

Reaping the Rewards of Restoration



By Lauryn Colquitt

Utility commission wins award for increasing efficiency, reducing costs & consumption

Deteriorating infrastructure continues to plague municipalities across the U.S., compromising local budgets and natural resources. Utility officials nationwide are actively searching for innovative strategies to circumvent these problems. When the Caryville-Jacksboro Utility Commission (CJUC), located 36 miles north of Knoxville, Tenn., began restoring its collection system, it successfully avoided \$13 million in equipment upgrades and \$18,000 in energy costs in just one year of implementation.

The utility first initiated a system-wide evaluation to reverse years of collection system inefficiencies and deterioration. Frank Wallace, CJUC executive secretary, employed several methods of investigation to create a system that would fully meet the community's present and future needs. Successfully restoring the collection system not only reduced key problem areas, but offered CJUC substantial savings. Wallace knew that resourceful measures were necessary to save ratepayers from runaway expenses in many areas. Aside from high energy consumption, CJUC faced capacity and environmental impacts from inflow and infiltration (I&I). Its collection system had numerous entry points for ground and storm water intrusion. I&I caused peak flows to rise above maximum capacity during rain events, which often overburdened the treatment plants. In extreme cases, the

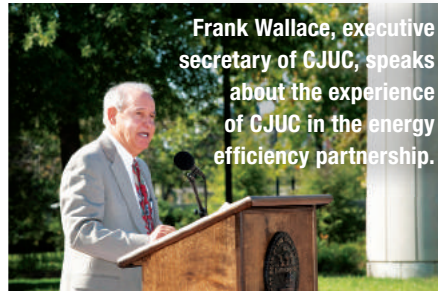
excess volume caused backups and bypasses to occur. This not only was challenging treatment plant capacity, but it also was shortening equipment life and increasing energy costs.

Devising a Plan

In 2000, Wallace met with U.S. Environmental Protection Agency (EPA) officials at a conference in Tennessee to discuss energy conservation and I&I reduction. He agreed to evaluate the collection system and implement a capacity, management, operations and maintenance (CMOM) program. Wallace also met with Tim Kazmier of Kazmier & Associates to discuss the managed supervisory control and data acquisition (SCADA) system provided by Mission Communications for reducing operations and maintenance costs. SCADA systems are recommended for many CMOM programs to assist in gathering data.

CJUC did not have a SCADA system in place at that time. Instead, six employees made daily visits to assess its 49 pump stations. Conducting site visits at remote locations can be time consuming. Cellular-to-Web data transmission saves man-hours by giving personnel the convenience of accessing the information from any Web-enabled device.

"Forty-eight man-hours per day is the time that was spent conducting site visits," Wallace said. "This was time that could have been better spent



elsewhere. We needed easy access to information on our remote stations.”

Creating a Sustainable System

The towns of Caryville and Jacksboro authorized the utility commission to install Mission’s remote terminal units (RTUs) on the most critical pump stations. Over several months, Wallace began to see the value of the data the SCADA system provided. Daily visits no longer were required to make equipment assessments. Real-time alarms inform personnel of sensitive issues at each pump station.

“I receive a notification immediately if anything is abnormal at one of our pump stations. We tend to the station right away to avoid damage to equipment. We know the condition of our system at all times,” Wallace said.

Reports like the Pump Runtime vs. Rainfall report began compiling data that could be analyzed by CJUC staff. Wallace and his staff noticed dramatic increases in pump runtimes and starts and stops after each heavy rainfall. He added RTUs to the remaining 35 pump stations, where he witnessed similar results.

“The runtime reports gave us a good indication of areas with excessive infiltration,” Wallace said. “The data provided the necessary information to initiate the planning phase of our rehabilitation program. Our treatment costs are \$1.50 per 1,000 gal of infiltration. One of our goals was to reduce this as much as possible.”

The next phase of CJUC’s investigation was to conduct field inspections in areas where the runtime versus

rainfall data were problematic. In order to upgrade the pipe, specific areas affected by deterioration were plotted on gridlines from district maps. Concrete sewer mains with severe damage were replaced with Class 200 PVC pipe. Each manhole also was lined with the SpectraShield liner system, a three-layer coating system used to rehabilitate and protect wastewater infrastructure. It shields the manhole from groundwater entering the collection system and reduces infiltration.

Seeing is Believing

The efficiency of the SCADA system has reduced site visits from 48 man-hours per day to 30 minutes. This allows CJUC personnel to spend most of their time conducting preventive maintenance—something they did not have time to do in the past. Alarms and alerts also are helping to prevent pump damage, a common problem for collection systems. The pump runtime variance report is emailed to Wallace if runtimes exceed the average. This gives CJUC staff adequate time to fix issues before they are magnified into bigger problems.

Since the system upgrade, CJUC has lowered operation and maintenance costs by an average of \$98,000 per year. Pump station flow has been reduced by 36 million gal per year. Wallace acknowledged that the SCADA system’s return on investment made the decision to restore rather than rebuild easy. CJUC settled on rehabilitating the existing system for \$3.5 million rather than putting \$13 million into upgrading the treatment plant to

process the excess volume from I&I.

CJUC's pump data show efficient pump alternation with similar run-times and pump starts on both pumps.

"The decision was a no-brainer. The utility commission and the towns of Caryville and Jacksboro couldn't place that sort of burden on our community when we didn't have to," Wallace said. "Instead, we sought out innovative products that would fulfill the collection system needs along with the needs of the community."

Energy Efficiency Upgrades

CJUC also implemented a program to reduce energy consumption and costs. An initial energy management system installed at the wastewater treatment facility revealed multiple areas of low energy efficiency. The utility tuned six aerators to sequence on and off for the optimal amount of energy usage and dissolved oxygen for disinfection. The pumps also were sequenced to turn on and off to consume less power. Several other cost- and energy-saving measures were adopted. As a result of these changes, CJUC saved \$18,000 and 200,000 kWh of power in the first year. Energy conservation efforts now save an ongoing yearly average of \$21,500.

"We allowed EPA to audit our collection system for one year so that we could work together to make improvements. We recognized the importance of making our system more efficient," Wallace said.

A Rewarding Partnership

In 2011, CJUC joined the Tennessee Water and Wastewater Energy Efficiency Partnership in conjunction with EPA Region 4, the Tennessee Department of Environment and Conservation and seven surrounding utilities. A combined carbon dioxide emissions savings

of 6,696 tons per year was recorded. This is equal to powering 739 homes for one year. As a result of its efforts, CJUC received the Outstanding Leadership and Successful Organizational Achievements award for efficiency upgrades, energy conservation, and I&I reduction in late 2012 from EPA. In July 2013, EPA representatives visited the utility commission and the towns of Caryville and Jacksboro to follow up and congratulate them on their achievement of 40% annual energy savings.

The wastewater treatment facility will soon benefit from a \$250,000 grant awarded by EPA as a result of its wastewater system optimization. In addition, Tennessee Gov. Bill Haslam awarded CJUC with the Appalachian Regional Commission grant of \$421,279 for further wastewater system restoration.

"The decisions we made throughout the past several years helped us to create a more sustainable system. The Mission Communications system is incredible. The data that it provides were a vital part of helping us to identify our inefficiencies within the system," Wallace said. "Without that information, we wouldn't have the ability to make sound decisions."

Although CJUC could have chosen the route of adding on to the system, it improvised and followed its plan to rehabilitate instead. The benefits of taking this path made CJUC an award-winning utility that is creating a sustainable system for future generations. **WWD**

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