



TODAY'S CALL TOPIC

Reducing the Energy Use of Water and Wastewater Systems

Speakers:



Bill Baynes
Chief Operator, Waste Water Plant
City of Rome, NY



Chris Kalwara
Account Executive
Johnson Controls, Inc.



Peter Cavagnaro
Water Project Development Consultant
Johnson Controls, Inc.



Upcoming Events

JUNE 15-17, 2011

**Local Clean Energy
Leadership Summit
Washington, DC**

www.localenergysummit.org

June 2, 2011

For more information: www.climatecommunities.us



Federal Policy Agenda

FY 2012 Appropriations

- o EECBG, Sustainable Communities, Climate Showcase Communities, TIGER, energy efficiency & renewable energy grants, electric vehicles

Clean Energy Legislation

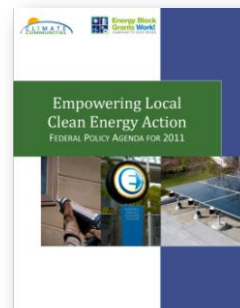
- o Clean energy standard, financing tools, clean vehicles

Transportation Reauthorization

- o Transit, clean vehicles, VMT reduction strategies

Adaptation

- o Pre-disaster mitigation, planning resources



<http://www.climatecommunities.us/endorse.html>



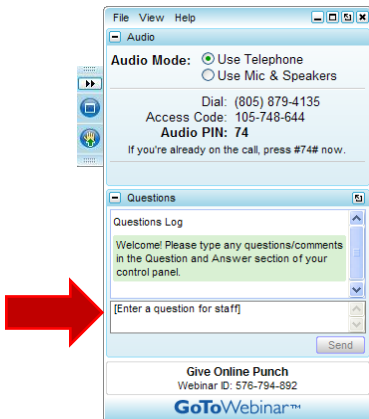
Upcoming Events

Local Government Clean Energy Leadership Summit Washington, DC June 15-17, 2011

- Major energy efficiency and renewable energy conference for local government sector.
- Demonstrate success of EECBG and other federal investments in local clean energy projects
- Share best practices.
- Urge Congress and the Obama Administration to make further clean energy investments in local governments.
- For more information, visit www.localenergysummit.org.



Asking questions



At any point during the presentation, you can type your question into the question text box and click send. All questions will be read aloud and answered at the end of the presentations, as long as time permits.

Impacts of Water & Wastewater on Community Energy Consumption



Climate Communities Weekly Webinar Series
June 2, 2011



Discussion Points

- Compelling Events
- Energy/Water Nexus
- City of Rome NY
- Renewable Solutions
- Discussion



Compelling Events & Drivers

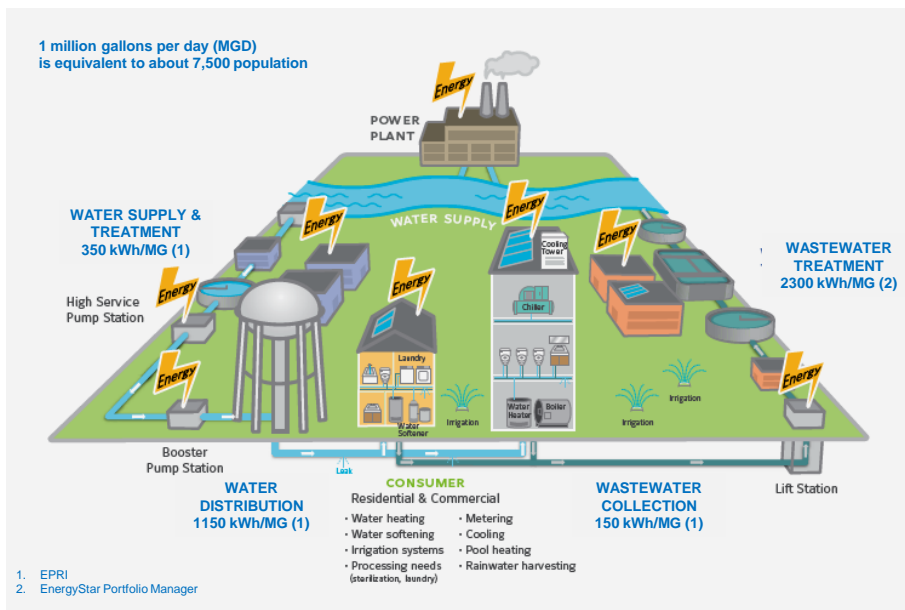
- Rising Energy Costs
- Impact on operating budgets of volatile energy pricing
- Needed improvements to water/wastewater infrastructure
- Economic downturn



