Alarm Management and Reliable Architecture Needed for Utility-wide SCADA Systems

Achieving Effectiveness, High Availability, Subsystem Autonomy, and Centralized Administration

Speaker: Alan Hudson

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Presenter

- US Sales Manager, Trihedral
- Electrical Engineering, Auburn University
- Mathematics, Samford University
- Automation and SCADA industry for 26 years
- Water Wastewater industry for 26 years
- Specializing in applying proven technologies
Presentation Outline

SCADA Systems: Deceptively Complex
Alarm Systems: Critically Important
Key Industry Standards, Established by ISA
Centralized Architecture, Local Autonomy
The Recursive Process
How Systems Become Complex
Water Filtration Made Easy
Birmingham Water: Educating the Public

Filtration Process

You are here:  Home

Shades Mountain Filter Plant

WHERE WATER COMES FROM

HOW WATER IS TREATED

THE COST OF WATER TREATMENT
Through a 12-Minute Video

Filtration Process

You are here: Home
And 9 Simple Steps

Water Treatment

How Is Water Treated?

It takes more than just turning on the tap. Water treatment is a very expensive and involved process. The Birmingham Water Works has four water treatment facilities – Carson, Putnam, Shades Mountain and Western Filter Plants. Combined, these filter plants deliver an average of 100 million-gallons of water a day to customers in five counties.

1. **Intake** - Water is taken from the source. Logs, fish and plants are screened out and water is drawn into the treatment plant.

2. **Chemical Addition** - Chemicals are added to kill germs and improve taste and odor.

3. **Mixing** - Water and chemicals are rapidly mixed.

4. **Coagulation & Flocculation** - The particles stick together and form larger particles called flocculants or "floc."

5. **Sedimentation** - The water and floc particles flow into a sedimentation basin. The floc then settles to the bottom and is removed from the water.

6. **Filtration** - Water flows through filters. The filters are made of layers of sand and gravel.

7. **Disinfection** - A small amount of chlorine or other disinfecting chemical is added to kill any remaining germs and keeps the water safe as it travels to houses and businesses.

8. **Storage** - Water is placed in a closed tank or clearwell.

9. **Distribution** - Water is transported to houses and businesses. The Birmingham Water Works delivers on average 100 million gallons of water per day.
The Same for SCADA: From the Simple to the Complex
Legacy Alarm Systems: Very Basic

- What is the Alarm?
- Has it been Acknowledged?
- Has it Cleared?
- Did it Print?
- What more could an operator want?
Alarm Systems: Critically Important

- For Operations
- For Maintenance
- For Planned Procedures
- For Operational Adjustments
- For Management Decisions
ISA Continues to Establish Standards

• ISA 18.2 – Management of Alarm Systems
  – Definitions
  – Requirements
  – Class
  – Roles
  – Rationalizations
  – Priority Definitions
  – Shelving / Suppression
  – Monitoring Requirements
  – Change Management
  – Training

ISA 18.2 Application Examples: Distribution of Priorities

Reported History
- Critical: 17%
- High: 83%
- Warning: 0%

Current Configuration
- Critical: 33%
- High: 67%
- Warning: 0%

ISA 18.2 Recommended
- Critical: 5%
- High: 15%
- Warning: 80%
### ISA 18.2 Application Examples: Advanced Analytics

<table>
<thead>
<tr>
<th>Area</th>
<th>Name</th>
<th>Description</th>
<th>Count</th>
<th>Percent</th>
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<tbody>
<tr>
<td>Zone 1</td>
<td>Local TCP Port\PLCSim\Tank 1\Tank Level</td>
<td>Monitor tank level HIGH</td>
<td>14</td>
<td>66.7 %</td>
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<tr>
<td>Zone 2</td>
<td>Local TCP Port\PLCSim\Tank 2\Tank Level</td>
<td>Monitor tank level HIGH</td>
<td>5</td>
<td>23.8 %</td>
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<tr>
<td>Zone 3</td>
<td>Local TCP Port\PLCSim\Tank 3\Tank Level</td>
<td>Monitor tank level HIGH</td>
<td>2</td>
<td>9.5 %</td>
</tr>
</tbody>
</table>

**Graph:**

- **Bad Actors**
- **Alarm Flood**
- **History**
- **Distribution of Priorities**

**Timeline:**

- Mar 20
- Mar 25
- Mar 30
- Apr 4
- Apr 9
- Apr 14
ISA 18.2 Application Examples: Shelving and Suppression
Alarm Systems: Available Anywhere
Which Means that SCADA Must Have Centralized Architectures w/ Local Autonomy
The Recursive Process

**The Mindset of Continual Improvement**
Summary

- SCADA Architectures will continue to evolve and improve
- Alarm Systems are a critical tool, not an annoying nuisance
- Embrace technologies but implement safeguards
- Manage the System; don’t let the System manage you
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