Energy Management Initiative for Water & Wastewater Utilities – Summer 2011

City of St. Peters

A Simple Plan – Great Change

Overview

One of the most effective ways for cities to reduce their costs and improve environmental performance is to improve energy efficiency. In U.S. cities, an estimated 30 to 40 percent of municipal energy use and associated operating budgets are spent treating water and wastewater. Rising energy costs add to the other challenges that water utilities are facing that include the need to expand services, meet more stringent regulations, and replace aging infrastructure. Because most of the energy used to pump and treat water in the Midwest comes from coal-fired power plants, significant quantities of air pollutants are also emitted as a result. Energy conservation can be a mechanism to improve both air and water quality as well as save money.

In May 2009, the U.S. Environmental Protection Agency (EPA) invited 12 Missouri communities to participate in an Energy Management Initiative for Water and Wastewater Utilities, a pilot program led by the Missouri Water Utilities Partnership (MOWUP). Partners included the Missouri Department of Natural Resources (MDNR), the Missouri University of Science & Technology, Siemens Industry, Inc. (Siemens) and EPA Region 7. Seven communities chose to participate in the pilot program which included developing an Energy Management Plan (EMP), implementing an energy efficiency project, maintaining data and sharing results. The City of St. Peters was among the participating communities.

About the City of St. Peters

The City of St. Peters is home to nearly 60,000 people and more than 2,500 businesses that provide jobs for 27,500-plus people. The city is located in St. Charles County to the northeast of St. Louis County. The City of St. Peters has operated a modern wastewater treatment plant since 1989 and has won recognition for its biosolids management and safety programs.

When Russ Batzel, public works services manager, and Bill Malach, director of utilities, attended the first of four MOWUP workshops, they were favorably impressed by the partnership between industry, higher education, and state and federal government. Although the city leaders were already aware of the correlation between energy use and cost, they were hesitant to make energy efficiency a top priority and unsure exactly how to effect that change at the City of St. Peters. The MOWUP Initiative assisted them to focus on optimizing control over their processes using an advanced Supervisory Control and Data Acquisition (SCADA) system and replacing some outdated equipment at both their Wastewater Treatment Plant (WWTP) and Water Treatment Plant (WTP).

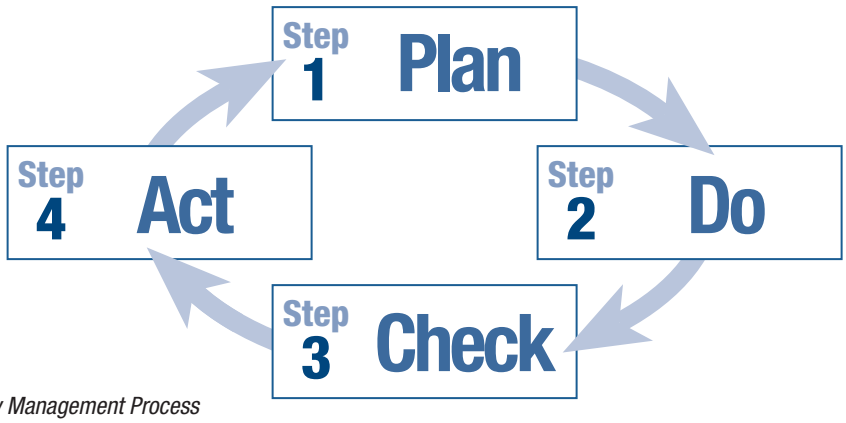
Developing an Energy Management Plan

The MOWUP workshops introduced them to the guidebook, "Ensuring a Sustainable Future: An Energy Management Guidebook for Wastewater and Water Utilities." The workshops also taught them how to create an EMP that benchmarked energy usage and calculated simple payback periods as a tool for understanding energy use. While developing the EMP, the city's team members met several times outside of the workshops to review what was taught and plan for the upcoming meetings. Both the guidebook and the timing of the workshops encouraged them to create a customized EMP for their facilities, and challenged them to present their goals and action plan to the group.

New SCADA control interface


New high service pumps

The City of St. Peters already had several capital equipment upgrades identified in their 5-year Capital Improvement Plan including the funded WWTP upgrades. They re-evaluated their potential projects in light of their new EMP as well as their Utility Energy Policy. They decided to continue the WWTP upgrades with renewed confidence because of their cost-benefit and quantified return on investment. The planned WWTP upgrades included: replacement of the oxidation basin mixing equipment, adding variable frequency drives (VFDs) that can be controlled through the SCADA system using input from dissolved oxygen probes located in the oxidation basin channels, and a new



Energy Management Process

ultraviolet (UV) disinfection system for the plant effluent. The energy input for the UV system can be varied based on the flow rate and transmittance of the effluent. The waste sludge is stored in aerated sludge holding basins before being pumped to the dewatering presses and then composted onsite with yard trimmings. The Class A compost is sold to area landscape businesses and residents as a garden product for soil amendment.

Using the experience with implementing an EMP at the WWTP, the city decided to start a new project at the WTP. The city proposes to replace 30-year-old motors on five high-service pumps with new premium efficiency motors to save energy. The WTP stores finished water onsite in a 2-million gallon holding tank. Currently, the city fills the holding tank using an old high-service pump that cannot be run at maximum efficiency, because it is designed to handle much greater flow at higher pressure than needed to fill the tank. The project is to install a new low head, high-volume transfer pump which will reduce energy consumption. This project was specifically chosen because of its cost benefit and quick return on investment. In addition, two old backwash pump motors will also be replaced by two new high-efficiency motors and new VFD controllers at the WTP. The city is currently awaiting delivery of the new high-efficiency motors for the high-service pumps and the backwash pumps. The new low head, high-volume pump will be bid out soon for installation later this year.

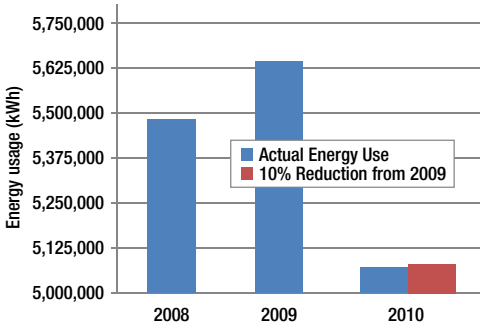
Financing

The WWTP upgrades performed between July and October 2009 were funded before the city participated in the MOWUP program. However, the new pump and motors at the WTP were partially funded (67%) through MDNR's Energize Missouri Communities Grant Program and an Energy-Biz grant from AmerenUE. The MDNR grant and the AmerenUE grant provided funding of $91,564 and $19,287.54, respectively.

> ***"The City of St. Peters Utility Department will promote the efficient use of energy and conservation of natural resources to serve the water and wastewater treatment needs of our community in a sustainable way."***
>
> **Exerpt from City of St. Peters Utility Energy Policy**

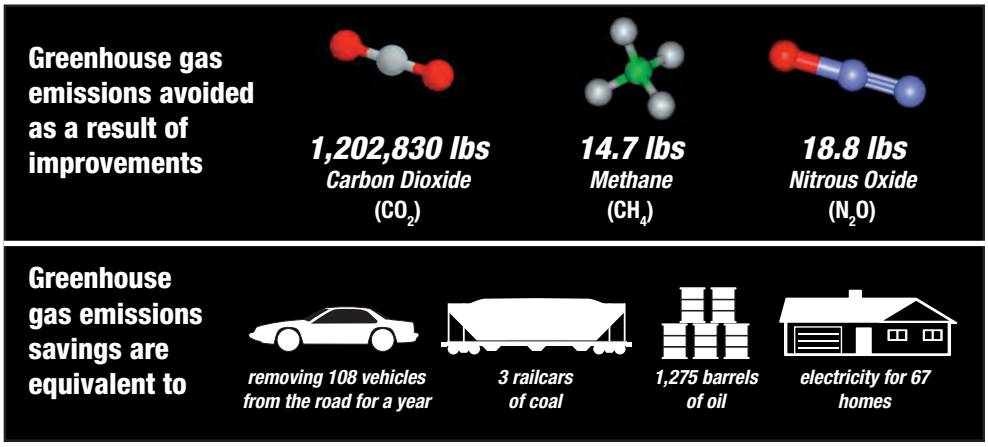
Next Steps

Besides the overarching goals created by the Utility Energy Policy within its EMP, the City of St. Peters created short-term easily quantifiable goals: 1) to reduce energy use at the treatment plants by 10% in 2010 through SCADA optimization, and 2) to reduce sewer inflow and infiltration (I/I) by 5% annually. To meet the I/I goals, the city mapped the sewer system and studied hydrology maps of the area. The study narrowed the likely I/I pipe sources and helped the city concentrate its efforts on repairing or replacing these pipes. The city continues to plan for the future. Eventually, the city plans to manage its peak-time electricity demand by shedding electrical load when it is at highest-cost.



Reduction in WWTP Energy Use

Annual greenhouse gas reductions resulting from the upgrades undertaken by the City of St. Peters. They were calculated using EPA's eGRID web converter (http://cfpub.epa.gov/egridweb/ghg.cfm).



1970
Lagoon system treatment

1989
New Plant
- **Lagoons turned into equalization basins**
- **Two oxidation ditches**
- **Two clarifiers**

2009
Plant Expansion
- **6.9 to 9.5 MGD**
- **Variable speed controlled mixers using DO probes**
- **UV light disinfection system**
- **Advanced SCADA**

1970s | 1980s | 1990s | 2000s | 2010s

Contacts

Kerry Herndon
Sustainable Infrastructure Program Manager
U.S. Environmental Protection Agency
Water, Wetlands and Pesticides Division
901 N. 5th Street
Kansas City, Kansas 66101
(913) 551-7286
fax (913) 551-7863
herndon.kerry@epa.gov

Ruben B. McCullers
U.S. Environmental Protection Agency
Resource Conservation and Pollution Prevention Section
901 N. 5th Street
Kansas City, Kansas 66101
(913) 551-7455
mccullers.ruben@epa.gov

Russ Batzel
Manager, Public Works Services
130 Ecology Drive
St. Peters, MO 63376
(636) 477-6600, x1304
rbatzel@stpetersmo.net

Author Ms. Samantha Markus works for the Shaw Group and is pursuing a Masters Program in Environmental Engineering at the Missouri University of Science and Technology (S&T). She can be reached via email at slm437@mst.edu.