



Solving the Energy Optimization Puzzle:

Getting the Most out of your Facilities

David B Bouffard
PE, CEM, CEA, LEED AP, CSDP



Why are we here?

- The EPA estimates:
 - Water and wastewater plants spend about \$4 billion per year on energy in the United States accounting for 30% to 60% of a municipality's total energy bill.
 - Reducing these energy costs by just 10% would save over 5 billion kWh annually.
 - It is estimated that loads are expected to increase by 20% over the next 15 years due to increased populations and more stringent regulations.



- Optimizing total system performance is essential for energy reduction



How to do it

1. Make a commitment
2. Assess current performance and set goals
3. Create and implement an action plan
4. Evaluate progress and reassess
5. Recognize achievements





1. Making the Commitment

- Commitment has to come from the very top
 - Municipalities have to be proactive in initiating change
 - Commitment must be embraced to leverage resources and funding
- Search for local, state, and/or federal money set aside for energy efficiency upgrades
- Be creative
 - Performance contracts
 - Alternative financing



2. Assessing Current Performance

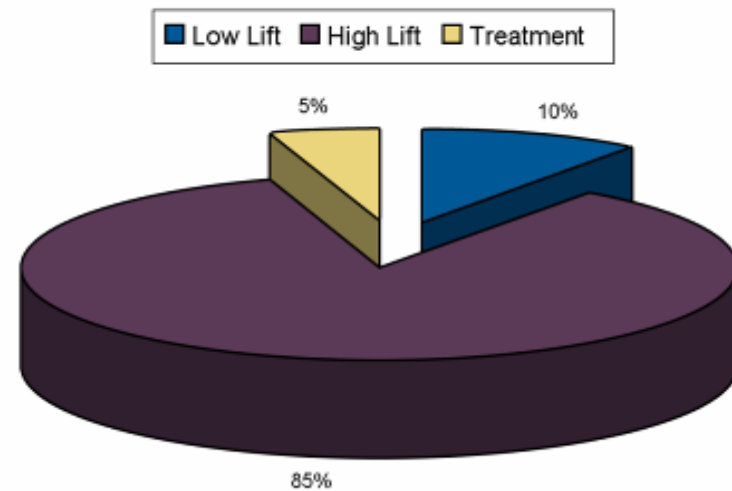
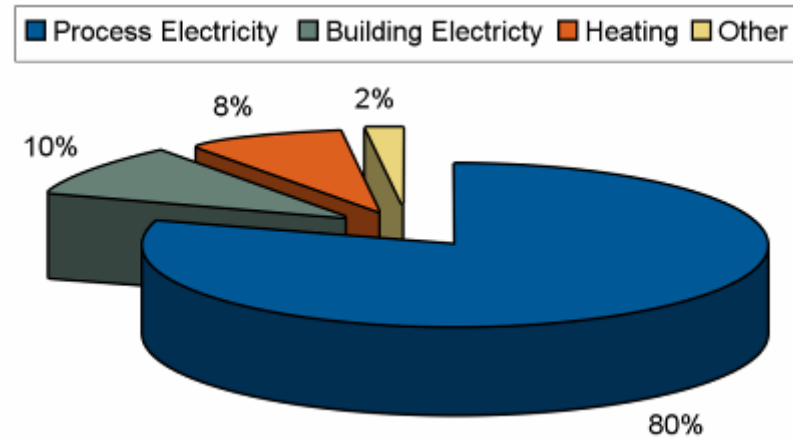
- **Benchmark Facility using Energy Star Portfolio Manager**
 - Court Houses
 - Houses of Worship
 - K-12 Schools
 - Municipal Wastewater Treatment Plants
 - Administration / Office Spaces
 - Warehouses (refrigerated and non-refrigerated)
- **Set Goals**
 - Define how much energy you want to save
 - Define how long it will take you to get there
- **Plan for the future**
 - Use benchmarking information and goals to supplement the facility/municipality master plan





