Energy Efficiency In Water and Wastewater Facilities

Providing information and resources to assist facility management and staff in identifying and implementing opportunities to reduce energy use and increase their budget

GEORGIA RURAL WATER ASSOCIATION

Contents

The GRWA Energy Efficiency Technical Assistance Program

Initiated July 1, 2019

Assist small community water and wastewater utility systems

- Evaluating their energy needs, consumption and costs
- Identifying and Recommending measures to reduce energy consumption – Goal 15% reduction
- Identifying potential funding sources for improvements

Eligible systems serve < 10,000 people

Typical Municipal Energy Consumption

Drinking water and wastewater services account for 20 to 40 % of the total budget

Represents the largest controllable cost of municipal services

Reducing energy costs “increases” the municipalities annual budget

Opportunity for Energy Optimization

Most water and wastewater systems

- Are designed with a large reserve capacity
  - typically based on a 20-year growth forecast
  - include estimated peaking factors (flow, head, diurnal flows, inclement weather, main breaks, fire)
- Not often configured to operate in an efficient manner
- Not unusual to find 40 and 50 year old technology still in use (pumps, motors and controls)

Historical Perspective on Energy Conservation

Drivers

Primary Goal of the Water & Wastewater Industry

- Environmental Stewardship to:
  - Protect the Health and Welfare of our Communities
  - meet all WQS

Cheap energy

General Lack of Knowledge about energy use and billing

Belief: Energy use and costs are (largely) uncontrollable

Historical Perspective

Results:

Cautious approach to innovative and alternative strategies and technologies

Belief that Energy Efficiency and plant optimization are mutually exclusive (reduce production, jeopardize water quality)

Low priority in incorporating energy efficiency concepts and technologies (often phased out during the “value engineering” phase of facility design)

Belief that saving energy is not important

Ultimate Goal: Change the Industry Perception

Work toward implementing a Comprehensive Energy Management Program

- A systematic process to document, analyze, and support energy related decisions
- Goes well beyond the GRWA One-Time Energy Assessment
- Continually monitors and assesses where additional energy efficiency can be achieved
- Requires long-term organizational support

Program Elements & Strategy Summary

- Establish Organizational Commitment
- Assemble and Energy Team
- Develop a Baseline of the facilities energy use
- Develop profiles of energy use for major equipment types
- Identify and Assess Project Opportunities
- Prioritize Opportunities for Implementation
- Develop Implementation plan
- Track and Report Progress
- Continually review and update plan

Elements of an Energy Efficiency Program

Compares the original facility design capacity with the current system demand

Considers a variety of strategies to reduce energy consumption

Prioritizes the energy optimization strategies

- Cost/ROI, ease/speed of implementation, component age, regulatory compliance, etc

Where the Rubber Meets the Road

Conduct 30 water/wastewater energy efficiency assessments a year

Interview the staff and assess where the utility is at

Collect and organize data on power bills, equipment, energy use, energy costs, hydraulic loading and organic loading.

At a minimum, one year of data should be analyzed to identify any seasonal patterns.

What GRWA Needs to do an Assessment

1. Copy the pertinent information from the O&M Manual(s)
    a. Design Specifications and expected performance
    b. Equipment List with specific data (HP, Motor Eff, Capacity, VSD, soft start, run times, flow meters, amp meters, maintenance schedules, etc)
2. Current Capacity and performance (DMR, process control Data)
3. Facility Walkthrough: used to verify equipment lists, size and capacity of equipment, operating status, and motor sizes for major unit treatment systems. Can often spot items not covered in interview.
    a. Equip Condition, new motors, new equipment, soft starts, VFD, tanks out of service, etc
4. The last twelve (12) months of Power Bills (at least)

What You Can Expect From an Assessment

Zero cost alternatives (i.e. changes in operational strategies/behaviors)

- Incur no cost
- Can be implemented immediately
- Often offer significant savings
- EX: shifting energy intensive equipment operation to off-peak hours, reduce head conditions on pumping systems (increase levels on suction side, reduce levels on discharge side), turn off lights, turn down space heaters in unmanned areas, reduce target DO, reduce # hours digesters operate, optimization of current automatic control systems

What You Can Expect From an Assessment

- Evaluations of Low cost alternatives
  - Best Maintenance Practices
  - The use of timers to control equipment
  - Replacing V-belts with Notched or Synchronous belts
  - Trimming impellors
  - Inexpensive VSD controls

What You Can Expect From an Assessment

- Evaluations of Mid-range cost alternatives
  - Variable Speed Drives (VSD) with more options
  - More efficient equipment upgrades such as impellers, pumps, motors and blowers are evaluated
  - Replace High intensive lighting to low intensive lighting alternatives
  - Evaluating Piping Manifold Configurations
  - Evaluating HVAC/Hot Water Heaters
  - Upgrading building insulation

What You Can Expect From an Assessment

- Evaluations of High Cost Alternatives with Longer Payback Periods
  - Replacing Older Mechanical/Blower Aeration with Newer, More Efficient Technology
  - Replacing Mechanical Aeration with Diffused Aeration
  - Replacing Larger Blower with Smaller Blower
  - Investigating Renewable energy alternatives (wind/solar)

Estimates of Return on Investment (Example)

- Cost Based on purchase of the most expensive VSD for a 60-HP pump and an additional $1,000 installation cost

Energy Conservation Measure Description	Annual Energy Savings (kWh)	Annual Cost Savings ($)	Estimated Cost of Improvement ($)	Payback (Years)
Add Variable Frequency Drive Controller, reducing the pump operating speed to 80% to reduce energy consumption and peak demand	23,769	$3,153	$7,430	2.4

Key To Success

Organizational Commitment

- Energy Team should represent as many stakeholders as possible: management, administration, accounting, compliance, operation, maintenance
- Understand the value of system-wide energy efficiency
- Identify and secure management support
- Establish and communicate measurable, long-term, energy goals
- Resolve many of the organizational barriers to improving energy use

Program Summary

Assist and educate water and wastewater utility systems by:

- Educating them about their rate structure
  - how they can optimize power usage schedules to minimize peak demand and overall power consumption in the system;
- Identifying, cataloging and assessing major energy sources and primary energy consuming devices in the system;
- Identifying changes in operation strategy, high efficiency pumps, motors, aeration equipment, mixers, enhanced technology controls, etc. that leads to increased energy efficiency;
- Provide information on the return on investment of capital expenditures on energy efficient equipment;
- Educate and assist utility systems on the available funding options.

Benefits

- Lower electrical costs
- Lower utility surcharges
- Lower maintenance
- Increased equipment life
- Improved treatment
- Reduction in chemical consumption
- A better understanding of treatment processes

Questions

Dennis Brown
678.750.3886
dbrown.grwa@gmail.com