Choosing Durability: WWTP Team Replaces Mixers' Impeller Blades

By Chris French | 03-2017

The Durham County team chose mixers with stainless steel impeller blades for extended service life

Stainless steel blades on mixer impellers help eliminate maintenance issues and enhance process performance at Research Triangle Park's treatment plant.

Are fiberglass or stainless steel impeller blades better for a wastewater treatment plant's mixers? At one of the world's largest research parks, there is no shortage of expertise for weighing whether one material is better than another.

With more than 200 companies and some 50,000 people skilled in fields such as microelectronics, telecommunications, biotechnology, chemicals, pharmaceuticals and environmental services, Research Triangle Park in Durham County, North Carolina, is a place to find answers to all sorts of technical questions.

At the nearby Triangle Wastewater Treatment Plant, operators' experience made a case for mixers with stainless steel impellers. As a result, the plant team has been gradually replacing its fiberglass-bladed mixers with stainless steel.

Variable flows

Industrial wastewater accounts for 70 percent of the plant's intake, but it also handles large flows from the weekday workforce at the research park, and from 6,000 local residents on weekends, when flows are appreciably slower.

Joseph R. Pearce, deputy director of the Durham County Engineering and Environmental Services Department, says, "Although our percentage intake of industrial wastewater is significantly higher than the national average, we still have to deal with all the hair and rags that despite pre-screening can cause clogging problems for any treatment plant."

During his near 10 years at the plant, Pearce and his team have labored long and hard to keep the original mixer blades going. "We've been doing everything we can, but the clogging, especially during storm events, became more and more frequent.

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"We had to pull up mixers from which heavy hair mixed with plastics and cotton swabs were hanging, taking them out of service. It became normal for this to be once per month, per mixer in some of the treatment facility mixing zones. Eventually, the blades' gel-coat front edge wears off, making them split, and at up to almost $10,000 per blade to replace, this was something we had to address."

Processing solids

Built in the early 1960s and expanded in the 1970s, the Triangle plant was upgraded in 2005 when the 6 mgd tertiary treatment facility was replaced with a 12 mgd five-stage enhanced biological nutrient removal system that removes nitrogen and phosphorus with carbon source addition and chemical phosphorus treatment using sodium aluminate. The mixers installed at that time had fiberglass impellers.

In 2013, a new biosolids handling facility was constructed. This time around, with Pearce at the helm, the decision was made to use mixers from Landia that have solid stainless steel impellers.

The biosolids facility consists of two aerated holding tanks with 1 million gallons capacity, three centrifuges, and an automated truck loading station. Excess biomass flows to sludge holding tanks. The waste sludge thickens by gravity, and the supernatant is decanted into a sidestream equalization tank.

Landia mixers and jet aerators then go to work on the thickened material (1 percent solids) to ensure a uniform solids concentration and minimize anaerobic conditions. Polymer is added to the thickened material before it is moved to the centrifuges, which deliver a cake at 20 percent solids. This material is pumped to trailers for transport to a commercial Class A composting facility for stabilization and distribution to the landscape market.

"In our biosolids facility, we have no issues whatsoever with the mixers," says Pearce. "They were very reliable, so we then retrofitted a Landia mixer into one of our problem basins to try it. After a seven-month run we had no clogging whatsoever, so one by one as the existing mixers split, we replace them with the stainless steel impeller mixers. We expect fewer clogging problems and blade wear not to be an issue."

Maintenance savings

The Triangle plant now has 15 of the stainless mixers, and that is expected to almost double as the steel units are phased in. The mixers will be installed in the anoxic and anaerobic zones and in 18-foot-deep oxidation ditches requiring propellers about five feet in diameter, operating at 47 rpm.

"Not surprisingly, we've made a big saving on our maintenance program, and I'm also pleased for our team that there is now much less use of winches and crane hoists and exposure to rags because we don't really have to do much to the mixers," says Pearce. "We're extremely happy with our investment because improving Durham County's facilities and improving safety is very much our mission."

Setting standards at the Triangle plant is nothing new. The facility's administration building was the first to be LEED-certified. Low-energy, recycled, and regionally manufactured materials were used in its construction. The building's wastewater is treated and rerouted to the HVAC system and low-flow toilets. Using reclaimed water has reduced potable water use by 32 percent.

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In addition, the Triangle plant's recycled water facility consists of four turbine pumps, a hydro-pneumatic tank, a 500,000-gallon storage tank, instrumentation and metering, a dual disinfection system and a distribution system.

Recycling value

Recycled water has become a community asset for landscape irrigation, cooling towers and construction activities. In Research Triangle Park, having a redundant water supply is important for water-critical facilities such as computer database services, pharmaceutical plants, LED manufacturing, and agricultural research and development in greenhouses.

Triangle's proactive recycling didn't escape Pearce's eye when he recently snapped up some 12-year-old Landia mixers from another treatment plant in North Carolina: "Even though these mixers are over a decade old, the blades are in excellent condition. I'll gladly have these longer-lasting stainless steel units on board as backup."

See more about Landia mixers here