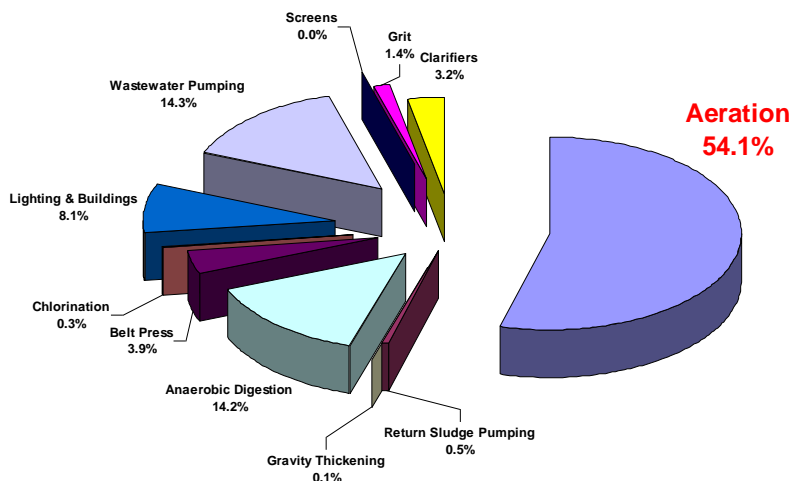
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Energy/Water Nexus



WWTP Energy Usage



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City of Rome, NY Energy Savings Performance Contract

Water and Wastewater



Climate Communities

June 2, 2011



Performance Contract Agreement

- City Council approves performance contract project 8/2007
- Project Scope throughout City Facilities:
 - Lighting Retrofit
 - Building Envelope Improvements
 - Facility Management & Controls
 - Boiler Optimization
 - Perimeter Heating System
 - New High Efficiency Boiler
- Water & Wastewater Scope:
 - Water Plant- Low Lift Pump VFD
 - Wastewater Plant- Fine Bubble Aeration



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Energy Performance Contract

- Energy Savings Performance Contract
 - NYS Energy Law, Article 9- enabling legislation
- City financed through tax-exempt municipal lease, no capital outlay required from City
- Turn-key project installation
- City has greater control over equipment supplier and subcontractor selection
- Performance (savings) is guaranteed
- JCI obtained NYSERDA grant funding on City's behalf
- No change orders



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Fine Bubble Aeration- Scope

- Demolition and removal of ten (10) existing aeration mixers
- Design and installation of three (3) new aeration blowers and air piping
- Installation of new aeration membrane diffusers in the bottom of each aeration tank
- Installation of Instrumentation & Control
 - SCADA upgrade to include aeration system
 - Dissolved Oxygen Control- Oxygen flow to each tank is monitored and controlled to provide just the amount needed to treat the waste
- Improved hydraulic distribution to aeration basins- install ten (10) new baffles to minimize short circuiting in aeration tanks.



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Fine Bubble Aeration Project Benefits

- Guaranteed annual energy savings year 1: \$111,282
 - Year 1 savings achieved \$187,202
- O&M savings
 - eliminates repairs to mechanical aerators: \$6,000 annually
- Capital cost avoidance
 - existing aerators are at end of useful life, require replacement
 - Project eliminates capital expense to replace, totaling \$1,000,000 over 15 years
- Increased capacity and automation enable plant to treat high strength waste generating additional revenue to city
- Increases plant capacity without adding aeration tanks



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Fine Bubble Aeration Project Benefits

- Automation enables plant to efficiently achieve treatment goals
 - controls air flow to each of the ten (10) aeration tanks (nitrification/de-nitrification)
- Automation helps plant stay on single shift, saving labor costs
 - automation reduces air flow and energy consumption after hours when oxygen requirements are reduced
- Improved reliability and redundancy
- SCADA allows staff to trend/monitor system, and make adjustments to maximize process control and energy savings
- Combination of blowers and diffusers enable plant to efficiently treat wide range of plant loading

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Project Performance

- Construction completed, Measurement and Verification began 10/2009
- Energy cost savings achieved City-wide - \$788,343
 - exceeds guaranteed amount by \$81,160
- Aeration System- year 1 savings achieved \$187,202
 - Guaranteed savings- \$111,282
- Revenue increase: Actual 12 month total- \$180,000



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Renewable Energy Opportunities for Water & Wastewater Facilities

