Part 2: Using Your SCADA System As A Management Tool

2015 Joint Annual Meeting
West Virginia AWWA
West Virginia WEA

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A CMOM program is a detailed business plan for how a utility intends to manage and operate a permitted treatment facility, and the associated collection system infrastructure in a manner that assures adequate capacity at all steps of the process, given reasonable circumstances.
Advances Affect CMOM Programs

- Gather hard data to measure and analyse
- Establish baselines for your pump stations' reliability and capacity characteristics
- Integrate alarms, site inspection and maintenance records, pump performance analysis and rainfalls effect on the station into one system.
- Speed record keeping and report filing tasks

Provides EPA, DEP, BPH, PSC Hard Evidence of Shortcomings and Successes
SCADA design rule #1

Garbage in = Garbage out
SCADA design rule #2

To much information is as bad as not enough information
SCADA design rule #3

What your engineer or the rep wants to know is not always what you want or need to know!
A friendly SCADA system should supply you with at least:

- A system map or graphic display
- Data in ways that make sense at 2 AM and when doing a report for the board *As the burger folks say, have it your way*
- Data that can be printed or shared for operational and troubleshooting analysis
- Data when you need it, not just at the plant
- Documentation of your efforts
DATA COLLECTED IS OFTEN CONTAINED IN SOMETHING REFERRED TO AS THE “HISTORIAN”.

THINK “FILE CABINET”
Data should be:

- Easily obtained
- Searchable by date and time
- Zoomable to zero in on the details or look at a trend
- Intuitive, it should provide data in a familiar format that answers the questions
Data should be:

- Sharable, we all can use a second opinion
  - Over a network
  - Remote locations
  - Over the internet
  - PDF or Excel via email
Let's look at some examples of those core functions in a SCADA System that affect you the operator.
A system map or graphic display example/tabs/pick
A system map or graphic display example/menu/float over/pick
2 AM data: voice message

- Pleasant, understandable voice
- Your message by channel/condition
- Accept/reject
- Documented acceptance or delivery problems
  - No excuses or finger pointing, labor-management peace and respect
2 AM data:
iPhone - flow last 6 hours
2 AM data: Any Windows computer with internet connectivity
Same data, different looks

<table>
<thead>
<tr>
<th>13th Street Flow Meter</th>
<th>Flow (Gallons)</th>
<th>Rain (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bell Avenue</td>
<td>Flow Total (Gallons)</td>
<td></td>
</tr>
</tbody>
</table>

Presented in a table
Presented in a calendar
Downloaded into Excel
Graphed
Making a SCADA system work for you
Case Studies
Case #1 Proving major I&I

Tools needed
- Your station
- Real time data
- Airport or local rain gauge
## Case #1 Proving major I&I

### Runtime vs. Rainfall Report

<table>
<thead>
<tr>
<th>Chestnut Street Pump Station</th>
<th>Rainfall</th>
<th>Total Runtime</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Date</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Aug</td>
<td>0.00</td>
<td>116.9</td>
</tr>
<tr>
<td><strong>2 Aug</strong></td>
<td><strong>0.00</strong></td>
<td><strong>111.4</strong></td>
</tr>
<tr>
<td>9 Aug</td>
<td>0.00</td>
<td>101.0</td>
</tr>
<tr>
<td><strong>10 Aug</strong></td>
<td><strong>0.83</strong></td>
<td><strong>186.3</strong></td>
</tr>
<tr>
<td>11 Aug</td>
<td>0.06</td>
<td>116.8</td>
</tr>
</tbody>
</table>
Case #1 Proving major I&I
Case #1 Proving major I&I

- What did we see here
  - Selectable date ranges
  - Which pumps were running how long
  - Light to moderate rain, 1 pump can handle
  - Heavy rain causes both pumps to run
  - Data presented in two forms, printable, assessable 24x7 from any computer
Case #1 Proving major I&I

