

**W**astewater treatment facilities are critical to the health of communities and the environment. Consequently, operators must give most of their attention to effluent quality, often at the expense of attention to energy efficiency. Here are eleven common ways to save energy and related costs at a wastewater treatment facility, while maintaining effluent quality:

### **1) USE FINE BUBBLE DIFFUSERS IN YOUR AERATION SYSTEM.**

Fine bubble diffusers produce many small bubbles that, together, have a larger surface area than the bubbles produced by coarse bubble diffusers. This increases the oxygen transfer efficiency because more oxygen dissolves into the wastewater. Increasing the oxygen transfer efficiency allows the system to provide adequate treatment with less air, allowing a reduction in the size of the blower(s). Energy and cost savings of 30 percent to 50 percent are common for this measure. Simple payback periods vary from three to seven years.



Fine Bubble Aeration, Sheboygan, Wis.

### **2) AUTOMATICALLY CONTROL AERATION BLOWERS WITH DISSOLVED OXYGEN SENSORS AND VARIABLE SPEED DRIVES.**

Wastewater influent flow rate varies throughout the day at most wastewater treatment facilities. A typical aeration blower will operate at full power all the time, providing

excessive oxygen to the treatment process. Alternatively, a system that modulates according to real time oxygen demand saves energy by avoiding excessive airflow. Variable speed drives on blowers, when controlled by dissolved oxygen sensors, ensure that only the amount of air needed gets provided for treatment. This arrangement maintains dissolved oxygen levels within a desired range, usually 1.0-2.0 mg/L.

### **3) ARRANGE AERATION DIFFUSERS IN THE MOST EFFECTIVE WAY TO MEET YOUR LOADING REQUIREMENTS.**

Tapering the distribution of diffusers throughout the aeration basin can reduce both the number of diffusers and the total airflow to an aeration system. Diffusers should be concentrated at the beginning of the system where the oxygen demand by wastewater is greatest. As the flow progresses through the system, fewer diffusers are necessary to meet required dissolved oxygen levels.

### **4) PROPERLY SIZE THE AERATION SYSTEM.**

Typically, wastewater facilities are sized to meet a peak load flow that is substantially larger than the average flow. Additional energy savings can be achieved by a system that is sized to accommodate (not exceed) peak flow and that can be partially shut down to satisfy the smaller daily, off-peak flow rates. Designs that include multiple aeration basins when constructing a new facility provide shutdown scheduling choices that can reduce energy consumption and costs.

### **5) SHUT OFF AERATION BASINS WHEN NOT NEEDED.**

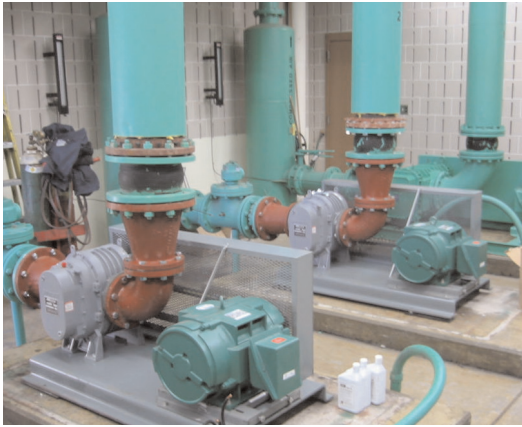
Operators can take advantage of seasonal variations in flow and save energy by shutting down a portion of the aeration system when not needed for treatment. Turning down or shutting off the blowers that serve the aeration system can save a significant amount of energy and reduce demand

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costs. This measure requires an analysis to determine: 1) if an appropriate equipment and treatment situation exists to allow for energy savings; and 2) appropriate scheduling of turn-down/ shut-off.

#### **6) RECOVER BIOGAS FROM ANAEROBIC DIGESTERS AND USE IT BENEFICIALLY.**

Anaerobic micro-organisms produce methane gas as a by-product of digestion. This gas contains approximately 650 British thermal units (Btu) per cubic foot and can be utilized as a fuel source for digester heating, space heating, electric power generation, etc. Energy savings vary based on the amount and quality of biogas produced by the digester.



Motors and drives, Ephraim, Wisconsin.

#### **7) OPERATE ANAEROBIC DIGESTERS AT THEIR OPTIMUM TEMPERATURE.**

The microorganisms used to digest wastes in anaerobic digesters are classified as being either mesophilic or thermophilic. Each type of microorganism has a temperature range at which it is most active. To ensure optimum performance of the digester, the operating temperature should be kept within the appropriate range, allowing the wastes to be treated efficiently.

#### **8) THICKEN SLUDGE BEFORE IT ENTERS THE DIGESTER TO INCREASE BIOGAS PRODUCTION.**

Removing water from the sludge entering the digester will increase available biogas for beneficial use. As water is removed, more digester space becomes available for biosolids that can be digested by microorganisms, thereby producing more biogas. Additionally, decreasing the volume of liquid decreases the digester-heating requirement, which provides more biogas for beneficial uses and saves energy.

#### **9) SIZE PUMPS TO MEET (NOT EXCEED) THEIR APPLICATION AND LOADING. OPTIMIZE THE PUMPING SYSTEM FOR EFFICIENT FLOW RATE.**

Much like aeration systems, pumping systems are sized to

meet peak load conditions, usually ignoring how efficiently they will operate at present day average or low-flow rates. Therefore, pump sizing should assess how to efficiently meet both future peak conditions and present day flow variations. This assessment should include multiple pumps, variable speed drives and responsive automatic control systems.

#### **10) INSTALL STORAGE TO MANAGE THE INFLUENT FLOW RATE TO MINIMIZE ON-PEAK PROCESSING.**

By providing adequate influent storage, a facility can control the flow rate through the treatment processes, allowing for the use of smaller equipment in many cases. Even if downsizing the process is not possible, the stored influent can be held and treated during off-peak periods, thereby lowering peak demand and associated power costs. The energy and energy cost savings vary greatly depending on facility size, type of treatment, etc.

#### **11) PUT AN EMERGENCY, PREMIUM EFFICIENCY MOTOR REPLACEMENT PLAN AND PROTOCOL IN PLACE.**

Since community and environmental health depend on the reliable operation of wastewater systems, equipment failures must be corrected immediately. This leaves little time for financial and efficiency considerations. An emergency motor replacement plan saves time, energy and money by determining whether a motor should be repaired or replaced by a premium efficiency motor before failure occurs.

#### **NEXT STEPS:**

To see which Best Practice opportunities will work for your facility, contact an equipment or service supplier to perform an evaluation for your facility.

To obtain names of suppliers or find out more about Focus on Energy incentives and technical assistance, call:

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