Water & Wastewater Treatment, Collection & Distribution January 2016
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Energy Savings Guidance

Know Usage

Review and Track energy (kWh), demand (kW) and power factor at your facility.
Do you know your electricity rates? kWh rates, fuel cost adjustments, demand charges, power factor penalties.
What is your treatment cost per MG of water treated or pumped?
Have you done or had some do a demand curve or graph? This should cover at least a week.
List big motors and their operating specifications. Voltage, amps, power factor, hours operated per day. Verify these are consistent with nameplate specifications and that phase imbalance is less than 10%.
What are the other electrical loads? Lighting, HVAC, odor control?

Aeration

Don't over aerate- Generally DO levels above 1.5 mg/L are excessive. All plant are different, some may need more and some less.
Have you profiled the aeration basin DO? Measure in different locations and different times of day, different days of the week, different loading situations.
Keep as short a SRT or MCRT as operationally possible. Long Solids Retention Time or Mean Cell Residence Time or high MLSS uses lots of air and thus electricity.
Don't discharge Nitrite/Nitrate- if you nitrify, make every effort to also denitrify. Many plants have documented up to 30% electrical savings simply establishing denitrification into their existing operations.
Don't discharge Nitrite/Nitrate in sludge or biosolids. Aerobic digesters that are aerated 24/7/365 can contain very high levels of nitrite/nitrate, just like an aeration basin these units can be denitrified by cycling air off then back on.
Are blower air filters kept clean?
Are diffusers kept clean?
Are airline pressure reading available?
If you have multiple basins are "units in service" kept to a minimum?

Motors & Pumps

Keep motors, switch gear and pumps clean, dry and cool.
Are high efficiency motors used? Especially motors that operate 24/7/365.
Are all pumps operating within the manufactures pump curve?
Are motors and pumps maintained according to manufactures recommendations?

Are there any pipelines that are flow controlled using a partially closed valve? Throttling increases friction head and increased energy usage?

Are all electrical connections tight? Are foundation bolts tight?

Has anyone ever done an infrared evaluation on motors and electrical controls? Loose connections and phase imbalance can cause heating and deterioration.

Are motors and pumps properly sized for the application? Under loaded and overloaded motors can be very energy inefficient.

Are VFD's used in locations that require response to varying loads? VFD can save energy, but VFD's can also have low power factors when operated very slowly.

Have pumps been evaluated using PSAT (Pump System Assessment Tool)

Can pump pressure gauges be isolated when not in use?

Has a vibration analysis been performed?

Equipment Maintenance

Are all pieces of moving equipment properly lubricated?

Have valves been exercised to the full opened and full closed position?

Is the equipment kept clean and free of debris?

Are motor and equipment drive/drive belts aligned properly?

Electrical Checks: Infrared Thermal imaging, Insulation resistance, Voltage balance(<2% difference), Amperage balance (<10% difference).

Lighting

Do plant operators or maintenance staff change light bulbs or fluorescent ballasts? Changing to LED bulbs and tubes as existing equipment is a slow steady way to reduce energy usage. LED tubes do not require a ballast, so when the ballast fails is opportune time to make the change to LED's. "High Mast" or HID fixtures can also be changed to LED. LED usage can very marginally improve power factor.

Are motion detectors or occupancy sensors used?

Administration and Corporate Culture

Is management concerned about energy efficiency and cost management?

Is energy efficient design requested in any equipment replacement or new construction?

Does the Department participate in EnerNOC?

Have you had third party energy audits in the past?

Is there an inflow and infiltration reduction strategy?

Is there a drinking water leakage reduction strategy?

TDEC Energy Initiative 2014 & 2015 plants

Wastewater Treatment Benchmarks

1. 4227 kWh/MG, includes effluent pumping, oxidation ditch
2. 3943 kWh/MG, Complex conventional plant with tight small stream limits
3. 3286 kWh/MG, SBR tight small stream limits, UV disinfection
4. 3267 kWh/MG, Oxidation ditch with effluent filtration
5. 2606 kWh/MG, Oxidation ditch, UV
6. 2493 kWh/MG #1 without the effluent pumping
7. 2337 kWh/MG, SBR
8. 1703 kWh/MG Oxidation ditch 30/30 limits
9. 1535 kWh/MG, Oxidation ditch, effluent filtration
10. 1300 kWh/MG, conventional AS
11. 1079 kWh/MG, Extended aeration, aerobic digestion
12. 1650 kWh/MG, SBR, influent pumping, anaerobic digestion