MANAGING ENERGY COSTS FOR SMALL WASTEWATER SYSTEMS

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EFCN environmental finance center network

CAUSES OF INCREASING ENERGY COSTS

- More stringent effluent requirements (nutrient removal, contaminants of emerging concern)
- Enhanced treatment of biosolids
- Aging infrastructure in collection systems
- Increased electricity costs
- Changes in influent composition due to climate related factors

EFFECT ON SMALL WASTEWATER SYSTEMS

- Small systems often lack the funding, personnel, and access to training to adapt to changing effluent standards, upgrade infrastructure, and other necessary process changes
- Provide an overview of available resources and funding options for small wastewater systems to help manage increasing costs

STEPS TO MANAGE ENERGY COSTS

Step 1: Self-assessment of energy use

Step 2: Conduct an energy audit

Step 4: Implement energy control measures

Step 3: Develop an energy management plan

DETERMINING YOUR FACILITY'S ENERGY USE

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- Self-assessment
  - Free online tools available
  - Don’t need outside help
- Energy Audit
  - Varying levels of detail and price
  - Opportunities to receive assistance in paying for and conducting audits

SELF-ASSESSMENT

- EPA's Energy Use Assessment Tool
  - Free, downloadable, excel-based tool
  - Designed for small to medium wastewater systems
  - Analyzes a facilities utility bills, provides baseline energy use and costs, plot their energy use over time for up to five years, identifies areas for improvement
  - User inputs: utility bills, process information (influent/discharge volume, etc.), building information (HVAC, lighting fixtures, etc.).

SELF-ASSESSMENT

- EnergyStar Portfolio Manager
  - Free, online tool
  - Calculates energy use intensity and gives a score 1-100 to benchmark against other wastewater facilities
  - Tracks changes in energy use and costs over time
  - User inputs: utility bills, process information (influent/discharge volume, etc.), building information (HVAC, lighting fixtures, etc.).

SELF-ASSESSMENT

- **NYSERDA Wastewater Checklist:**
  - More high-level and can be done quickly (great starting point)
  - Designed specifically for small wastewater facilities
  - A series of yes or no questions for each that helps identify potential areas for energy reduction
  - A little outdated, many states have made their own adaptations of this checklist!

ENERGY AUDITS

- Identify operation and capital improvements necessary to reduce energy use
- Identify opportunities to incorporate renewable energy
- Can be conducted on existing plants or designs

TYPES OF ENERGY AUDITS

- American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Tiered Energy Audits
  - Level I – Walk-through analysis
  - Level II – Energy Survey and Analysis
  - Level III – detailed analysis of capital, process modifications, etc.

TYPES OF ENERGY AUDITS

- ASHRAE Tiered Energy Audits
  - Level I – Walk-through analysis
  - Level II – Energy Survey and Analysis
  - Level III – detailed analysis of capital, process modifications, etc.

Most valuable for wastewater systems, Level I typically covered by self-assessment

TYPES OF ENERGY AUDITS

- Renewable Energy Assessment
  - Identify opportunities for incorporation
  - Desktop analysis for possible technologies
  - Feasibility study for most promising options

ENERGY AUDITS

- Work with your utility and a program administrator
  - Program administrators (PAs) can help fund audits and identify incentives for energy projects
- Contact your utility to find your PA
  - Some states also have state-run efficiency programs
- Paying for energy audits
  - Typically split 50/50 between utility and wastewater system
  - Some utilities may not offer assistance

OUTSIDE ASSISTANCE FOR ENERGY AUDITS

EFCN TECHNICAL ASSISTANCE (TA)

- Wastewater systems that treat one million gallons per day or less can receive assistance in assessing options to lower energy use
- A request for TA can be filled out on the EFCN website

US DOE INDUSTRIAL ASSESSMENT CENTERS (IACS)

- Apply to receive a free energy assessment
- Must be within 150 miles of a participating university and have annual energy expenditure between $100,000 and $3.5M
- For more information check the US DOE IACs website

Industrial Assessment Center
U.S. DEPARTMENT OF ENERGY

RURAL ENERGY FOR AMERICA PROGRAM ENERGY AUDIT & RENEWABLE ENERGY DEVELOPMENT ASSISTANCE

- Provided though the USDA
- Grants for energy audits, renewable energy technical assistance, renewable energy site assessments.
- Must be located in a designated rural area and operated by a state, local government, or tribe
- For more information check website

DEVELOPING AN ENERGY MANAGEMENT PLAN

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- What did your self-assessment/energy audit identify as areas for potential energy efficiency improvement?

- Identify applicable and accessible energy control measures (ECMs)

ENERGY CONTROL MEASURES

- Changes in your facilities operation that reduce the amount of energy used
  - Equipment vs non-equipment
  - Process related
  - Incorporating alternative energy sources

EQUIPMENT RELATED ECM'S

- Optimizing efficiency in various wastewater treatment processes from preliminary to tertiary treatment

- References for comprehensive discussion of ECMs for specific process element/equipment
  - NYSERDA Water and Wastewater Energy Management Best Practices (2019)
  - AWWA's Self-Assessment of Wastewater Treatment Plant Optimization (2017)

NON-EQUIPMENT RELATED ECM'S

- Building improvements
- Reducing loading
- SCADA Systems
- Co-generation technology
- Organizational strategies (peak electric demand reduction, submetering processes, etc.)

