Using Dashboards to Optimize Plant Performance

Wateruse Los Angeles Chapter
August 14th, 2018
Proactive vs Reactive Operations

Knowledge of Potential Issue → Incident → Identifying Issue, Field Testing, Water Quality, Ordering Parts, Responding to Regulators/Customer → Operations back on track

TIME
Reuse System Operations Challenges

- How do we monitor Critical Control Points (CCP)?
- How do we best control fouling?
- How do we plan chemical cleaning?
- How do we optimize pretreatment?
- What is the remaining useful life?
- Is our system reliable and robust?
- Are we meeting customer demand?
- Are we meeting regulatory requirements?
- Can we produce water more efficiently?
Optimizing Processes by Operating Proactively

- Asset Management
- Process Optimization
- Training
- Dashboards
- Standard Operating Procedures

Proactive Operations
Creating Dashboards to assist making critical decisions

1. Identify Key Performance Indicators
2. Develop Target Values (Design)
3. Identify Equipment and Instrument Tags
4. Data Storage, Handling and Cleanup Methods
5. Create Dashboard Reports
Overview of KPIs

Target Performance

KPI

Boundary Values

Frequency of Measurement

Chlorine Residual - Treated Water

Total Chlorine (mg/L)

0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50


Target
Process Audits develop useful KPIs

- Investigate opportunities to improve operations and optimize plant
- Identify and review Key Performance Indicators (KPIs)

<table>
<thead>
<tr>
<th>ID</th>
<th>Train</th>
<th>Parameter</th>
<th>Units</th>
<th>Historian Tag</th>
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</thead>
<tbody>
<tr>
<td>D1</td>
<td>1</td>
<td>Feed Temperature</td>
<td>°F</td>
<td>W75.TEM_001_SCL.23H</td>
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<tr>
<td>D2</td>
<td>1</td>
<td>Feed Conductivity</td>
<td>μS/cm</td>
<td>W75.CON_001_SCL.23H</td>
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<tr>
<td>D3</td>
<td>1</td>
<td>Train 1 – Stage 1 Permeate Flow</td>
<td>gpm</td>
<td>W75.FLO_101_SCL.23H</td>
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<td>D4</td>
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<td>Train 1 – Stage 2 Permeate Flow</td>
<td>gpm</td>
<td>W75.FLO_201_SCL.23H</td>
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<tr>
<td>D5</td>
<td>1</td>
<td>Train 1 – Combined Permeate Flow</td>
<td>gpm</td>
<td>W75.FLO_301_SCL.23H</td>
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<tr>
<td>D6</td>
<td>1</td>
<td>Train 1 – Concentrate Flow</td>
<td>gpm</td>
<td>W75.FLO_500_SCL.23H</td>
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</tbody>
</table>
Membrane Maintenance – CIP Triggers

- Train Drop Down
- Facility Drop Down

**CIP Thresholds**

- **Facility:** CATS
- **Train:** CATS - Train 1

**Thresholds:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Tag/Name</th>
<th>Green</th>
<th>Yellow</th>
<th>Red</th>
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<tbody>
<tr>
<td>Normalized Flow</td>
<td>CATS.Train1.NF</td>
<td>&lt;= 10</td>
<td>Between 10 and 25</td>
<td>&gt;= 25</td>
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<tr>
<td>Normalized Pressure</td>
<td>CATS.Train1.NP</td>
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<td>Between 10 and 25</td>
<td>&gt;= 25</td>
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<tr>
<td>Normalized Solute Passage</td>
<td>CATS.Train1.NSP</td>
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<td>&gt;= 25</td>
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<td>Normalized Permeate Flow</td>
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<td>Between 5 and 10</td>
<td>&gt;= 10</td>
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<tr>
<td>Normalized Flux</td>
<td>CATS.Train1.NF</td>
<td>&lt;= 10</td>
<td>Between 10 and 25</td>
<td>&gt;= 25</td>
</tr>
</tbody>
</table>

**Change Since Last Clean**

- Normalized Flow
- Normalized Salt Passage
- Normalized Differential Pressure
- RO Recovery

**Add / Edit / Delete Buttons**

**CIP Thresholds Information**
Facility Reports
Example – Irvine Ranch Water District Graphical User Interface
Project Example – Beverly Hills

Weekly Report

<table>
<thead>
<tr>
<th>Week Beginning</th>
<th>6/1/2015</th>
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<tr>
<td>Report Completed By</td>
<td>Nathan</td>
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June 15

Weekly Production

<table>
<thead>
<tr>
<th>Day</th>
<th>Flow (MG)</th>
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<tbody>
<tr>
<td>Mon</td>
<td>12</td>
</tr>
<tr>
<td>Tues</td>
<td>20</td>
</tr>
<tr>
<td>Wed</td>
<td>7</td>
</tr>
<tr>
<td>Thurs</td>
<td>8</td>
</tr>
<tr>
<td>Fri</td>
<td>5</td>
</tr>
<tr>
<td>Sat</td>
<td>10</td>
</tr>
<tr>
<td>Sun</td>
<td>3</td>
</tr>
</tbody>
</table>

Operating Costs

<table>
<thead>
<tr>
<th>Component</th>
<th>Operating Cost (w/k)</th>
<th>Total Chemical Cost (w/k)</th>
<th>Total Energy Cost (w/k)</th>
<th>Cost per MG of water produced</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antiscalant</td>
<td>$ 53.70</td>
<td>$ 3,807</td>
<td>$ 6</td>
<td>$ 53.70</td>
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</tbody>
</table>

Key Items

1. Antiscalant higher than usual due to increased RO runtime
2. Caustic dosing higher than normal due to high raw water pH
3. 

Actions

1. 
2. 
3. 

67% Overall Average Plant Recovery
Project Example – West Basin

RO Dashboard

Date Change
Year
- 2002
- 2003
- 2004
- 2005
- 2006
- 2007
- 2008
- 2009
- 2010
- 2011
- 2012
- 2013
- 2014
- 2015
- 2016
- 2017
- 2018

Production - Blend Flow
- Average of Flow - Blend
- Average of Flow - Blend rolling average

Recovery - Average by Month

RO Feed Pressure

Permeate Flow

Blend Water - Water Quality Targets
- EC (500μS/cm)
  - Blend Electrical Conductivity (μS/cm)
  - Blend pH
  - Blend Chlorine Residual (mg/L)

- 426.06
  - Average of EC - Blend
  - Min of EC - Blend
- 577.00
  - Max of EC - Blend

- 10.89
  - Average of pH - Blend
- 6.26
  - Min of pH - Blend
- 807.00
  - Max of pH - Blend

- 1.81
  - Average of CL2 Residual
- 0.70
  - Min of CL2 Residual
- 23.00
  - Max of CL2 Residual
Key Benefits

• Data ‘on demand’ to make quick decisions.

• Help manage data from complex reuse systems - Normalization of RO Data, log removal values, large arrays of data.

• Save hours of engineering time by automating data handling.

• Remove potential for erroneous values.

• Information focused and tailored to all levels of operations – management, engineering and operations.
Thankyou

Nathan Boyle, PE
Principal Engineer
Hazen and Sawyer – Los Angeles, CA
nboyle@hazenandsawyer.com