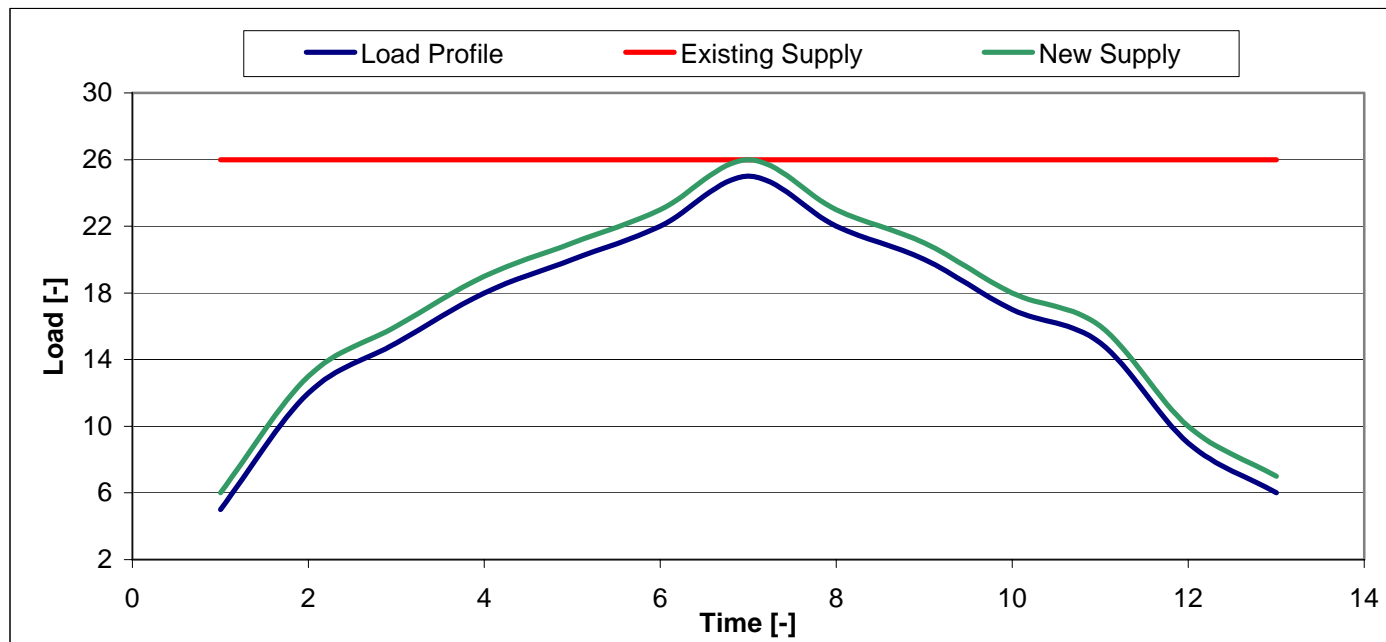
Assessing Current Performance

- Know how the system operates
- Understand where to focus resources
 - Where is the biggest “bang for the buck”





System Profile: Flow, Pressure, and Power



- If flow is decreased by 12%,
- Head pressure is increased by 20%, and;
- Power consumption is increased by 40%



3. Creating & Implementing an Action Plan

CREATE

- Get help
 - Junior operators to experienced consulting professionals
- Search for alternatives
 - Wind, solar thermal, solar photovoltaic
 - Influent / effluent thermal exchange
 - Natural lighting
 - Biomass (Cogeneration)
- Create a training program and communication plan

IMPLEMENT

- Track and monitor progress
 - Recommissioning and Retro-commissioning
 - Preventative maintenance
 - Proactive vs reactive maintenance
- Motivate staff to seek out further savings
- Reward staff for creative ideas



4. Evaluate and Reassess

- Measure the effectiveness of projects and programs implemented
 - An increase in energy consumption isn't a bad thing if it leads to a decrease in total energy per unit volume treated.
- Make informed decisions about future energy projects
 - Develop metrics to prioritize future capital improvements
 - Use gathered information for more effective capital improvement planning
- Document additional savings opportunities that can be leveraged for future initiatives





5. Recognize Achievements

- **Use progress to get public involvement**
 - Reach out to government agencies, the media, and other third party organizations that reward achievement
- **Educate, Educate, Educate!**
 - The EPA estimates that if one out of every 100 American homes were retrofitted with water-efficient fixtures, annual electrical energy consumption would be reduced by about 100 million kWh, equating 80,000 tons of greenhouse gases.
- **Gauge Awareness**
 - Assess changes in employee and organizational awareness of energy issues.



Getting it Done

- Understand your rate structure and how your operation is affected by it
 - Know your power profile, peak consumption time(s)-of-day, and power factor
- Match the supply to the load as closely as possible
 - VFD's and other control systems
- Reduce water pressure (feet of head) by rerouting piping
 - Remember a 20% increase in head pressure results in a 40% increase in power consumption
- Don't forget about the admin areas
 - Light tubes, insulation, occupancy sensors, solar walls. Every little bit counts!
- Search for utility rebates for energy audits and equipment upgrades



Helpful Links

- United States Environmental Protection Agency's ENERGY STAR for Wastewater Plants and Drinking Water Systems
http://www.energystar.gov/index.cfm?c=water.wastewater_drinking_water
- United States Environmental Protection Agency's Sustainable Infrastructure for Water & Wastewater
http://www.epa.gov/waterinfrastructure/bettermanagement_energy.html
- United States Department of Energy Industrial Technologies Program, Best Practices, Motors, Pumps, and Fans
<http://www1.eere.energy.gov/industry/bestpractices/motors.html>
- United States Department of Energy Industrial Technologies Program, Best Practices, MotorMaster+
http://www1.eere.energy.gov/industry/bestpractices/software_motormaster.html
- United States Department of Energy Industrial Technologies Program, Best Practices, Pumping System Assessment Tool
http://www1.eere.energy.gov/industry/bestpractices/software_psat.html



Questions?

COMMITMENT & INTEGRITY DRIVE RESULTS