TECH CLOSE-UP: WIPES READY TECHNOLOGY SHREDS PROBLEMS PAGE 22

HUMAN SIDE: GOOD MANAGERS ARE CRITICAL TO SUCCESS PAGE 36

BETTER MOUSETRAPS: BREAKING THE MANHOLE CORROSION CYCLE PAGE 38

For sanitary, storm and water system maintenance professionals February 2019

UNICIPAL

MAPPING A BETTER FUTURE

Tennessee utility reorganizes, refocuses and embraces the challenges of system improvement

PAGE 14



Johann Coetzee Water Resources general manager Elizabethton, Tennessee

PRODUCT FOCUS: PIPELINE AND INFRASTRUCTURE, HYDRANTS









Elizabethton Water Resources crew member Trevor Guy connects pipe to a directional boring head. Elizabethton replaces about 2,000 feet of galvanized waterlines with polyethylene pipe annually. (Photography by Martin Cherry)

MAPPING A BETTER FUTURE

Tennessee utility reorganizes, refocuses and embraces the challenges of system improvement

By Jim Force

ustainability means more than sound infrastructure in Elizabethton, Tennessee.

It also means a respectful relationship with its customers.

"No matter how hard you work," says Johann Coetzee, Water Resources general manager, "you have to get the relationship with the customer right.

"We are a monopoly," he adds. "We have regulatory powers and we are the only game in town. But we have to rethink that and look at our services in terms of sustainability. We not only need our customers' money, we need their goodwill. If we get those two things, we can fulfill our mission."

Service area

Located in the far northeastern corner of the state, Elizabethton Water Resources serves more than 28,000 people in Elizabethton and Carter County.

Its 75-square-mile service area includes three water treatment plants and 269 miles of water distribution lines. Raw water is drawn from three springs: Hampton, Valley Forge and Big Springs. The Watauga River Regional Water Authority serves as an additional source.

Eleven storage reservoirs have a total capacity of 6.9 million gallons, and water is moved to more than 11,500 water connections through a series of nine booster stations.

The department operates one wastewater treatment plant — an extended oxidation ditch facility designed for an average daily flow of 3.5 mgd. Originally constructed in 1958, the plant has seen a number of improvements and upgrades since. Treated effluent is discharged to the Watauga River, a popular fly-fishing and paddling stream.

A 70-mile long sewer system serves approximately 5,500 sewer connections and is powered by seven pumping stations.

Need to change

To the casual observer — maybe even the semi-interested ratepayer — it might have looked like Elizabethton Water Resources was doing just fine.

Water quality was good, sewers were working and the water and wastewater plants were winning awards.

"We were a typical utility," Coetzee says. "Our treatment plants were in good shape. Everybody was happy."

PROFILE: Elizabethton, Tennessee, Water Resources

FOUNDED:

The city was founded in 1799; the water system was established in the early 20th century

POPULATION SERVED: 28,000

AREA SERVED: 75 square miles

WATER:

269 miles of distribution lines, 11 storage reservoirs, nine booster stations, four water sources, three treatment plants (6.9-milliongallon storage capacity)

WASTEWATER:

70 miles of sewers, one wastewater treatment plant (3.5 mgd design average)

STAFF:

Johann Coetzee, general manager; Ed Mullins, facilities manager; Jonathan Pleasant, construction manager

AWARDS:

Kentucky-Tennessee Water Environment Association Operational Excellence Award — 2008-17 American Water Works Association Small Plant Category Award of Excellence for Valley Forge Water Treatment Plant — 2014 William Hunter Owen Award for Outstanding Wastewater Treatment Plant — 2009

ANNUAL OPERATING BUDGET: \$11.5 million

WEBSITE: www.elizabethton.org Robbie Hill operates a Ditch Witch JT20 horizontal directional drill on a waterline replacement project.

But deferred maintenance of the infrastructure loomed in the background, growing like a cancer. "Our water losses were creeping up," Coetzee says. "We were also experiencing inflow and infiltration in our sewer system." In 2012, the city manager and the council started waking up to the water loss phenomenon and asked Coetzee to investigate and find solutions.

"We were losing 55 percent of our finished water," Coetzee says. "Plus, on rainy days, our 3.5 mgd wastewater plant was seeing as much as 8 mgd. We had to deal with this."

Coetzee and his team developed a plan that involved not only leak testing, but full-scale replacement of miles and miles of galvanized water pipe that made up most of the distribution network. Also, cracked and broken sewers were scheduled for repair or replacement. The department planned upgrades of its storage tanks as well.

