Lurking in the Background: A Review of the Components of Leakage and Intervention Strategies

Presented by:
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Four Pillars of Managing Leakage

- **Active Leakage Control**
- **Existing Real Losses**
- **Economic Level**
- **Unavoidable Real Losses**
- **Speed & Quality of Repairs**
- **Pressure Management**
- **Maintenance Rehab Repair**

As each component receives more or less attention, the losses will increase or decrease.

Source: AWWA Water Loss Control Committee

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**Background Leakage**
- Unreported and un-detectable using traditional acoustic equipment.
  - Tools:
    - Pressure Reduction
    - Main and service replacement
    - Reduction in the number of joints and fittings.

**Unreported Leakage**
- Often does not surface but is detectable using traditional acoustic equipment.
  - Tools:
    - Pressure Reduction
    - Main and service replacement
    - Reduction in the number of joints and fittings.
    - Proactive Leak Detection

**Reported Leakage**
- Often surfaces and is reported by public or utility workers.
  - Tools:
    - Pressure Reduction
    - Main and service replacement
    - Optimized repair time
Real Loss Component Analysis

Where the total cost is at a minimum

Economic Level of Loss

District Metered Areas

Background Leakage
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Tools:
- Pressure Reduction
- Main and service replacement
- Optimized repair time
Active Leakage Control Strategy

- Assessment
- Localization
- Pinpoint
- Confirm
- Repair
Active Leakage Control Strategy

1. Assessment
   - Locate
   - Pinpoint
   - Confirm
   - Repair

Reported LEAK DURATION
- CUSTOMER SIDE: 299,000 Gallons, 6500 Galls./day, 46 Days
- UTILITY SIDE: 104,000 Gallons, 6500 Galls./day, 16 Days

FLOW RATE AT A GIVEN PRESSURE
District Metered Areas

Intake and treatment works
Bulk meter into supply zone
District meter measures flow into districts e.g. 1000-3000 properties
Sub district meter measures flow into smaller area e.g. 1000 properties
River
Source meter measures total output
Mains
Closed valve
Meter

GPM Flow
Minimum Night Flow
*150 GPM
Unaccounted Leakage Rate for the DMA

District Metered Areas

Main Break

GPM Flow

Courtesy Water & Wastewater Authority of Wilson County, Tennessee
HIGH PRESSURE

Source: George Kunkel Jr.

CITY OF ASHEVILLE – CASE STUDY
Which zone do we select?

Zone Selection Criteria:

- Are there any continuously pumped zones?
  - Potentially lower capital implementation costs
  - Higher level of potential energy savings

- Pressure Logging
  - Average Zone Pressure & Critical Pressure logs identify if there is pressure that can be reduced

- Break Frequencies
  - Pressure Dependent Main line breaks
  - Pressure Dependent Service line breaks
  - Comparison to “Unavoidable” Levels

Zone #1 - Haw Creek

Operating Conditions:

- Continuously Pumped – (4) 30 HP Pumps
- Controlled by discharge pressure
- Lower Sondley PRV – Backup supply
Pressure Logs:

Zone Baseline:
- Low Reported Break Frequencies
- No Active Leak Detection
- Excess Pressure at Critical Points

Field Testing:
- Goal – How much background leakage?
- Initial flow/pressure/consumption
- Active Leak Detection #1
- Active Leak Detection #2
- Additional flow/pressure/consumption
Results:

<table>
<thead>
<tr>
<th>Survey</th>
<th>Leaks Found/Repaired</th>
<th>Leakage Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>6</td>
<td>24 gpm (estimate of 4 gpm/leak)</td>
</tr>
<tr>
<td>#2</td>
<td>3</td>
<td>12 gpm (estimate of 4 gpm/leak)</td>
</tr>
<tr>
<td>Total</td>
<td>9</td>
<td>36 gpm (estimate of 4 gpm/leak)</td>
</tr>
</tbody>
</table>

Pre/Post Leak Detection & Repair Flow Logs:
Business Case: Haw Creek Pump Zone 2014

Infrastructure Data

| Average pressure when supplied (PSI) | 196 |
| Mains length (miles) | 11 |
| No. of connections | 569 |
| Hours of supply per day (h) | 24 |
| Effective average pressure in 24 h | 196 |

Annual volume and average flow

| NFRL 24 (CARL) | 196 |
| Unassailable annual real loss (UARL) | 0 |
| Effective miles | 0 |

Performance Indicators

| Current annual real lost | 0 |
| Unassailable annual real lost | 0 |

Business case

| Corrected CARL MGY | 196 |
| Production cost $/MG | 274.29 |
| Savings per year $ (1) | 2,052.69 |
| Power for booster pumping $/MG | 700.00 |
| Savings per year $ (2) | 5,238.54 |
| Mains replacement cost $/mile | 359,040.00 |
| Savings per year $(3) | 1,265.62 |
| Deferral for five years $ (4) | 17,772.48 |
| Probability of one catastrophic event per year | 4% |
| Avoidance of catastrophic event value per year $ (5) | 2,327.50 |
| Total saving per year $ | 28,656.83 |

Lessons Learned:

- Hydraulically, existing set-ups leave limited opportunity for reduction of pressure in consecutive pumped zones;
- Detailed assessment of boundary integrity, especially when evaluating parts of zones, is very important;
- Not every zone will have a business case, even if the pressures are really high;
Questions?

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