Artificial Intelligence in Wastewater

California Association of Sanitation Agencies

Richard W. Loeffler IV
January 24, 2019
Vital signs: Our infrastructure is failing, and we can’t afford to fix it

- 30 percent non-revenue water
- 240 thousand water main breaks
- 850 billion gallons of raw sewage released

$655B in required funding over the next 20 years (EPA)
Water infrastructure’s policy trilemma

Addressing Investment Needs
- Deferred investment
- Rising populations
- Climate resilience

Affordability
- Unit costs too high
- Costs rising faster than incomes
- Cost recovery needed

Process & Stability
- Compliance
- Risk aversion
- Capabilities

Inevitable

Expensive

Unsustainable

Future

Today

The New York Times

Dear Customer: We’re Shutting Off Your Water

Millions of people lose their water service every year after falling behind on what they owe.

By Wenonah Hauser and Mary Grant
Ms. Hauser and Ms. Grant work at Food & Water Watch.

Oct. 29, 2018

The Wall Street Journal.

Why Your Water Bill Is Rising Much Faster Than Inflation

Rate increases average 5.5% a year as utilities race to fix corroded pipes and overflowing sewers.
Is there a way to...

- Cut non-revenue water in half?
- End sewer overflows?
- Halt sewer rate increases?
- Eliminate shut-offs?
- Incorporate data into your organizational decision making?
Changes in 10 years: Computing

Source: Brookings, Wikimedia
In the next 12 years, innovation will transform water

Use **data analytics** to help utilities monitor, optimize, and control condition and performance of water & WW infrastructure…

…to **create outsized economic and social impacts**

Source: Global Water Intelligence, Team analysis
Three big ideas

From the ER to Preventative Care

“UEA-MEP”

“If It Ain’t Broke…”
Three big ideas

From the ER to Preventative Care

“UEA-MEP”

“If It Ain’t Broke…”
This is what ‘big data’ looks like
Turn on the Lights!
Turn on the Lights!
Turn on the Lights!
Three big ideas

From the ER to Preventative Care

“UEA-MEP”

“If It Ain’t Broke…”
AI, Surgical Application & Risk

Do ratepayers want us to replace good pipes?

Pre Inspection Plan
$6M

Post Inspection Plan
$1M

86%
Three big ideas

From the ER to Preventative Care

“UEA-MEP”

“If It Ain’t Broke…”
Intelligent Urban Watersheds™

Internet of Things/Edge Computing
Machine Learning
Dynamic Control/RT-DSS
OUTSMART TRAFFIC WITH THE WORLD’S LARGEST COMMUNITY OF DRIVERS

REPORT REAL-TIME TRAFFIC & ROAD CONDITIONS TO IMPROVE DRIVING FOR ALL

GET ALERTS BEFORE YOU APPROACH ACCIDENTS, HAZARDS, POLICE & MORE
## Traditional solutions

<table>
<thead>
<tr>
<th>City</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hawaii</td>
<td>$5.0B</td>
</tr>
<tr>
<td>Missouri</td>
<td>$4.5B</td>
</tr>
<tr>
<td>Ohio</td>
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<td>$2.0B</td>
</tr>
<tr>
<td>Florida</td>
<td>$1.8B</td>
</tr>
</tbody>
</table>
Storage Tank: “I’ve got lots of room. My price is $2 per gallon”

Interceptor: “I’m about half full. I’ve got capacity at $3 per gallon”

Storage Tank: “I’m filling up quickly. I’ve got capacity at $3.50 per gallon”

CSO 30: “I’m about to overflow! I need to buy capacity!”
Dynamic Control

CSO 30: “Done!”

Storage Tank: “Deal!”
Outcomes of active control

More rain, fewer overflows – $500M less cost
Measured Flow: S150-233
5 weeks
10 weeks
15 weeks
Objective: Save over $1 Billion
270 node sensor network (level & flow)
Deploying 25-30 RTC sites
100+ AI nodes
Flow balancing between plants
Coordinated control of pump stations

Outcome:
- Plan will achieve CSO compliance
- Plan will exceed economic objectives
Enhance Data Use and Optimize Potable Reuse Treatment

Eliminate SSOs, manage peak flows across 3 main WWTPs
Enhance use of data from 700+ installed sensors and meters
Minimize time plants operate near peak capacity (adapt to seasons, capacity)
Reduce/eliminate major CIP projects
I/I reduction
Load balancing for indirect potable reuse system implementation
Real Time Decision Support Systems (RT-DSS)
Imagine the possibilities if we as an industry were able to...

- Cut non-revenue water in half...
- End sewer overflows...
- Halt sewer rate increases...
- Eliminate shut-offs...
- Incorporate data into your organizational decision making...
WE ARE A WATER INDUSTRY LEADER WITH GLOBAL REACH …

- Global technology provider
- Approximately 17,000 global employees
- Headquarters: Rye Brook, NY; ~350 global locations
- Doing business in 150+ countries on 6 continents
- $4.7 billion in combined sales in 2017

…UNIQUELY POSITIONED TO HELP OUR PARTNERS SOLVE LOCAL AND GLOBAL WATER CHALLENGES