Mapping, please

It wasn't easy.

Coetzee says one of the biggest hurdles was the lack of modern GIS mapping. "In order to repair, replace and upgrade our water and sewer lines, tanks, and pump stations, we needed to practice sound asset management, and you can't do that if you don't know what you have."

Coetzee says the department's old GIS system was machine-to-machine. "We'd put things on

flash drives and hand-carry them from one place to another."

The department developed a new data system and had it reviewed by an outside engineering consultant. New GIS servers (Esri ArcMap) were installed at City Hall and connected via fiber optics to the engineering department and the city garage. In early November, all crew chiefs and water technicians started carrying iPads using Esri's Collector application. Coetzee expects his team to be able to issue electronic job tickets down the road.

"You need high-quality data and you have to be able to communicate with other software in order to know where to spend your next dollars. It's a lot better than having a pickup-truck load full of paper reports."

Addressing losses

Elizabethton's leaky water and sewer pipes are the focal point of the upgrade. While Coetzee says finished water losses are still in the 55 percent range, his team is making progress, slowly but surely.

"We have over 500,000 feet of old 2-inch galvanized waterline throughout the service area, especially out in the county," Coetzee says. "We've purchased a Ditch Witch JT20 horizontal directional drill and have three repair crews and one line laying crew, each headed by a crew leader who reports to our construction supervisor. The cost of HDD line installation is one-third that of opencut."

The line laying crew operates the HDD equipment and handles new opencut line installations. The leak repair crews do service work, repair leaks and tackle other projects like tying over customers to newly constructed lines.

The department is using Case CX60C, Bobcat E45 and Bobcat E80 mini-excavators to dig in confined areas and narrow roadways. Also, crews save time by carrying all the necessary equipment and repair components on larger service trucks so they don't have to run back and forth to the department's supply depot.

Coetzee says the department uses soundsensing devices to look for leaks and has reduced them significantly, but it is committed to replacing the galvanized lines altogether.

"It doesn't make sense to just keep fixing leaks," he says. Instead, crews are laying new 2-inch HDPE pipe on one side of the road or street, with new PEX lines tying into the customer's service connection. The department has purchased its *(continued)* "You need high-quality data and you have to be able to communicate with other software in order to know where to spend your next dollars."

Johann Coetzee

Construction Manager Jonathan Pleasant works with the Arc GIS system to locate a water meter. own McElroy Pit Bull 14 fusion machine to join pipe sections. The department will strategically install 6-inch lines to assure adequate fire protection in the neighborhoods.

Looking ahead, crews are also installing valves so that the new lines can be shut off in case leaks need to be repaired 20 to 25 years from now.

Coetzee says one of the issues is disconnecting the old pipe, end to end. "We don't have maps of the old lines," he explains. "If a customer had flow or pressure issues, they may have charged a line from an old line but didn't map it." He says some of the pipes were installed nearly 100 years ago, and in some cases, there may be as many as three different waterlines running beneath the same road.

That means finding the source of flowing water often requires crews to dig. "We're sometimes like gophers, digging potholes all over the place," Coetzee says. "It's important to find where an existing line is being charged from, and we've sometimes had to cut off a whole neighborhood trying to find the last 6-inch connection on an old galvanized line."

In another case, Coetzee says it took the field crew six weeks to find the connection and get the old line completely tied off.

"It's very important that we do this right."

Neighborly approach

With such a large area to upgrade, Elizabethton made another strategic decision and is replacing the pipes one neighborhood at a time. "This is an overwhelming process," Coetzee explains. "We decided to do whole neighborhoods rather than jumping around the system (responding to breaks). We've already completed all of the lines in our Eastside neighborhood with about 700 meters, as well as in the Golf Course Acres neighborhood and the Valley Forge and Cripple Creek communities. We are moving into the western part of the county next.

"Our goal is to replace 5.5 miles of galvanized a year. With 500,000 feet of line to deal with, it will take us a long time," he says, but he notes that active leaks on the repair list have dropped from 300 to 20 or even 10. The number of customer repair calls has also come down.

"Overall, we're still at 55 percent water loss. That's unacceptable, but we expect that will start coming down soon."

Sewers assessment

Elizabethton is also addressing its I&I problems, though it's taken a period of time to build up the necessary equipment. Coetzee says the department has added a new Vactor 2100 jet/vac truck and a new CUES OZIII CCTV camera on an Ultra Shorty track body. The CCTV camera system uses a K2 Dolly system (CUES) for the *(continued)*

ONE IS MORE THAN TWO

In mathematics, the number two is greater than one.

