SmartClean™

Driving & Optimizing Collection System Maintenance with Smart Technology
About SmartCover® Systems™

- San Diego Technology Company
- Serving water industry with smart technology
- 12 years of operations
- >3,000 installations, >135 million operating hours
- 14 Patents, Major Apps:
  - SmartLevel™ - level monitoring
  - SmartFLOE™ - flow monitoring
  - SmartRain™ – rain data
  - SmartTide™ – tidal data
  - SmartTrend® – trend analysis
SmartCover Vision

Collection System Asset Management

Real-Time Condition Assessment & CIP

CSO Monitoring

I&I Assessment

Optimized Cleaning & SSO Prevention

Real-time monitoring enables Informed decisions producing Transformational change
Today’s Challenge

Primary Driving Factor

Clean Water Act of 1972 seeks to eliminate SSOs & CSOs
Overflow Impact

- Human Health
- Environmental Impact
- Bad Press
- Political turmoil
- Unplanned Cost
Conventional Solution

Clean, Clean, Clean where...

- Exaggerated action (high frequency cleaning) increases expense

<table>
<thead>
<tr>
<th>Frequency</th>
<th>30-Day Sites</th>
<th>90-Day Sites</th>
<th>6-Month Sites</th>
<th>Annual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action</td>
<td>Clean</td>
<td>Clean</td>
<td>Clean</td>
<td>Inspect &amp; clean</td>
</tr>
</tbody>
</table>

Limiting Factors

- Open-loop- no ongoing feedback
- Users are *blind* collection system changes between cleanings
Using Smart Tech for Collection Maintenance - A Case Study

• San Antonio Water System (SAWS) Cleaning Routine based on historical information:
  • Monthly: 204 sites
  • Quarterly: 620 sites

• Calculated cost of cleaning per site
  • $500 per site per instance
  • 2,448 ‘monthlies’ per year
  • $1,224,000 annual cost

Is there a better way?
A Smart Solution

- Smart Technology Pilot Demonstration
  - Focus question: can technology reduce frequency & expense with no increased risk?

- SAWS’ Pilot Set-up (Aug. ‘15 through Jul. ‘16)
  - 10 monthly cleaning sites selected
  - Sites cleaned prior to start
  - SmartCovers® installed & added to system network map
  - SmartTrend™ trend analysis performed daily
  - Crews directed to clean based on level change
  - Cleaning work order issued only when data as indicates
System Architecture

SmartCover® Monitoring Systems

Redundant Iridium Satellite Network

Redundant Ground Stations

Bi-Directional User Interfaces

SmartCover®: Remote Site Direct to Satellite Communication

Data

Alarms/Alerts

Secure SCS Servers

Secure digital network servers
Detection of Small Changes

SmartTrend™: Automated data trend analysis of level change

PS 639 MH 11


Alarm Setpoint = 5 in
Sensor Position = 0.0 in

“WATER LEVEL IS RISING”
Significant Cleaning Reduction

High frequency cleaning: 10 sites x 12 months = 120 instances

SmartClean™ Pilot: 7 instances

Reduction: 94.1% cleaning saved \[\frac{(120-7)}{120}\]
# SAWS Pilot Results

## Pilot Summary

<table>
<thead>
<tr>
<th>Pilot System Tested</th>
<th>High Freq. Cycle (10 Sites)</th>
<th>Pilot Duration</th>
<th>High Freq. Expectation</th>
<th>SmartClean™ Results</th>
<th>% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>San Antonio</td>
<td>Monthly</td>
<td>12 months</td>
<td>120</td>
<td>7</td>
<td>94.1%</td>
</tr>
</tbody>
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## The Bottom Line

- High Frequency Cleaning annual costs: $1,224,000
- Savings at 85%* reduction: $1,040,400
- Implementation Costs: $699,200 (start-up)
- Annual Costs Year 2 through 5: $590,000

Total Savings (5 Years) $2,142,800

* Calculation based on a lower, conservative reduction
SmartClean™ Process

Technology Benefits Summary

• Productivity gain- personnel/equipment re-directed to more critical tasks
• Continuous SSO protection- full monitoring in between cleanings
• Lower risk- less time crews in traffic

• Lower carbon footprint

• Extended Asset Life - lower frequency cleaning reduces pipe and structure wear
Transformational Change

• Smart technology brings *transformational*, not incremental, change...
  o SAWS: achieved a 94% reduction with cleaning frequency
  o Hawthorne, CA: SSOs reduced by 99% over the last 10 years

• The *essential* question:
  o Do we continue to look backwards to ineffective, expensive solutions to meet regulatory requirements?

Or, do we use Smart Technology to let us see the road ahead
Thank You!

SmartCover® Systems™

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