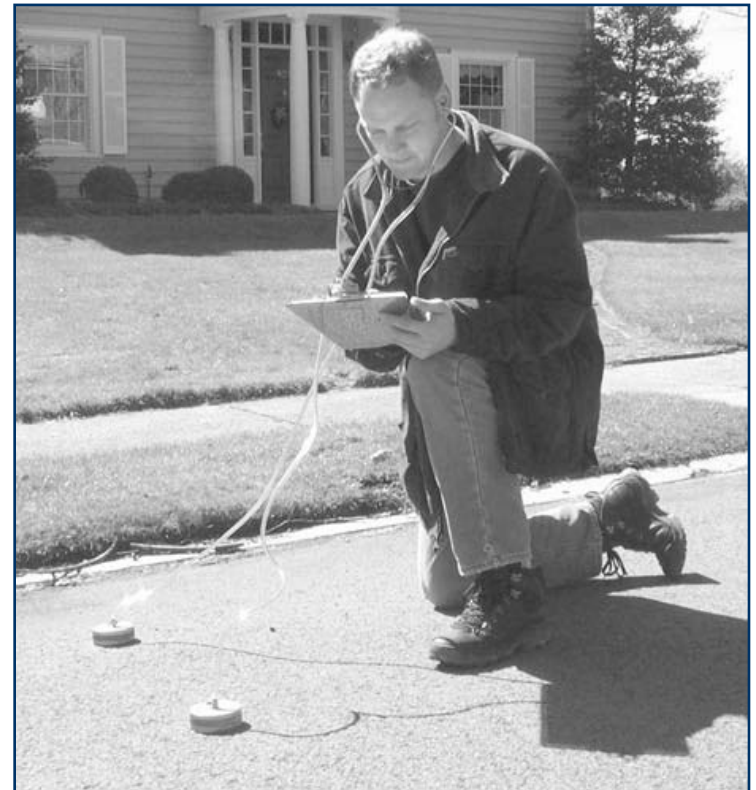
# Active Leak Detection

- Manual acoustic listening equipment
- Ground microphones used for listening along a pipe segment
- Listening sticks used for listening to valves, meters, and hydrants



# Active Leak Detection (continued)

- The active method allows for the user to listen for themselves if a leak is present
- It is possible to pinpoint a leak using the active method
- Requires a trained and dedicated employee



Source: <http://www.nesc.wvu.edu/ndwc/>

# Pros and Cons of the Two Methods

## Passive Leak Detection

### Pros:

- Minimal amount of labor
  - Requires less time to cover an area
- Easy to use
  - Computer assisted
  - Alarm mode

### Cons:

- Limitations - valve distances and pipe type
- Maintenance
  - Corrosion
  - Battery failure
  - Theft
- Transmission interference

# Pros and Cons of the Two Methods

## Active Leak Detection

### Pros:

- Easy maintenance
- Able to pinpoint leaks without additional equipment

### Cons:

- Amount of time to cover an area
- Requires a trained ear to be effective

# Conjunctive use of the two

- The two technologies can be use together
  - Use one to double check the other
  - Some situations my only work using one method over another
- One is not superior over the other
  - No technical journal article stating one outperforms the other

