



## CABARRUS COUNTY

### PROJECT-AT-A-GLANCE

Replacing traditional bar screens at North Carolina Wastewater Treatment Plant improves employee safety and reduces maintenance.

**CUSTOMER:** *Water & Sewer Authority of Cabarrus County*

**EQUIPMENT:** *Four (4) 4' x 47' FlexRake® FP-M w/ 1" Bar Opening*

**FLOW RATE:** *25 MGD / Per Screen*

**INSTALLED:** *2018*

## GRIT IN THE PIT

The Water and Sewer Authority of Cabarrus County (WSACC) serves selected water and sewer needs for five jurisdictions in south-central North Carolina—Cabarrus County, Concord, Kannapolis, Harrisburg and Mount Pleasant—providing wholesale wastewater transportation and treatment and reservoir management.

One of WSACC's primary facilities is the Rocky River Regional Wastewater Treatment Plant (RRRWWTP) in Concord. This two-stage 26.5 MGD biological wastewater treatment facility processes domestic and industrial wastewater from both in-plant and off-site sources. An innovative utility, RRRWWTP's solids processing operation relies on a combination of proven and innovative equipment including energy-saving and environmentally sustainable technologies.

In early 2016, maintenance staff at WSACC determined that the four existing bar screens at RRRWWTP's Main Pump Station (MPS) needed to be replaced. Upgrading the bar screens that had been installed in 1978 when the plant was built was a welcome opportunity to address serious operational challenges – safety, cost and time - that WSACC had been dealing with for years.

## THE PROBLEM

The bar screens were deep—about 40 feet from the deck level to the bottom, about 55 feet total – making them difficult to access at the bottom of the four-foot wide channel. The coarse screens at the MPS are used to remove debris from wastewater prior to entering the dry pit submersible influent pumps that convey the water to WSACC's headworks facility, which has climber fine screens and a grit removal system. While debris carryover can often be challenge to bar screen operation, WSACC's challenge to optimum screen operation was profound grit build-up. Grit is not an unusual issue with aging U.S. infrastructure, but it can – and did - wreak havoc with the traditional bar screens that WSACC needed to replace.



*New intermediate access level door*

During a rain event, when water flow picked up, grit would inundate the old screens and jam the sprockets at the bottom of the system. To get the screen moving again, Christopher Carpenter, WSACC maintenance manager, would need to send a maintenance crew of six or more in order to access a dark, four-foot by eight-foot pit to replace any broken components and shovel the grit out of the pit and into buckets that needed to be hauled back up to the deck. This would happen three to four times each month.

“The old screens constantly broke,” said Carpenter. “Access was so hard, and it was a tremendous amount of staff time - and permits for confined space entry - sending six or more people to access the lower level, down a ladder into a dark pit to replace the chain

and dig out the grit. The new screens would have to eliminate the need to send our employees down there.”

Engineering firm Black & Veatch, based in Overland Park, Kansas, was hired to work with WSACC staff to select the best option to replace their problematic equipment. The new screens needed to be unfailingly reliable during weather events, and the team was committed to finding a solution that would keep their maintenance crew out of the channel. While they initially considered climber screens that were working well in other parts of the plant, it simply wasn't feasible for this application; the space was just too tight at six degrees from vertical and the single carriage would have had insufficient cleaning cycle times for such a long unit.

## THE SOLUTION

The team agreed that the technology that would fully address their concerns was the FlexRake® FP-M 1" full-penetration coarse screens from Duperon Corporation. The stainless steel, link-driven mechanical bar screens are front-clean, front-return, mechanically cleaned screens with no lower sprockets, bearings or tracks that can jam below the deck. The FlexRake FP-M is ideal for vertical and near vertical applications, such as the one at RRRWWTP because the unique Flexor™ technology allows the screen to be vertical without adding submerged maintenance components into the channel.

“A lot of the previous issues were associated with the direction that the screen traveled,” said Thomas Hahn, utility system engineer. “We wanted to minimize the need to get to the bottom of the screen for maintenance. With the old rear-return style screen, the direction of the rotation required space - a pit - beneath the system. The grit would accumulate in the pit, which would prevent the chain from continuing to move at times. With the Duperon FlexRake screen, the pit was unnecessary and could be filled with concrete.”

“The old screens broke constantly.”

