Smart Sewers: Using Technology to Improve Wet Weather Operations

Reese Johnson, PE, PMP
Metropolitan Sewer District of Greater Cincinnati
Metropolitan Sewer District (MSD) of Greater Cincinnati, Ohio

- 800,000+ Residents of Cincinnati and Hamilton County
- 290 Square Miles
- 7 Treatment Plants
- 100+ Pump Stations
- 3,000 Miles of Sewers, Both Sanitary and Combined
- 184 MGD on Dry Days
Southwest Ohio receives **41 inches of rain** per year…

Results in approximately **11 billion gallons of overflow** in a typical year

Led to a **$3.2B Consent Decree** to address the 200+ overflow points through:

- Pipe Upsizing, Storage
- Strategic Separation
- Green Infrastructure
- Dedicated WW Facilities
What if…

... we could use *all* the conveyance capacity in our pipes before we had a combined sewer overflow?

....we could use a remote storage tank to reduce overflows many miles away?

....we could use real-time information to prioritize treatment?

Could we achieve the same, or better, environmental benefit and build less new infrastructure?
Cloud-based SCADA Enables a Smart(er) Sewer

- Flow Monitors
- WWTPs
- Rain Gauges
- Level Sensors
- Stream Gages
- Remote Facilities

Analysis

Historical

Live Data

REPORT

METROPOLITAN SEWER DISTRICT of greater CINCINNATI
“Smart Sewer” Achieves Results Without Additional Construction

- Improves Treatment Plant Operations
- Reduces Overflows from the Collection System
- Improved Watershed Protection
Improved Operations by Projecting Future Flows to WWTP

Legend:

- Mill Creek WTP Influent (Total): 126
- Auxiliary Mill Creek Interceptor (AMCI): 32
- Mill Creek Interceptor (MCI): 29
- East Branch Ohio River Interceptor (EBOR): 18
- West Branch Ohio River Interceptor (WBOR): 0

Historic Future
Reduced Overflows by Leveraging Distant Storage/Treatment Facility

Mill Creek WWTP

1.4 MG discharge prevented on one day

Ohio River in flood stage

16 Miles
Reduced Overflows by Remotely Resetting an Un-staffed Facility

1. WW Flow Begins

2. Dams Deflate to Avoid Upstream Flooding

3. Dams Remotely Reset by Watershed Operations

4. Dams Modulate to Maintain a Safe Storage Level

Overflow Reduced by 178 MG during a single storm
Reduced Impact by Prohibiting High Strength Discharge Upstream

1. Sewer begins to overflow
2. Restricted Conditions Set in SCADA
3. Visual Signal Activated at Customer’s Facility
4. Texts and emails sent to Drivers, Guards, Operators, etc.

From: <noreply@wssd.coc.local>
Date: April 17, 2016 at 5:42:11 PM EDT
To: <wwtspo@cincinnati-oh.gov>
Subject: Restricted Conditions

Conditions exist such that leachate cannot be accepted at the Recycling Facility. Please proceed to the Mill Creek WWTP.
Quantified Early Benefits of the Wet Weather SCADA System

2-year study of 4 Wet Weather Facilities:

- **15% improvement** with addition of real-time monitoring capabilities
- **33% improvement** with real-time monitoring and real-time control
At approximately 1¢/gal, the cost of operational optimization is significantly less than the typical price point for new wet weather infrastructure.
Reese Johnson, PE, PMP
reese.johnson@cincinnati-oh.gov