SB 555: Water Loss Performance Standards

Public Stakeholder Workgroup Meeting #2

Pressure Management Methods
Pressure and Real Loss

Pressure influences leakage and main break rates
Highly affected: Flexible pipe material & Joints
Audits 2017
Pressure and Real Loss

High operational pressures observed
Pressure needs improved monitoring
Pressure Monitoring

Preliminary analysis and Field measurements

Desktop analysis

Average Zone Pressure and Critical point
Monitoring
Impact studies

Pressure loggers + zones (or District Metered Areas)

Pressure v/s Leaks and Breaks

For more information, WRF: Leakage Management Technologies
Pressure Reduction

Pressure reducing valves + zones (or District Metered Areas)

Add pressure reduction valve
Scope for Pressure Reduction?

Minimum for new service area if number of connections increases by 20%

Minimum residual pressure

For more information: California Code of Regulations § 64602. Minimum Pressure (California Waterworks Standards)
Fire Flow Requirements

**Hydrants**
- Tested for flow rate based on lowest pressure reached in operation
- Required residual pressure of 20 psi

**Fire sprinkler systems**
- Vary with occupancy and building
- Insurers rate building based on compliance with required flow

In CA Fire Code, required fire flows given at 20 psi

Fire Suppression Ratings Schedule: Insurance Services Office (Verisk Analytics)
Monitoring

Field measurements

Set up
- Pressure v/s Leakage
- Pressure v/s Breaks
- Leakage volume and location
- Pressure reduction

District Metered Areas
- Pressure Loggers (different types)

Instruments
- Pressure measurements
- Transient detection
- Instruments
Pressure Management

Pressure v/s Leakage
Pressure v/s Breaks
Leakage volume and location

Operational Pressure Reduction

District Metered Areas + Pressure reduction valves + Booster stations
Questions for Discussion

• To what extent does your agency monitor pressure for individual pressure zones in your distribution system?
• Has your agency identified opportunities for or implemented pressure reduction programs to reduce water loss and pipe failures in the distribution system?
• Has your agency encountered conflicts with fire follow requirements while practicing pressure reduction? If yes, in which scenarios do these conflicts typically occur?
• Has your agency identified solutions for balancing pressure reduction programs with fire flow requirements?
• Are there technologies and measures that your agency is unable to implement in its water distribution system for pressure monitoring and reduction, and why?
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Pressure Surge Control
Pipe Surges (Transients)

Pump shut down

Level changes in tanks

Rapid valve closure

Rapid demand changes

For more information: Boulos et al, 2005, Hydraulic Transient Guidelines for Protecting Water Distribution Systems
Pressure Transient Monitoring

Desktop analysis

High frequency pressure loggers

Software for transient detection
## Surge Monitoring and Control

### Monitoring

**Instruments**

- Pressure Loggers (different types)
- Pressure measurements
- Transient detection

### Control

**Operational changes**

- Avoid rapid closing and opening of valves
- Correct level controls for tanks/reservoirs

**Retrofits/Installations**

- Back up pump *To avoid sudden flow cut-off*
- Flywheel *Slow down pump responses*
- Surge tanks *Divert excess water/pressure*
- Relief valves
Questions for Discussion

• Has your agency attempted to monitor pressure surges in its distribution system?
• What is your agency’s approach for pressure surge monitoring?
• Did your agency find that currently available technology and software were effective in detecting pressure surges?
• Are there technologies and practices that your agency is unable to implement in its water distribution system for pressure surge control, and why?
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Case Studies
Background leakage reduction

Philadelphia Water Department, DMA: 2261 connections

Average pressure reduced from 95 psi to 67 psi
Background leakage reduced from 350 to 60 gal per min

One time capital cost $380,000
Breaks v/s System Factors

Large system, Tennessee: 175,000 people

GIS regression analysis:
Pressure, pipe size and material
Pressure Reduction + Active Leakage Control

12 small zones
Dryanovo, Bulgaria: 1470 connections

4 DMA pilots
Razgrad, Bulgaria: 716 connections

Night flow analysis to improve estimates
Reduced leakage by 228 gal/day

Identified high leakage zones
Meter testing to improve estimates
Reduced night flow by 2400 gal/min

Only repairs, no replacement
Maintaining Low Leakage

Salzburg, Austria

30 breaks/100 miles per year (Cast Iron)
16 breaks/100 miles per year

Permanent noise loggers on high-traffic metallic pipes
Divided 4 zones into 15 zones to assess pressure v/s leaks

50 leaks detected in first year
Determined critical pipe groups to be replaced
Virtual DMAs

Pula, Croatia

Pressure reduction (30% of system)
Quick leak response in oldest zones or zones with highest breaks

Solutions for fire flow purposes

Non-Revenue Water reduction: 53 million gallons per year averaged over 9 years
Hilly Terrain

Iren Emilia system, Northern Italy

PMA in existing zones, (about 60% of total area)

Transients:
High frequency pressure loggers

Leakage reduction (liters/connection/day)

20% reduction in energy consumption
57 gal per connection per day reduction in real loss