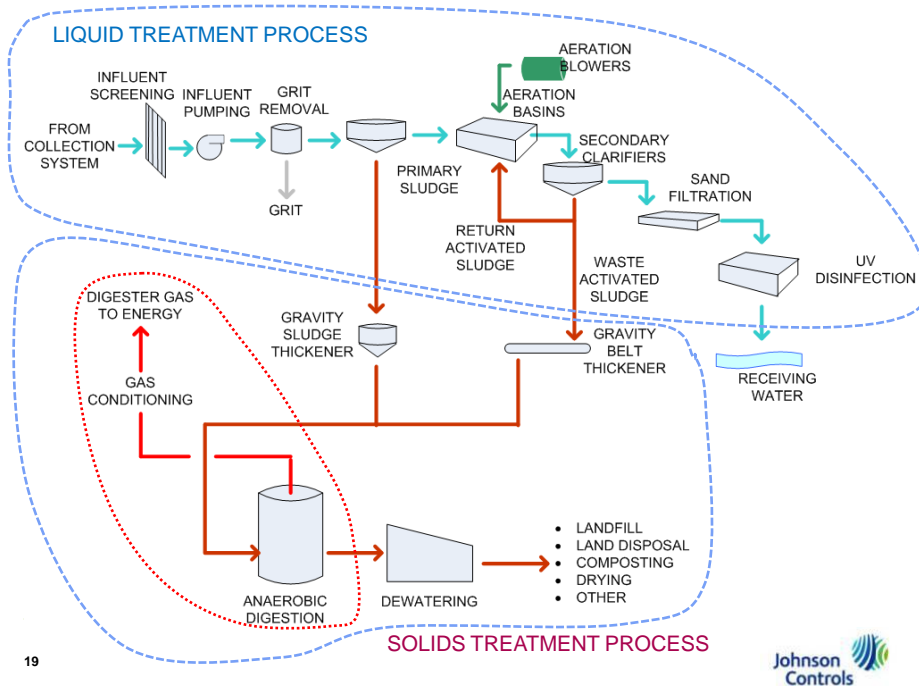


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DIGESTER GAS
TO
ENERGY
(Wastewater)





Digestion of Wastewater Solids

Types of WWTP Sludge Digestions

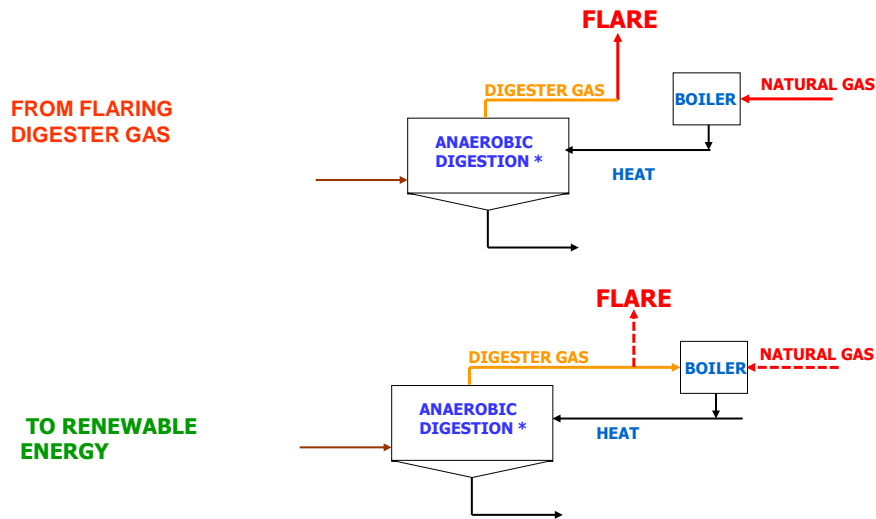
- **Aerobic:** Uses air to provide oxygen and mixing – does not produce methane
- **Anaerobic:** Uses closed tanks without air injection

Produces methane which can be used as a fuel resource



Covered tank / with Flare

Digester Gas to Heat Energy



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Example: Lafayette, CO

- All digester gas was being flared
- Replaced DG Piping from gas holder to boiler

