

# Evolving with Wastewater Demands

By Kenneth Dudley

*Beaufort is a major population center situated in the Hilton Head Island-Beaufort Micropolitan area in a region known as South Carolina's Lowcountry. The scenic community is known for its natural beauty as well as its historical architecture and military establishments, which include the Marine Corps Beaufort Air Station and Parris Island Recruitment Depot. Southern Living magazine named the city "Best Small Southern Town," and American Style lists it among the country's "Top 25 Small City Arts Destinations." As Beaufort's recognition increases, so do the responsibilities of the Beaufort-Jasper Water and Sewage Authority (BJWSA) planners who need to ensure the city's systems keep pace with growth.*

New pumping technology helps city keep up with changing system requirements

Despite the city's permanent population of only 13,000, the demands on the wastewater system are formidable. The greater area boasts nearly 125,000 residents, while the military presence and burgeoning retail and tourist trades mean a significant transient population.

Beaufort is largely flat, with an elevation only slightly above sea level. Without the assistance of a natural grade to assist system flows, most everything in the complex sewage network requires pumping. Wet wells must be relatively shallow in the island geography, and lines to the treatment facility often cross bridges and causeways. All these factors mean a significant number of sewage lift stations service a relatively small area. Regulating the capacity of the sewage systems here requires a close synchronization of engineering talent with technology and professional relationships.

## The Bay Street Station

In 1973, then city of Beaufort's Chief Operator and later Utilities Director Frank Emminger recognized early on careful planning and attention to detail were required to meet the area's challenges. Calling on the application expertise of TenCarva Machinery Co., it all began with the installation of a series of lift stations that included the Bay Street station. The latter project was not only the deepest in the city, but was also challenged with handling a significant amount of wastewater for the city.

With a wet well nearly 19 ft deep, the Bay Street station incorporated Gorman-Rupp T Series 6-in. self-priming pumps. An auxiliary Wisconsin LPG engine was incorporated that turned on and kept the system pumping in the event of a power loss. According to Emminger, the auto-start technology was "an incredible innovation. It carried us through more than a few storms."

## Innovative Thinking

Decades after Emminger flipped the switch on the original Bay Street station, the station began to have difficulty handling the increasing flow, and a cost-effective solution was sought. Even though the station was among the first pump systems used by the city to feed its first treatment facility, it had managed nonstop operations up until that point, requiring only basic maintenance over the years.

"We found ourselves needing to address a wet-weather flow problem with the station. It simply could not keep up with flow during rain events," said Todd Ritchie, a distributor's representative with TenCarva Machinery. "At that time, we shared information with Frank Emminger and Joe DeVito, BJWSA director of field operations, about Gorman-Rupp's newly developed technology—parallel/series pumping."

An interim solution was implemented: a parallel/series pipe configuration that still allowed the city to run the station's pumps in parallel during normal conditions, but when necessary, a valve connecting the discharge of one pump to the suction of the other could be opened to allow the pumps to run in series. As the second pump came on, performance was maximized for times of unusually high flows.

"Very quickly, we saw the benefits that could be applied to the situation," DeVito said. With a single



From left to right: Todd Ritchie, municipal sales engineer for TenCarva Machinery Co.; Frank Emminger, general manager for DuPriest Construction; Joe DeVito, BJWSA director of field operations; and Robert Horner, principal for HEG Eng. Consultants.



pipe modification, nearly 15 years of new life was added to the station. In effect, from a technology standpoint, the parallel/series technology allowed Beaufort's Bay Street station to enjoy not only an extended life but also new and previously unforeseen opportunities. Later, by integrating more new technologies into their gravity system, Beaufort virtually eliminated inflows and infiltrations, freeing up more capacity within the system.

## Starting Anew

More than 36 years after the Bay Street station was originally installed, and with 15 years of enhanced performance made available to the BJWSA engineering team, the system has undergone a landmark rebuild. The Bay Street station has been redesigned to accommodate a mixed-use scenario.

Bay Street itself is a major downtown thoroughfare and home to the Henry C. Chambers Waterfront Park. With no less than 10 restaurants within an eight-minute walk, many businesses create significant wastewater that flows to the station. Additionally, just outside the area lies a sizeable residential area with a light commercial addition. Originally, when the Bay Street station was built, it met the needs of a simpler residential community.

"We're not required to pump more gallons per minute," DeVito said. "We're required to pump more throughout the day."

