Remote Operation of Wastewater Treatment Facilities
On-site Plant Operations
Remote sites are typically controlled and monitored from the main plant...
Operations Staff may be across town...
Or across country...
Wastewater Treatment
Fundamental Information Needed for Operations

Key Flows
Wastewater Treatment

Fundamental Information Needed for Operations

Wet Well Levels
Wastewater Treatment
Fundamental Information Needed for Operations

Instrument Readings
Wastewater Treatment
Fundamental Information Needed for Operations

Pump Status
Wastewater Treatment
Fundamental Information Needed for Operations

Alarms (Critical and Non-Critical)
Operator Interface is typically provided through a SCADA System
Development of Remote Operation

On-Site Horn Alarm
Red Light on top of the Lift Station
Dialer – calls operator at home
Dialer – calls operator pager
Dialer – calls cell phone

Software-based Alarm Management

• Calls any phone number
• Prioritized and scheduled numbers
• Send an e-mail or text message to a smart device
Up until now, these technologies focused on alarms, without regard to plant status, or operation.

**What About Remote Operation?**

Remote Operation:
The ability to monitor or control plant processes from a location some distance away from the plant.

- At another affiliated facility
- On the road
- At home
- Across country
Two Kinds of Remote Control

Monitor Only

• Provides a window into the plant, but does not permit operation of pumps, or changing plant parameters. 

   Look, but Don’t Touch.

Monitor and Control

• Provides full access to not only monitor the plant status, but also allows the remote operator to turn pumps on and off, change setpoints, etc.
Monitor Only Remote Operation

PC-based SCADA system at the plant
“View” software installed on the plant computer
Plant computer needs Internet access
Any remote computer with Internet access can “log-in” to view the SCADA screens
Monitor Only Remote Operation (continued)

Remote computer only needs Internet Explorer - similar to browsing to a web site

Remote operator sees same thing as if right at the plant

View SCADA screens only

Username and password protection
Monitor Only Remote Operation

Home PC (Web Browser) → Internet → Cable/DSL Router/Modem → ENET Switch

- VFD
- VFD
- VFD
- HMI
- SCADA Server (Web Client Software)
- SCADA Client
- SCADA Client

AT PLANT
Monitor & Control Remote Operation

A VPN (Virtual Private Network) is added to the plant network – either software-based VPN or hardware-based

Plant network needs connectivity to Internet

A remote access computer needs (1) Internet access, and (2) SCADA “client” software installed (Internet Explorer is not good enough)
Monitor & Control Remote Operation (Cont.)

Remote user can do anything that he could do as if accessing SCADA at the plant.

Permissions can be established, either by user, or for any remote access connection.

Provides access to the entire network:
- VFDs
- PLC ladder logic
- Excel reports/graphs

Username and password protection (possibly two levels)
Monitor and Control Remote Operation

Laptop (SCADA Client Software)

Internet

Cable/DSL Router/Modem

VPN Router

Optional Hardware Firewall

ENET

Switch

VFD

VFD

VFD

HMI

SCADA Server
(No Web Software Needed)

SCADA Client

SCADA Client
# Comparison of Monitor Only vs. Monitor Plus Control

<table>
<thead>
<tr>
<th>Monitor Only</th>
<th>Monitor, plus Control</th>
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</thead>
<tbody>
<tr>
<td>Window into system is accessed remotely via Internet Explorer</td>
<td>A special VPN is configured for remote access - browser not used.</td>
</tr>
<tr>
<td>“View” software is installed at SCADA PC; remote PC only needs Internet Explorer</td>
<td>“Client” software is installed on the remote PC.</td>
</tr>
<tr>
<td>Can look, but can’t touch</td>
<td>Remote operator can look, and do - start pumps, change setpoints, and wreck the place if he wants to.</td>
</tr>
<tr>
<td>A “secure” connection. Username and password protection.</td>
<td>A “secure” connection - username and password protection. Permissions can be established to limit remote capabilities.</td>
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</table>
Connectivity of Remote PC

Under either option, the remote PC needs High Speed Internet Access

- “Plug-in” Internet access (home cable service or DSL)
- Use of business-provided “wi-fi” internet service
- Wireless broadband service (Verizon, Sprint, etc.)
  - Can use cell phone as wireless broadband connection (“tethering”)
Alternate Remote Access

Web Server-capable Module

- Provides window into Network
- Needs only minimal IT integration at site
- VPN Server is managed by remote 3rd party provider
- Speed may be slower
- All else, same operation as if self-managed VPN
Alternate Monitor & Control Remote Operation

- Laptop (SCADA Client Software)
- Internet
- Cable/DSL Router/Modem
- Web Server Module
- Optional Hardware Firewall
- ENET Switch
- VFD
- HMI
- SCADA Server (No Web Software Needed)
- 3rd Party VPN Server
- SCADA Client
- SCADA Client
Security Considerations

Use “strong” passwords, and change them regularly
Software firewall – protects server
Hardware firewall – protects entire network
“View Only” Option – can’t be hacked
“Monitor and Control” Option – exercise good security practices
Practical Considerations

Remote Operation is possible. Do you want to?

Consider plant hours of operation

Consider plant level of automation

Consider the risk

- Hacking
- Unintended consequences of possibly removing human element from treatment process
Questions
Thank you