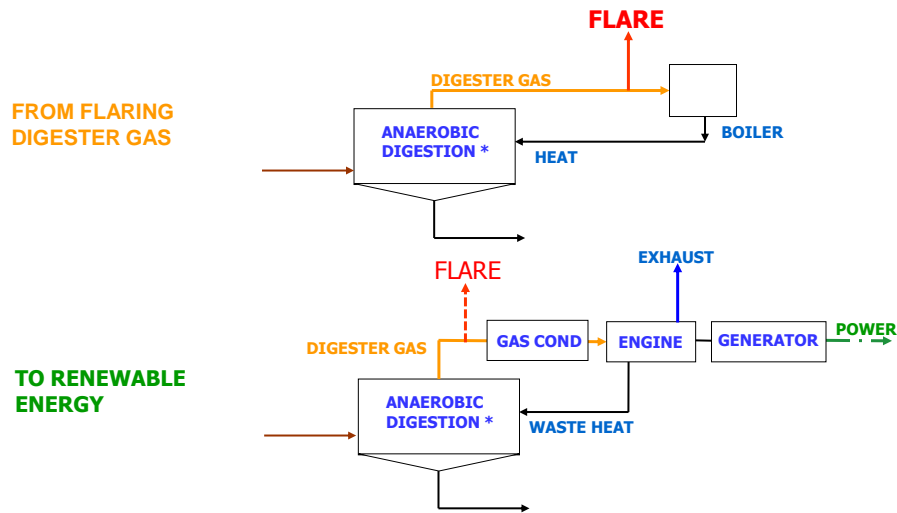


- Now boiler is fueled with digester gas

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Combined Heat & Power (CHP)



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Example: City of Baltimore, MD

Back River Wastewater Treatment Plant CHP

Opportunity

- Annual energy bill of \$6 million
- Flaring almost 1 million cubic feet of digester gas a day

Solutions

- Renewable methane gas energy generation facility and energy efficiency facility upgrades
- Gas Conditioning – ALL gas on site
- Engine Generators – 3 MW
- Heat Recovery – LP Steam
- Hot engine jacket water preheats boiler feed water



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Example: City of Baltimore, MD (cont)

Back River Wastewater Treatment Plant CHP

Results

- Captured former waste stream (methane gas) and converted it to a useful application
- Savings will pay for capital cost of new facilities
- Reduction in emissions of 13 million pounds of CO and 7.7 grams of nitrogen oxide
- **25%** of the project work done by local MBE/WBE contractors
- Performance contract guaranteed reduction in energy consumption of **\$1.8 million annually** from energy efficiency measures and renewable electricity



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SOLAR
PHOTOVOLTAIC



Tulare, CA WWTP

Opportunity

- Demonstrate commitment to Renewable Energy

Solution

- 28 kW Solar Photovoltaic
- Carport

Benefits

- Reduce purchased power
- Additional source of energy



Expansion currently under construction

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Saratoga Springs, NY WTP

Opportunity

- Demonstrate commitment to Renewable Energy

Solution

- 12.6 kW Solar PV
- Entrance to WTP

Benefits

- Reduce power costs
- Reduce risk to annual budget



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OBSERVATIONS ON OTHER RENEWABLE SOURCES

GEOHERMAL

BIOMASS

HYDRO POWER

WIND GENERATORS

Geothermal

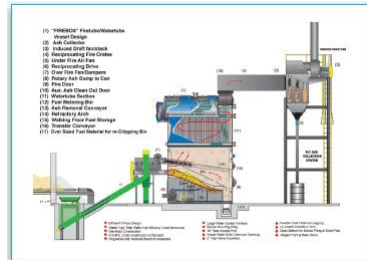
- Temperature of wastewater is typically about 70° F
- Treated effluent can be used as a heat source/sink for water to water heat pump
- Especially interesting for plants that use electric heat
- Plants using natural gas for heating need relatively low electric prices; relatively high natural gas prices



Water to water heat pump system

Biomass

- Biomass can be used in a specially designed Gassifier or Boiler
- Produces a low grade synthetic gas that can be used to fuel a boiler
- Can also be used to generate heat for a sludge dryer
- Need high natural gas prices



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Hydro Power

Falling water can be used to generate electricity

Water Supply / Distribution

- Consider where there is a pressure reducing stations
- Must be able to use the power near the point of generation

Wastewater

- Need large flows and high drops to generate sufficient power
 - See San Diego web site
 - MWRA Deer Island Plant
- May be useful where a small amount of energy is needed to power a wastewater sampler at a remote location

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Wind Turbines

- Wind turbines can generate power at a scale that can fill most the energy needs of a wastewater treatment plant
- JCI has looked at for several wastewater treatment plants
- Existing conditions must be monitored to establish wind patterns and generation potential
- Environmental concerns
 - Noise
 - Shadow Flicker
 - Lightning Strikes

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Contact Information

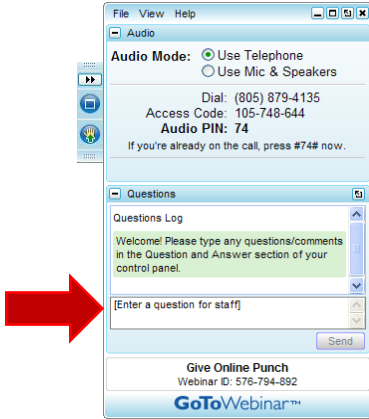
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Questions?



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Supporters:

