United Water Westchester

Design & Management of District Metered Areas

2015 NYSAWWA Conference

Nick Curcio
System Overview

- 7.0 MGD  Average Day Demand
- 16.8 MGD  Peak Hourly Demand
- 12,000  # Service Connections
- 168.0  Miles of Pipe
- 4.5 MG  Pumped Storage System

- 100% Purchased Water System
  - 7 Total Interconnections
  - Fluctuating Incoming Supply Gradient

- $2,270/MG  Variable Production Cost Associated with Real Loss
Introduction

- Operational Challenges
  - High Degree of Non-Surfacing Leaks due to System Topography
  - Availability of System Operating Data - Inefficient Deployment of Resources
  - Low Resolution Production/Consumption Data – Poor Water Loss Audits
  - High Levels of Water Loss (Leakage)

- Importance of Efficient System Operation
  - Tangible Benefits: Direct and Immediate Cost Savings
    - Production Costs – Energy, Chemicals, Etc.
    - Purchased Water Costs
  - Intangible Benefits: External Perception
    - Regulatory and Public Perception
    - Environmental Impact, Conservation
Non-Revenue Water Program Overview

- **Initial Evaluation – Components of Water Loss**
  - Nature of Water Loss Drives Remediation Actions
  - Characterize Nature of Water Loss
  - Efficient Deployment of Resources

- **Higher-Resolution Data Across Smaller Regions**
  - DMA System to Create Manageable Sized Zones
  - Anomalies Become More Evident
  - Better Align Production and Consumption Information

- **Short-Term Goals**
  - Leak Detection Efficiency
  - Clean-up of Existing Baseline Real Loss (Leakage)

- **Long-Term Goals**
  - High-Resolution Water Audits & Apparent Loss (Consumption) Reduction
  - Sustainability
DMA System Design

- **DMA System Basics**
  - Isolated Production Zone
  - Can be Viewed as Independent System
  - < 3,000 Service Connections – Easier to Achieve for Smaller Systems

- **Boundary Selection**
  - Existing Natural Boundaries (railroads, highways, waterways) = Minimal Crossings
  - Existing Pressure Zone Boundaries (already isolated)

- **Meter Sizing & Placement**
  - Weighted Average Accuracy (per DMA Zone) of 1% for Average Demand Flows, 2% Accuracy for Minimum Demand Flows
  - **Downsizing of Meters is Perfectly Acceptable from a Hydraulic Standpoint**
  - Hydraulic Modeling Evaluation to Determine Flow Ranges at Each Meter Site Under Various Operating Conditions
  - Additional Pressure Transducer at *ALL* Metering Locations
## DMA System Design

### Sizing chart

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<th>DMA-ID</th>
<th>Meter-ID</th>
<th>Model-ID</th>
<th>Location</th>
<th>Pipe Diameter (in)</th>
<th>In/Out</th>
<th>Average Flow (Meter)</th>
<th>Min Flow (Meter)</th>
<th>Max Flow (Meter)</th>
<th>Meter Dia. (in)</th>
<th>Headloss (Max Flow ft)</th>
<th>Average Accuracy (Meter)</th>
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DMA Meter Site Design & Installation

- **Direct Bury Open-Tube Meters**
  - Siemens MAG 8000 (21 Meters for 8 Zones)
  - Avoid Expense of Meter Pits (& Flooding)

- **Site Installation**
  - Planned Minimized Shut Downs
  - Field Improvised Specific meter Locations
  - Installation Orientation is **VERY** Important

- **Roadside Cabinet for Electronics**
  - Custom Designed Quartzite Box Enclosure
  - All Components are Battery Operated
  - Plan for Future Maintenance Access
DMA Zone Isolation

- **Implement Zone Isolation (Division Valves)**
  - Turn Count & Sounding to Verify Valve Seating
  - Evaluate & Remedy Hydraulic & Water Quality Issues Associated with Closed Valves

- **Isolation Testing to Verify Zone Isolation**
  - Good Opportunity to Verify Existing Pressure Division Valves as Well

- **Develop Proper Documentation & Policies to Ensure Zone Integrity**
DMA Data Collection & Management

- **Equipment & Data Flow**
  - Siemens MAG 8000
  - Siemens Meter Head
  - Pressure Transducer
  - Telog RU-32
  - Telog Enterprise Server
  - eOps Dashboard

- **Data Resolution**
  - Minute Level Data Capture
  - 24 Hour Transmit to SCADA

- **Mass-Balance Calculation**
  - Establishes Draft for Each DMA Zone
  - Meters are Bi-Directional with (-) sign
DMA Data Processing & Evaluation

- **Standard Leak Life-Cycle**
  - All Leaks Are Non-Surfacing for Some Amount of Time
    - Storm Drain & Wetlands
    - Rock & Soil Conditions
    - Frozen Ground Conditions

Very Little Opportunity to Further Reduce Find-to-Fix Time
DMA Data Processing & Evaluation

- **Real-Loss (leakage) Targeting**
  - DMA Specific Production/Draft Reports Used to Identify Zones Which Demonstrate a High Degree of Baseline Flow
  - Monitoring Overnight Flows to Identify Patterns Which Deviate from Normal Diurnal Fluctuations
  - Identifying and Localizing Leaks Which Have Occurred but not yet Surfaced (Event-to-Find Time)
DMA Data Processing & Evaluation

Drill-Down Approach for Leak Localization
1. Draft Indicator at Minimum Flow Period (over-night)
2. Modeling Analysis of Individual DMA Meters Serving Affected Zone
3. Generate ‘Heat-Map’ of Suspect Region
4. Localize, Correlate, & Repair

Stubborn Leaks Require Additional Data
- Pressure Logger Data Collection
- Isolation Testing
DMA Data Processing & Evaluation

- 150 gpm Leak (216k gal/day) – 6” Private Fire Service Line
  - Storm Drain Prevented Leak from Surfacing
  - Potential for Leak to Run for Long Durations
  - Winter Weather & Frozen Ground Conditions are Contributing Factors
DMA Data Processing & Evaluation

- Data Systems Integration
- Monitor System Operation & Performance
- Event Management

GIS & Mapping Integration

Production Monitoring & Trend Analysis

Event Detection & Efficiency Alarms
Preliminary Results & Findings

- 2.6% NRW Reduction – 2014 Partial Year
- 336 MG Total Production Reduction for UW Westchester Systems
- Better Monitoring of Service Parameters – Interconnections
- Better Optimization of System Operation

- Sector & Production Data Management Process led to Improvements in Other Non-DMA Systems
  - Leverage Existing Pressure Zone Metering
  - Production Meter Calibration & Maintenance for Non-Source Meters
Additional Functionality & Future Goals

- High-Resolution Water Audits (Monthly → Daily Basis)
  - Better Alignment of Production & Consumption Data
  - Assign Customer Meters to DMA Zones – Consumption Side
  - Characterize Nature of Water Loss – Real vs Apparent

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Additional Functionality & Future Goals

- **Sustainability**
  - Achieve & Maintain Economic Level of Water Loss
  - Continuous Real-Time Monitoring and Optimization of System Efficiency
  - Monitor & Report System Performance at Various Levels of Staff

![](example_water_loss_profile.png)

Example Water Loss Profile
Thank You

Questions?