<table>
<thead>
<tr>
<th>Date</th>
<th>Rainfall (inches)</th>
<th>Total Runtime</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Aug</td>
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<td>186.3</td>
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<tr>
<td>11 Aug</td>
<td>0.06</td>
<td>116.8</td>
</tr>
</tbody>
</table>
Case #1 Proving major I&I
Case #2 Using rain gauges

- Have you every noticed it raining on one side of town and not the other?
- Do you use system rain gauges as a tool or just a plant rain gauge?? $125 and up for a rain gauge can provide a lot of data to really understand your system.
Case #2 Using rain gauges

North end vs. South end, Same day
Case #2 Using rain gauges

- Can your plant or pump station handle a storm event without using the lag pump? Your permit says it can.
- Do you have the tools to make a case for new or upgraded equipment?
Case #2 Using rain gauges

Any number of rain gauges in a system, local or nearest reporting airport.
Case #3 Accountability issues

- Was the alarm transmitted
- Was the alarm received
- Was the alarm responded to in a timely manner
- Was the overtime earned and paid
Case #3 Accountability Solutions

### Dispatch History

<table>
<thead>
<tr>
<th>Case ID</th>
<th>Attempt #</th>
<th>Agent</th>
<th>Priority</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>#46966</td>
<td></td>
<td>Dennis Mike</td>
<td></td>
<td>Acknowledged By: Dennis Mike</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Acknowledgment Time: 8/19/2009 12:43:27 PM</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Alarms</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Notification Success 8/19/2009 12:43:27 PM, Use Aced</td>
</tr>
<tr>
<td>#46968</td>
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<td>Dennis Mike</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>#46970</td>
<td></td>
<td>Mark Brooks</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Dispatch details
- Savable/playable audio confirmation
- Multiple delivery paths
Case #3 Accountability Solutions

Credit where credit is due

<table>
<thead>
<tr>
<th>Name</th>
<th>Time</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chris Williams</td>
<td>19 Jul 04:41</td>
<td>Chestnut Street Pump Station</td>
</tr>
<tr>
<td></td>
<td>19 Jul 04:33</td>
<td>Chestnut Street Pump Station</td>
</tr>
<tr>
<td>Dennis Mike</td>
<td>28 May 13:27</td>
<td>Chestnut Street Pump Station</td>
</tr>
<tr>
<td></td>
<td>28 May 13:16</td>
<td>Chestnut Street Pump Station</td>
</tr>
<tr>
<td></td>
<td>27 May 12:25</td>
<td>Chestnut Street Pump Station</td>
</tr>
<tr>
<td></td>
<td>27 May 10:32</td>
<td>Chestnut Street Pump Station</td>
</tr>
<tr>
<td></td>
<td>27 May 10:28</td>
<td>Chestnut Street Pump Station</td>
</tr>
<tr>
<td>Justin Miller</td>
<td>7 Aug 07:08</td>
<td>Chestnut Street Pump Station</td>
</tr>
<tr>
<td></td>
<td>7 Aug 07:07</td>
<td>Chestnut Street Pump Station</td>
</tr>
<tr>
<td></td>
<td>12 Jun 08:05</td>
<td>Chestnut Street Pump Station</td>
</tr>
</tbody>
</table>
Case #3 Accountability Solutions

- Make Sure The Problem Is Fixed
  - Urgent Priorities Can Come Up Between Alarm Acknowledgement & Site Arrival

- Electronic Key Tracks Visits To Site and Automatically Logs Users Identity

- Additional Web Selectable Features By Key:
  - Place Unit In Service Mode...No Alarms
  - Acknowledge Alarms At Problem Site
Case 4 Can I reduce my operating costs with better level settings?

- Tools required
  - Pump curve
  - Real time level trending
  - Pump set points
  - Wet well calcs
Case 4: Can I reduce my operating costs with better level settings?

- Core Issue: A higher ON level means more suction head
  - That moves the operating point to the right.
  - Best case: more flow and more efficient
  - Worst case: cavitation due to NPSHr issues at the higher flows and less efficient
300@35 ON level at 5 feet
375@32 ON level at 8 feet
Case 4: Can I reduce my operating costs with better level settings?

