

## QUICK FACTS

- ◆ **INDUSTRY:** Municipal
- ◆ **PROCESS TYPE:** AB Activated Sludge
- ◆ **TECHNOLOGY:** DEMON®
- ◆ **DESIGN:** 27,600 LB/DAY NH<sub>3</sub>-N @ 3 MGD
- ◆ **STARTUP DATE:** September 2017

## BACKGROUND

Opening as a primary treatment facility in 1937, the Blue Plains Advanced Wastewater Treatment Plant is an enhanced biological treatment system located in Washington DC, and is the largest plant of its kind in the world. Needing to meet < 3 mg/L Total Nitrogen (TN), the facility uses an external carbon source, methanol, to aid in achieving this very low limit. Due to the amount of WAS (waste activated sludge) produced by the entire system, DC Water implemented a biosolids process, which included Cambi's Thermal Hydrolysis Process (THP) in conjunction with mesophilic anaerobic digestion to aid in producing beneficial biogas and reducing the amount of biosolids for disposal. As a result of this process implementation, the amount of ammonia recycled from the THP and digestion system was estimated to be 27,600 lb/day at full build out. This returned ammonia would have to be removed once again, to allow for the plant to continue to meet its effluent permit of < 3 mg/L TN, requiring large amounts of electricity for the blowers and methanol for denitrification.

Looking for a more sustainable and economical solution, the facility began evaluating Anammox (Anaerobic Ammonia Oxidation) based side stream treatment. The DEMON® process was identified after the first system was implemented at the Strass, Austria WTP in 2004. By 2010, the first pilot study was conducted to evaluate how the DEMON process would be able to treat the dewatered reject from the THP and anaerobically digested sludge.



## BACKGROUND CONTINUED

The implementation of the DEMON Anammox technology at Blue Plains WWTP would reduce the overall methanol requirements by roughly \$6 million per year. Detailed design started in 2012 and the construction broke ground in 2014. The system was fully installed and started up in September 2017.

## SOLUTION

World Water Works supplied the components for six of the largest DEMON reactors in the world to treat up to 27,600 lb/day of ammonia. The DEMON equipment provided by World Water Works, includes Anammox seed bacteria, aeration system and mixers, decanter, control system, instrumentation and Anammox retention. The blowers, normally supplied by WWW, were supplied by the contractor.

Due to inhibition issues with the THP filtrate, the system was designed at 0.6 kg N/m<sup>3</sup>-day with the use of dilution water of up to 150%. The desired ammonia removal was set at 72% while total inorganic nitrogen removal of 62%.

The new system started up in 2017. Once the first reactor was brought up to a loading rate of 0.5 kg N/m<sup>3</sup>-day, part of that reactor's content was pumped to a second DEMON reactor for start-up.

## SOLUTION CONTINUED

Due to the biomass being acclimated at this stage to the incoming THP filtrate, the ramp up of subsequent reactors was accomplished in a short period of time. In less than six months the DEMON system was treating 100 percent of the incoming filtrate.

Performance testing of two DEMON reactors showed the system was able to be loaded at an average loading rate greater than 0.7 kg N/m<sup>3</sup>-day which showcased an average ammonia removal of 86.8% and TIN removal of 83.3% over the 30 day period.

## CONCLUSION

Today, the facility treats over 300 MGD, while the use of its new THP and mesophilic digestion system with combined heat and power (CHP) generates almost 10 megawatts of electricity, allowing Blue Plains WWTP to cut its electricity consumption by a third. The facility also applies the Class A biosolids across the region - recycling nitrogen and phosphorus back into local soils.

The WWW DEMON Anammox installation has helped Blue Plains WWTP reduce its electrical and methanol requirements in treating the filtrate produced while allowing the facility to be even more sustainable for the future and maintain its leadership in being the most advanced treatment plant in the world.