Used by communities across the U.S., the Duperon FlexRake FP-M is known for its low maintenance requirements. With no replaceable or fixed parts below the deck and Jam Evasion™ technology that lifts or pivots around grit and debris, maintenance would no longer be an issue and WSACC could stop sending employees into the channel on a regular basis. The lack of mechanical rotating features at the bottom of the screen was a deciding factor when choosing the FlexRake and was preselected in the bid prepared by Black & Veatch.

“So far, we push a button, turn on the screens, and the system deals with the grit.”

## PUTTING THE NEW EQUIPMENT TO THE TEST

The screens were put to the test soon after installation with back-to-back hurricanes, Hurricane Florence in September followed by Hurricane Michael in October. Although WSACC is far enough inland that wind wasn't a concern for the screens, there was significant rainfall, especially during Hurricane Florence. According to the National Weather Service, at one point, Florence was moving at only two miles an hour, slower than the average walking speed. That caused record-breaking amounts of rain and devastating flooding in areas across North Carolina. The flow through the RRRWWTP main pump station doubled to more than 50 MGD during the storms and all four screens ran during the event. WSACC personnel did have to replace a snap ring on one screen during the event, but was able to return the screen to service with minimal downtime, and without having to access the bottom of the channel.



Main Pump Station intermediate level

“All four screens at the Main Pump Station ran just fine,” said Carpenter. “We turned them on and dealt with other things, like grit inundating the headworks facility and grit removal system. Although that had always been a problem, we had never really noticed because the crew always had to focus on keeping the bar screens running!”

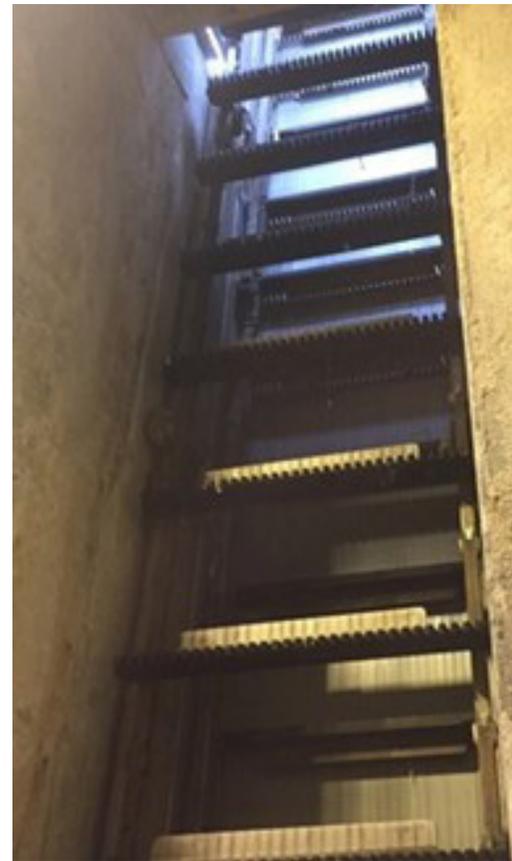
Carpenter explained, “We were able to primarily focus our available manpower to dealing with the grit at the Headworks Facility grit removal system. In the past we would have either split manpower between the MPS bar screens and grit removal or sent all available manpower to the MPS bar screens and forgo the grit removal due to lack of manpower. Grit is always an issue

at a wastewater treatment plant during heavy flows. Our thinking is it is much better to deal with the issues caused by grit at the Headworks Facility grit removal system than at the bar screens and the grit removal system at the same time. In our case, the working conditions at the grit removal system are exponentially better than the working conditions at the MPS bar screens.”

## COST SAVINGS

Time and employee safety aren't the only benefits WSACC is experiencing with their new equipment. The cost of maintaining the old equipment was significant, including \$100,000 to rebuild each screen every five or six years. With all four screens, they were looking at \$800,000 each decade, plus the cost of confined space permitting, and the labor costs associated with sending staff to fix the screens 3-4 times per month. Carpenter estimates that 10% of the WSACC maintenance budget was spent on the bar screens.

"All of this has been eliminated with the new Duperon equipment," said Carpenter. "We have had zero maintenance other than preventative greasing and inspecting. So far, we push a button, turn on the screens, and the system deals with the grit. We don't need to babysit it and there have been no problems at all. The Duperon screen basically walks itself over the grit so we've never had to send an employee down."



Main Pump Station intermediate level

## ABOUT DUPERON

*Duperon Corporation is the leader in innovative preliminary liquids/solids separation systems. For more than 35 years, Duperon has provided simple yet innovative solutions for a variety of screening and solids handling applications in the water and wastewater industry. Duperon technologies are designed and manufactured in Saginaw, Michigan.*