



City of Joplin

Focus on the Bottom Line



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 Joplin was among the participating communities.

About the City of Joplin

The City of Joplin, a community of approximately 49,000 people, is located in the southwest corner of Missouri on the edge

of the Ozark Mountain Region. It is a community that was first established to support the mining industry after lead and zinc were discovered in the Joplin Creek Valley before the Civil War. By 1873, the population had expanded significantly from the wealth created from mining. However, as the price of these minerals collapsed after World War II, the population leveled off.

Today, the city is growing again and serves as a regional center for retail, health care, higher education, and tourism. The city operates two wastewater treatment plants (WWTP) known as the Turkey Creek and Shoal Creek Plants, both built in the 1980s. By 2009, both facilities were nearing capacity and the city devel-



Ultraviolet (UV) disinfection system under construction

“When they come to you each year at about the same time and point out that you need to cut expenditures, energy savings go a long way towards that end.”

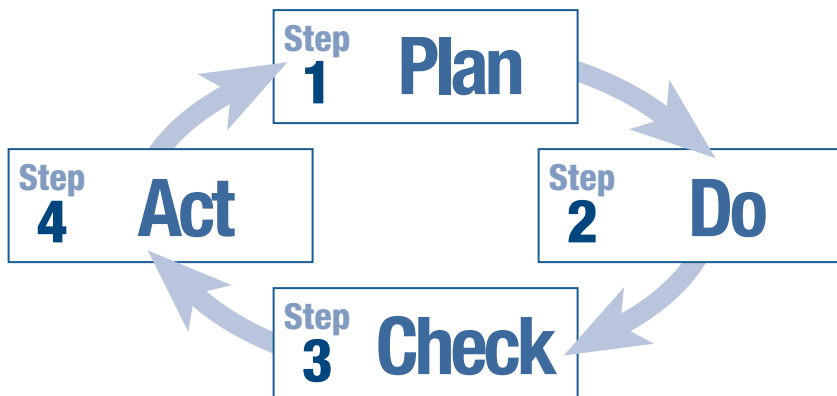
Lyndell Edwards
Superintendent WWTP

oped plans for a \$35 million dollar project to expand and upgrade the WWTPs. In 2009, the City of Joplin was also invited to participate in the MOWUP Initiative to improve energy efficiency. During the initial energy assessment conducted by MOWUP Initiative partners, a number of opportunities for improvement were identified. The City of Joplin decided to focus on several specific components of the larger plan to see if they could improve energy efficiency.

Energy Management Plan Development

Lyndell Edwards, superintendent of the Shoal Creek WWTP, and Mike Moudy, chief operator of the Turkey Creek WWTP, were asked by Mayor Reverend Gary Shaw to participate in workshops offered by the MOWUP. The purpose of the four workshops was to assist participating communities in developing an EMP for their water and/or wastewater utilities. At first, Mr. Edwards was concerned that he was being asked to commit to developing something that would not be useful to the community. As he started working through the program, however, he found that not only was the information valuable, but the EMP that he and other community members worked on was based on real needs and real opportunities. Mr. Edwards collaborated to design the EMP elements to focus on the bottom line.

The Plan-Do-Check-Act Model was used to guide the planning and implementation activities. Mr. Moudy felt that the MOWUP model essentially embodied the activities that naturally occur at their WWTP: all major ac-



Energy Management Process

tions being planned first, then implemented, then checked and rechecked to make sure they achieve the desired outcome. Subsequently, any unintended effects are fixed or tweaked to achieve the final result.

As part of the MOWUP Initiative, each community was asked to identify and implement a project that was projected to improve energy efficiency by at least 15%. The City of Joplin chose as their project a component of their Phase 1 Expansion Program - to install variable frequency drives (VFDs) on 8 pumps at its two largest sewage lift stations and to install fluorescent lighting upgrades in buildings at both WWTPs. These projects are projected to reduce the city's electric consumption by 442,265 kWh/year with the VFD upgrades, and 80,534 kWh/year with the lighting upgrades. During the first three months of 2011, with the upgraded equipment installed (VFDs, lighting and some HVAC upgrades), the city has reduced its natural gas consumption by an average of 16.6% and its electrical consumption by 12.5%. In addition, the overall energy demand at the WWTPs has reduced by 5.8% compared to the same period during the previous year.

Phase 1 upgrades also included the installation of energy-efficient ultraviolet (UV) disinfection and aerobic digesters. The UV disinfection includes controls to turn off sections of UV lighting during low-flow conditions. Also, the UV system's power usage can be lowered when tests indicate that the disinfection levels are meeting the permit requirements. The City of Joplin expects to see a 15% reduction in energy use for lighting and operation of lift stations.

Building on Momentum

The City of Joplin has decided that energy efficiency will be a priority for all future projects. Beginning in late summer 2011, a second construction phase will add independent mixers to the oxidation ditches, an energy

saving move which will allow aerators to be turned off during low flow conditions, and when tests show that enough aeration is occurring to achieve permit requirements. Other construction projects in the works include belt thickeners and replacement of a screw pump.

The City of Joplin is tracking energy usage and consumption patterns with EPA's ENERGY STAR® Portfolio Manager, a free online tool which is updated by entering monthly energy data gathered from the utility bills. This information will be used to optimize new systems and guide planning for future investments.

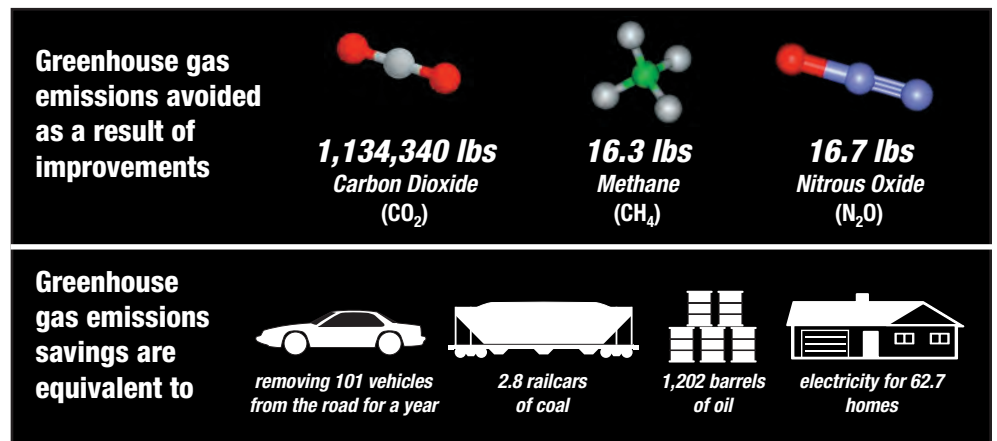
Financing

The City of Joplin financed the Phase 1 construction through an American Recovery and Reinvestment Act (ARRA) grant of approximately \$3 million with a local match funded by MDNR's State Revolving Loan Fund. Construction began in January 2010 and was completed in January 2011. The city was also awarded an Energy Efficiency and Conservation Block Grant for \$226,943 to complete their lighting changeover to energy efficient lighting.

Lessons Learned

According to Mr. Moudy, the city has always operated frugally and was constantly evaluating ways to conserve energy and save money. Even before the MOWUP initiative, the city began changing light bulbs and reducing energy use. Mr. Edwards pointed out that variable frequency drive (VFD) motors were planned as upgrades to the city's lift stations before he attended the first MOWUP workshop. The MOWUP assisted in formalizing the upgrade process. Overall, the city expects their electricity consumption to increase because of all the extra equipment and UV disinfection upgrades. However, the MOWUP-based planning efforts and installed equipment will minimize the increase.

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



1985
Turkey Creek WWTP built: screening, pumps, grit removal, primary clarification, trickling filter, final clarification, anaerobic digestion

1997
Added to Turkey Creek WWTP: intermediate clarifier, oxidation ditch, sand filtration after final clarifiers, second anaerobic digester

2010
Turkey Creek WWTP: UV disinfection, aerobic digestion, VFD pumps

1980s

1990s

2000s

2010s

1988
Added Shoal Creek WWTP

2011
Planned: mixers for oxidation ditch, belt thickeners, new screw pump

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