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Vacuum Sewer Technology

Virginia developer solves complicated sewer problem.

| By Steve Gibbs

A Solid Foundation For Future Growth

Virginia developer solves complicated sewer problem.

Cape Charles, Virginia was once a thriving place. Throughout the first half of the 20th century it was a vital rail link between Philadelphia to the north and Norfolk to the south. The town boasted a bustling port where freight and passengers were boarded to cross the Chesapeake Bay. The city's stores and shops were often packed with patrons.

The slow decline of Cape Charles began just after World War II. Transportation routes changed, the local economy dwindled and the glory days faded from memory. Like an arthritic hand, the town became withered, weak, and unattractive.

Cape Charles was among the poorest communities in all of Virginia in 1998 when developer Richard S. "Dick" Foster closed a deal to purchase 1,700 undeveloped acres. His vision was to create a resort community with modern amenities that would retain Cape Charles' rural, small-town charm.

Today, Foster's new Bay Creek development has condominiums and homes that fetch anywhere from \$300,000 to \$4 million. There are two new golf courses - an Arnold Palmer Signature Course and a Jack Nicklaus Signature Course. There's a new 224-slip marina on the bay, upscale restaurants and shops have opened, and the old town is bustling once again.



Above: Cape Charles is a thriving town once again thanks to the overwhelming success of the Bay Creek development.

"For more than 20 years the community had been losing people. Only three stores were still open and the town was on the verge of unincorporating," said the 61-year-old Foster. "Now they have a tax base. People are buying homes and moving in. Property values are going up. It's very rewarding to see this happening."

Property Pros & Cons

From a developer's standpoint, Cape Charles' location held both enormous advantages and serious obstacles. The rustic Eastern Shore of Virginia is known for its unspoiled beauty and bucolic feel. With its Chesapeake Bay shoreline, the town would seem an ideal getaway location for the 28.5 million people who live within a 3.5-hour drive. The area also has historic significance; "Old" Cape Charles is on the National Register of Historic Places.

The challenge Foster faced in developing Cape Charles was in creating a beautiful new community without spoiling the rustic charm or the local environment. For environmentalists, groundwater was a specific concern. Hundreds of new families moving to Cape Charles would potentially threaten the existing groundwater supply when pollution from the town's antiquated sanitary sewer leaked into the environment. Polluting groundwater is tantamount to polluting the Chesapeake Bay directly in the sensitive ecosystem of Virginia's Eastern Shore.

Designing and installing efficient new sanitary sewers became a pivotal aspect of the proposed Bay Creek development, and it was not an easy problem to solve. Installing sewers in coastal areas like Cape Charles pres-

Bill Powell, a technician with the town of Cape Charles, prepares to install a vacuum interface valve.



ents numerous headaches for developers like Foster. The town sits on extremely flat terrain, only 4-7 feet above sea level, so installing a gravity-flow system would require deep trenches - 12-14 feet deep - and at least a dozen pumping stations. Digging deep trenches would require lots of dewatering, as well as trench boxes and numerous safety considerations. The trenches also would require backfilling with select materials, not the sand and mud that would be excavated. Construction costs would be staggering and there would be no certainty that the new system would completely solve the problems of stormwater infiltration and sewage exfiltration.

In considering his sewer options, Foster recalled reading about vacuum sewer technology. Upon further examination of the technology, he found that installing vacuum sewers would eliminate many of the issues he would have with gravity sewers. A vacuum system would require much shallower trenches and far fewer stations, eliminate the need for extensive dewatering and trench boxes, speed up the installation process and, best of all, provide a sealed system that would protect the local environment.

"I give a lot of talks to environmental groups and it's great to report good news - this system won't contaminate groundwater and it will reduce treatment costs by eliminating infiltration," said Foster. "Vacuum sewers are really great environmentally."

Vacuum Power

Foster chose AIRVAC, Inc., of Rochester, Indiana as his vacuum technology provider. In a vacuum sewer system, a central vacuum station maintains vacuum pressure

within the sewer collection lines. Wastewater flows from each house by gravity line to a vacuum valve pit, usually located a few feet from the home or building. Typically, two to four homes can be connected to a single valve pit.

Each valve pit is equipped with a vacuum interface valve that activates when wastewater in the lower sump reaches a predetermined level, typically 10 gallons. When the valve activates, wastewater is pulled by vacuum pressure into the collector line, followed by a volume of air. The wastewater forms a slug that is driven by the air due to differential pressure. Operation of the valve pit is completely pneumatic, so external power is not required. An added benefit is that the sewage moves so rapidly through the line that buildups of grease or sludge are rare.

"Vacuum sewers made this project more feasible," explained Bobby Jarman, vice president of Baymark Construction. Jarman pointed out that the system is new and only a portion of its capacity is being used, but he is optimistic that vacuum sewer technology will be good for the city in the long run.