During the 15-year service life extension achieved with parallel/series pumping, trenchless

technology—as well as gravity system technology—has advanced considerably. With state-of-the-art controls and engineering, the new station includes Super T Series 4-in. self-priming pumps and a liquid-cooled LPG Zenith auxiliary engine drive featuring the latest Tier II technology available for meeting U.S. Environmental Protection Agency regulations. Using similar advancements to those found in automotive engines, a four-cylinder LPG engine now can generate considerably more horsepower than in the past. The station also features the parallel/series engineering that was so vital in the previous design.

The Engineering and Operations divisions at BJWSA asked HEG Eng. to provide design assistance with the pump station rehabilitation project by performing hydraulic modeling to verify the operational requirements for the pumping package under various conditions. HEG's background in municipal wastewater made it an ideal candidate to work with the BJWSA operational staff, along with Gorman-Rupp and TenCarva Machinery, to verify conditions and establish operational parameters.

After evaluating the situation, the authority recognized that smaller pumps now were suitable for the application, ironically yielding a higher flow as a result of technology advancements.

"The pumps are better, more efficient and we enjoyed a little cost savings in the rehab as well," DeVito said. "And this also frees up more room, as the pumps today are smaller than the 6-in. kit of 15 years prior."

"I don't think there's another horizontal

self-priming pump out there that's easier to work on and to teach people to work on," Emminger said. "Simplicity comes to mind with regard to routine maintenance and repairs. None of us can control what goes through a sewer line, but Gorman-Rupp pumps can consistently pass 3-in. solids—and from our experience, sometimes even larger objects. Hands down, there's not an easier pump to disassemble."

## Convenience in Design

Design updates to the new lift station include a back door to the station. Originally built with a single manway door, the new design incorporates a hidden double-width door to allow for easier and safer access way to the new pumps.

"Without the double-door design, the only way we could get the new technology into the station would have involved removing the roof," DeVito said. "The double-sided doors around the back side offered the best advantage. The existing building is a little tight, and this design further offers a much safer and more comfortable work area for the mechanics working on the station in the future."

Now, with more than 400 pump stations in the BJWSA system, safety remains essential. "Some of the quarters can get extremely tight. As a result, we've asked our operators over the past 10 years for suggestions on how we can make the BJWSA's operations safer, and what is needed to make it easier to work on the technology," DeVito said.

BJWSA standards, in response to operator input,

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allow for a 24-in. clearance between the pump or any other unit inside the building and the wall. Through adjustments like floor-mounting controls toward the center of the building—rather than mounting them on walls—the authority's personnel are provided with ample space to kneel down and shuffle around while servicing equipment.

"This new design not only brings in more maneuverability, but also allows for more natural light during day operation of the station," DeVito added.

#### A Team Effort

The team effort between TenCarva, HEG, the city of Beaufort's engineers and Gorman-Rupp was exceptionally beneficial.

"The ideas TenCarva and Gorman-Rupp brought forward allowed everyone to come together to provide a solution to an interim problem without investing additional dollars," Emminger said. "Salespeople sell something new. These partners were there to help us find the right solution."

Since his retirement from the city of Beaufort in the late 1990s, Emminger has gone on to become the general manager of the Beaufort County contractor that was awarded the Bay Street lift station rebuild. As a result, Emminger has once again



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become an integral part of the planning.

"To Frank [Emminger], these stations are a good part of his life. He was very dedicated and treated the lift stations and maintained them for an entire career," DeVito said. "Knowing that he now has the opportunity to rehab that original station and bring it back to its original condition—if not better than when he originally turned it on—is rewarding. Because he flipped the switch on the original station, he'll be the person to flip that switch again to turn it back on. It doesn't get any better than that."

Upon completion of the Bay Street location, several additional station rehabs have been awarded to

both HEG and DuPriest. The last two of these were part of the original 1973 installations.

"There is absolutely a strong sense of pride in the mechanical side of our progress at Beaufort, but there's the human side of our success that goes through generations as well," DeVito said. "We're watching one generation develop and define best practices and then turn it over to the new generation."

The TenCarva team concurs: "Because of this relationship, we've been allowed to solve problems in such a way that really adds value," Ritchie said. [www](#)

Kenneth Dudley is marketing supervisor for The Gorman-Rupp Co. Dudley can be reached at [grsales@gormanrupp.com](mailto:grsales@gormanrupp.com) or at 419.755.1011.

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