But at the Elizabethton, Tennessee, one water resources department is proving to be better than two separate water and wastewater divisions.

"We had two different departments," says Johann Coetzee, Water Resources general manager. "Both were operating within our water-sewer enterprise fund. When we looked at the departments, they both had identical goals and missions."

Under Coetzee's leadership, Elizabethton decided to merge the two departments into one, titled Water Resources.

Coetzee calls this a "holistic" approach that not only recognized the concept of "one water," but also provided the town with numerous opportunities to save costs, as well as coordinate infrastructure repairs and maintenance.

"When we looked at it, we were taking water from our springs, preparing it for our customers at our water plants and delivering it," he says. "Then our customers used the water, we collected it and routed it to our wastewater plant where it was treated and released back to the environment.

"It is a holistic transaction that needed to be managed as a single entity."

Coetzee says Elizabethton looked at its neighbors and other utilities for ideas and possible organizational structure, then formed a hybrid department designed to fit the community's needs. The basic organization features a facilities team that works under a facilities manager to take care of the water and wastewater treatment plants and other capital assets, and a construction group that handles all maintenance, repairs and replacement work, headed by a construction manager.

"It's working really well," Coetzee says. "We're finding many synergies such as purchasing things like chemicals, and using common equipment, that cross the board.

"The biggest benefit has been on the construction side," he notes. "We've cross-trained our employees and now manage all our waterline and sewer construction as a single enterprise."



reel, which is housed in a separate trailer. The department also uses a set of InfoSense Sewer Line Rapid Assessment Tools (SL-RATs) and GraniteNet software (CUES) for its sewer camera inspection records.

Similar to the waterline work, crews are using a "no-dig" approach where possible — sliplining sections in need of replacement with new HDPE pipe and short section repairs using inserted CIP liners, avoiding the excavations and disruption associated with opencut methods.

Coetzee says with such a far-flung sewer system, the SL-RATS are helping by quickly identifying the location of obstructions. "The sonic device, inserted into manholes, tells us where we may have an issue. Then we can go in and televise that section." It's much more focused than trying to televise the entire 70-mile system, he says.

"The SL-RATs tell us where we need to spend more time on CCTV investigation. The CCTV investigation tells us whether we need point repairs, sliplining or replacement."

Figuring out how to accelerate the sewer line repair effort is a major challenge, Coetzee says. "With the sewer lines now on our GIS platform, we are generating job tickets faster than we can deal with them."

Tank upgrades

The upgrade program is also remediating the department's 11 storage tanks. Coetzee says his crews are repairing and repainting one tank at a time, focusing first on the ones in most need. "Our protocol has been one tank per year, but now we're going to do one tank every other year," he explains. "It's moving along fine."

Coetzee says so far the bidding and contract supervision has been done in-house with the assistance of Carver Engineering, but long-term maintenance agreements may be used in the future. "We wanted to establish a baseline cost first; in other words, establish a cost profile before we invited bids for long-term maintenance agreements. Until we have that cost profile, we don't know how to respond (to long-term tank maintenance offerings)."

True costs

After discussing his department's comprehensive upgrade program, Coetzee pauses to



reflect on costs, lessons learned and customer relationships.

"The first hurdle most communities face is they are forgetful of the full cost of their infrastructure," he says. "It's not just the cost to operate the system; our infrastructure has a limited life span, it will need replacement.

"If something's broken, you can just throw money at it and go out and fix it," he says. "But that's not always sustainable."

Utilities need to be mindful of the full cost

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Vactor Manufacturing 800-627-3171 www.vactor.com (See ad page 3) of the services they provide, he says, warning against basing revenue projections on usage because water use may drop as appliances become more efficient.

That's why that customer relationship is so important.

"In our case, we proposed raising rates over a five-year period," Coetzee says. "The community was not too happy with us, so we went back after a year and made adjustments.

"We needed to come up with a 12- to 15-year investment profile which would get us caught up on our deferred maintenance. And we made sure everyone understood. We put information on our

"Our goal is to replace 5.5 miles of galvanized a year. With 500,000 feet of line to deal with, it will take us a long time."

Johann Coetzee

website. We talked to folks.

"The public wants three things from us," he says. "They want sound management of our systems, accountability with their money and a positive relationship that is respectful and helpful on all sides." ✦