- 3 feet in wet well level got us
  - 75 GPM of “new” capacity
  - 2.5% better efficiency
- Cost?
  - ZERO $
- Pump issues
  - Not this time
Case 4: Can I reduce my operating costs with better level settings?

- How can I test this theory and see the increased flow?

- Flow meter is always easiest
  - Magnetic
  - Strap-on

- Draw down test
  - Stop watch and tape measure
  - “real time” SCADA function
Easy set up form used with a "real time" RTU

**Volumetric Flow Calculation Parameters**
Wallace Run

- **Wet Well Cross Sectional Area**: 0 (sq ft)
- **Level Measurement**: Auto Channel 1 Level
- **Lead Pump Start Level (feet)**: 0 (0 if using CH1 Level Sensor)
- **Pump Stop Level (feet)**: 0 (0 if using CH1 Level Sensor)

Enter all values of 0 to disable calculation

* For a rectangular or square wet well
  Area = length x width.

* For a round wet well
  Area = 3.14 x (diameter / 2) x (diameter / 2)
Calcs are as good as the refresh rate and that is what?

<table>
<thead>
<tr>
<th>Pump OFF Time</th>
<th>Pump Number</th>
<th>Runtime (mm:ss)</th>
<th>Start Level (feet)</th>
<th>End Level (feet)</th>
<th>Gallons</th>
<th>Pump (GPM)</th>
<th>Station Inflow (GPM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>08 Sep 09:25:57</td>
<td>1</td>
<td>04:21</td>
<td>5.50</td>
<td>3.00</td>
<td>583.6</td>
<td>134.2</td>
<td>12.5</td>
</tr>
<tr>
<td>08 Sep 08:39:12</td>
<td>2</td>
<td>03:20</td>
<td>5.50</td>
<td>3.00</td>
<td>603.0</td>
<td>180.9</td>
<td>22.1</td>
</tr>
<tr>
<td>08 Sep 08:11:56</td>
<td>1</td>
<td>03:01</td>
<td>5.50</td>
<td>3.00</td>
<td>560.3</td>
<td>185.8</td>
<td>10.3</td>
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<tr>
<td>08 Sep 07:17:31</td>
<td>2</td>
<td>02:35</td>
<td>5.50</td>
<td>3.00</td>
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<td>14.3</td>
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<td>08 Sep 06:37:54</td>
<td>1</td>
<td>02:43</td>
<td>5.50</td>
<td>3.00</td>
<td>575.2</td>
<td>211.7</td>
<td>16.9</td>
</tr>
</tbody>
</table>

**Volumetric Flow**

**Koontz Farm**

30-second minimum runtime filter **OFF**
How well is the station sized?

Pump Duty Cycle Plot
Koontz Farm

Start Date: 8/11/2009 9:31:29 AM
End Date: 9/8/2009 7:53:11 AM
Pump 1 starts: 523
Pump 2 starts: 521
Pump 1 runtime (hours): 20.98
Pump 2 runtime (hours): 21.85
Case 5: Tracking problems with “flushable” wipes

- Clogging issues can be the pump or the check valves
- Clogs create
  - Reduced capacity
  - Pump cavitation damage
  - Excessive OT
Case 5: Tracking problems with “flushable” wipes

- Midnight to midnight run time data

<table>
<thead>
<tr>
<th>Site Name</th>
<th>- Runtime -</th>
<th>Starts</th>
<th>Average (minutes/start)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Route 65 Pump Station</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pump 1</td>
<td>192.7</td>
<td>30</td>
<td>6.4</td>
</tr>
<tr>
<td>Pump 2</td>
<td>196.6</td>
<td>29</td>
<td>6.8</td>
</tr>
</tbody>
</table>
Case 5: Tracking problems with “flushable” wipes

- Midnight to midnight flow data
Parting thoughts ....

- sometimes old ideas are the solution...
  and
  all old ideas started as a new idea...
Get involved....

- We are all in this together
- Join and participate
- ETC classes
- WVRWA, WV-WEA, WV-AWWA,
- WVWARN
Don’t be left out, take every class that you can.
Thank you!