**Remember - The purpose of leak detection is to find leaks before they surface**

# Pinpointing Suspected Leaks

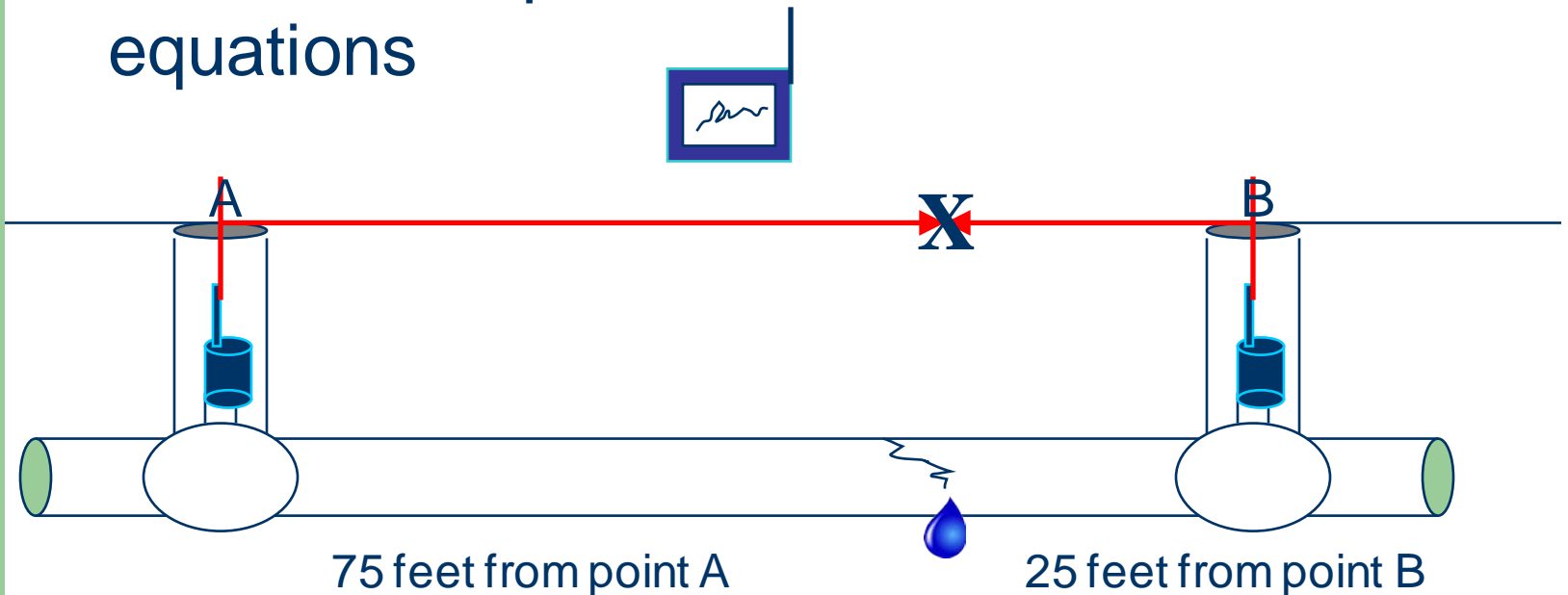
## Correlators

- The second component to leak detection
- Dependent on pipe type, diameter and length



# Pinpointing Suspected Leaks

- Correlators are effective in pinpointing leaks
- Correlators operate based on mathematical equations



# Pinpointing Suspected Leaks

- Potential Interference with Correlators
  - Splice in the main water line
  - Unknown pipe type
  - Background noise - traffic
  - Multiple leaks on same stretch of pipe

# Where are the Advancements in Leak Detection?

- Base technology has been around for 15 years
- Acoustic noise logger are still analog but are converted to digital
- Computers have made leak detection technology easier to use
- Smaller chips and battery improvements have increased performance and reduced costs

**But all this doesn't necessarily translate into finding more leaks – but it does make it easier**

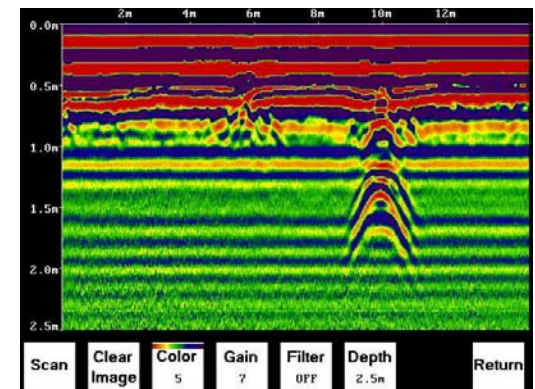
# Advancements (continued)

What would qualify as an advancement?

- Speed up the time it takes to find leaks?
  - Limited by how fast a technician can move through a system
- Lets you know in advance when a leak is going to occur?
  - Requires “smarter” pipes and not leak detection technologies

# Ground Penetrating Radar – Remote Sensing

- Originally used for locating utilities
- Considered effective in detecting leaks on both metal and PVC pipe
- Detects changes in material densities



# Conclusion

- There is not a one size fits all solution to leak detection
- Know your limitations based on system characteristics (pipe type, valve spacing & access points) before investing in one particular technology
- Have the resource available to address suspected leaks (repair crews and materials)
- The benefits of leak detection (real loss reduction) are only realized if the leaks found can be repaired in a timely matter
- All “leaks” are suspected leaks until they are excavated and verified

# Conclusion (continued)

“Ground Penetrating Radar is cost effective due to minimal interruption of operations, as well as avoiding the high costs of damage and repairs due to excavation.”

## **Distinguish between technical consultation and sales pitch**

- You either save water or find smaller leaks, not both
- You cannot save more water than what you are currently losing through real losses
- Knowing you have a leak is not enough, you have to repair it before you start saving water

## **The human component is just as important as the technology**