"It's a very low-maintenance system so we're looking at reduced costs over time. From an operational standpoint it is very smooth and trouble-free," he explained.

The Bay Creek development currently has about 1,000 connections on the new vacuum sewer system. When Bay Creek is fully developed, there will be up to 3,000 homes. Three vacuum stations have already been built to accommodate all of the planned Bay Creek construction. In addition, one of the vacuum

stations was built with ample capacity to handle the sewage flow of the new marina as well as the existing homes and businesses in Old Cape Charles. The city's public works department can convert the entire town to a vacuum sewer system should it choose to do so. If more growth occurs in the future, the system is easily expandable by simply building another vacuum station and adding more lines.

Maintenance Matters

Terry Tillery of Chesapeake Bay Contractors handled much of the installation work on the AIRVAC project. Although it was his first vacuum sewer installation, he reported no significant problems.

"We were unfamiliar with vacuum sewers, but AIRVAC was very good to answer all our questions and provide us with the materials we needed, when we needed them," said Tillery. "It's a much different, and in this case simpler, installation process than a gravity sewer. Because of the flat terrain around Cape Charles, this was a perfect application for vacuum technology. Since we didn't have to do any dewatering, installation was quicker and costs were lower. Nearly all of the trenches are 3-4 feet deep, about like a water line. For this type of application, I would highly recommend vacuum sewers."



Left: Each valve pit typically serves two connections. Laterals are connected to each home and operate on gravity flow principles. Right: The AIRVAC technology is easily expandable and will include the Bay Creek Marina.

Once the system went online, maintenance was turned over to the town of Cape Charles. Bill Powell, a technician with the town of Cape Charles, was given training by AIRVAC before he was assigned daily maintenance responsibilities. After four years working on both vacuum and gravity lines, he has formed some definite opinions.

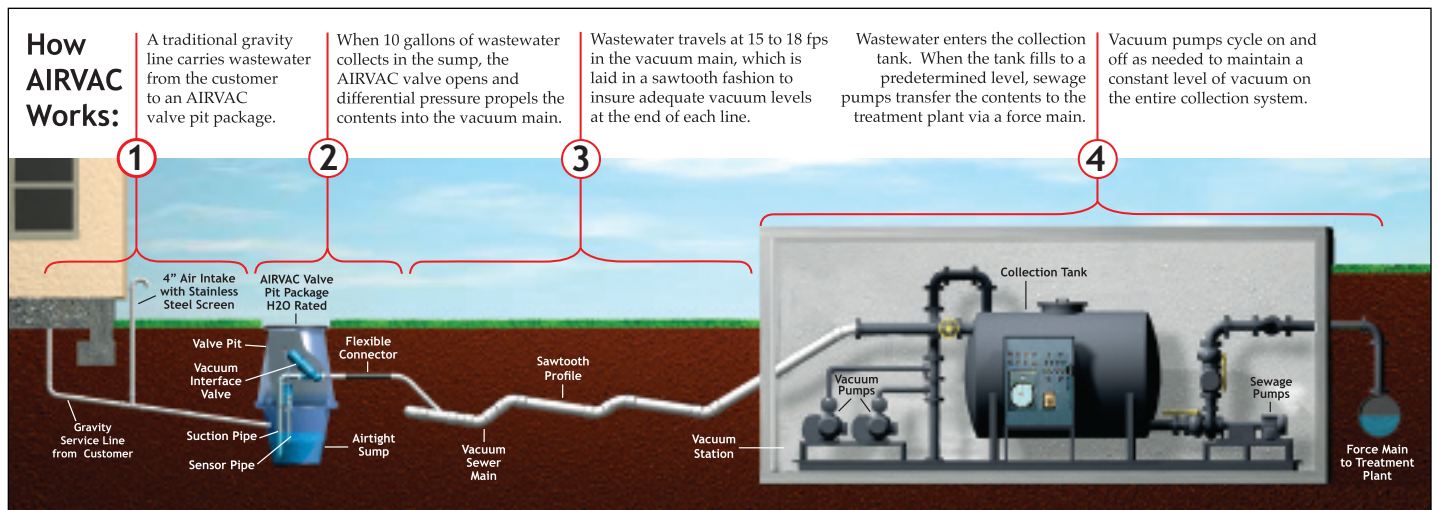
“Gravity sewers require more maintenance because grease builds up in the line and creates clogs,” he ex-

plained. “Vacuum sewers don't clog up with grease because the force moving through the lines doesn't let grease build up. There's also a safety benefit because vacuum lines are sealed, we never come in contact with raw sewage.”

With an efficient, modern vacuum sewer in place, the Bay Creek development can continue to grow, and Cape Charles will grow along with it. The benefits will be felt for generations to come.

“For a developer, a good sewer infrastructure is like a good foundation for a house,” explained Foster. “If the foundation is poor, you'll regret it later. You always want to put in the best foundation you can. My reputation is important to me, plus it's just the right thing to do.” **LDT**

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