IMPLEMENTING ECMS

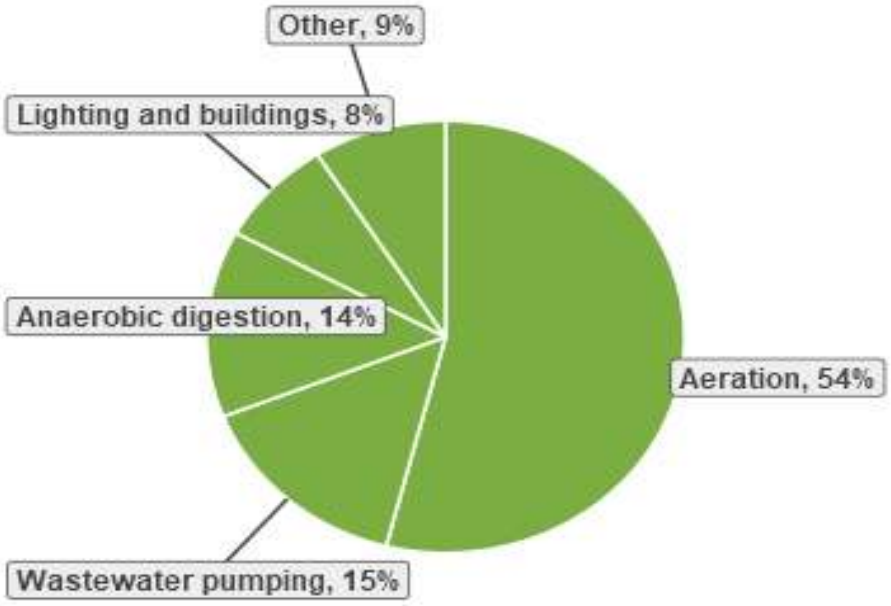
Step 1: Most accessible changes

(e.g. operational strategies, small equipment upgrades)

Step 2: More intensive upgrades that may require financing or outside funding

Step 3: Work on incorporating renewable energy sources

ENERGY USE IN A TYPICAL WASTEWATER TREATMENT PLANT



Note: The "Other" category combines all end uses that consume less than 5% of the overall energy for this sector, including belt presses and clarifiers.

ENERGY CONTROL MEASURES

- Aeration and pumping the two most energy intensive processes
  - Start with looking at pump and motor efficiency
- **DOE's Pumping System Assessment Tool (PSAT)**
  - free, downloadable software that helps utilities assess the efficiency of pumping system operations.
- **DOE's MotorMaster+ Motor Selection Management Tool**
  - free, downloadable motor selection and management tool
  - manage motor inventory/maintenance logs to evaluate energy efficiency

INCLUDING ECMS IN FACILITY UPGRADES

- Most important time to consider ECMs
- Guidance from the consortium for energy efficiency (CEE) on incorporating energy efficiency into requests for qualifications and proposals can be found here.

STAFF TRAINING AND DEVELOPMENT

- An informed staff is crucial to creating a sustainable energy management plan
  - Operators should understand basic energy use calculations and concepts
  - Staff should have familiarity with energy efficiency measures at their facilities

STAFF TRAINING AND DEVELOPMENT

Training and development resources:

- **NYSERDA Basic Operator Training:** overview of the basic calculations and concepts of energy use and efficiency for wastewater treatment operators.
- **Better Plants Virtual In-Plant Training (2022):** series of recorded online trainings focusing on helping wastewater treatment plants improve their energy efficiency.

FUNDING ENERGY EFFICIENCY PROJECTS

CLEAN WATER STATE REVOLVING FUNDS (CWSRF)

- **Description:** finance projects that reduce energy usage at publicly owned treatment works (POTW)
- **Funding type:** low-interest loans
- **Eligibility:** Projects include installing energy and component efficient equipment, onsite renewable energy, methane capture.
- For more information and application requirements look at their website.

Clean Water
State Revolving Fund

US BUREAU OF RECLAMATION WATERSMART PROGRAM WATER AND ENERGY EFFICIENCY

- **Description:** Renewable energy projects and high-efficiency indoor appliances and fixtures are included in eligible projects
- **Funding type:** grant, 50/50 cost sharing
- **Eligibility:** States, Tribes, and water districts
- For more information and application visit their website
  - Applications for FY23 closed July 28th

DATABASE OF STATE INCENTIVES FOR RENEWABLES AND EFFICIENCY

- **Description:** comprehensive source of information on incentives and policies supporting renewables and energy efficiency.
- **Funding type:** state incentives and policies to support energy projects
- **Eligibility:** dependent on incentive or policy

FINANCING GUIDANCE

- US DOE Fact Sheet on Financing Energy Performance Contracting discusses key steps involved in financing an energy savings performance contracting project.
- Energy Star financing guidance for energy efficiency projects here

QUESTIONS

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