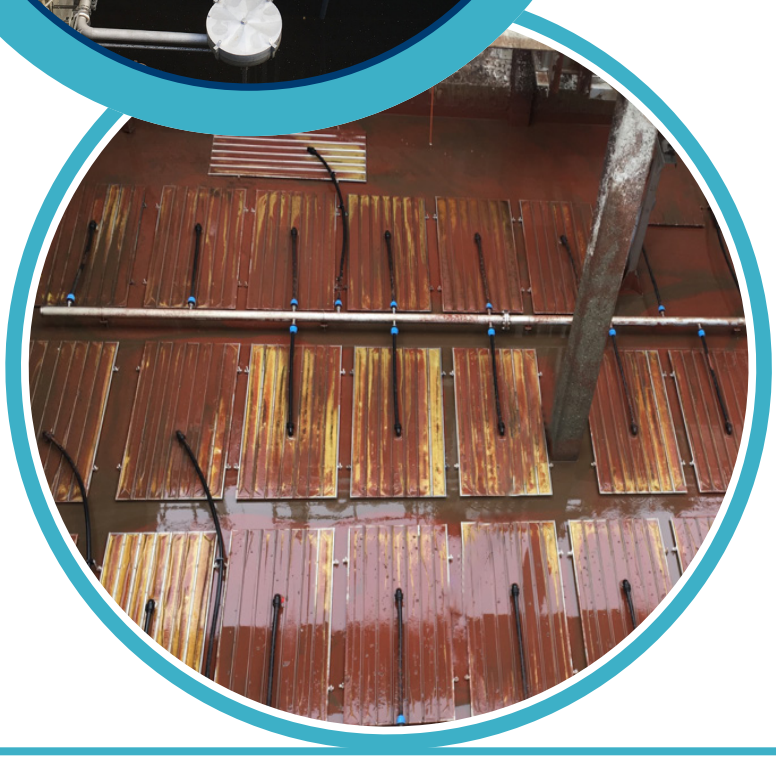
World water works

DEMON® ANAMMOX CASE STUDY

CHAMBERS CREEK WWTP, UNIVERSITY PLACE, WA USA

QUICK FACTS

- **INDUSTRY:** Municipal
- **PROCESS TYPE:** Activated Sludge
- **TECHNOLOGY:** DEMON®
- **DESIGN:** 3,190 LB/DAY NH_3-N @ 0.294 MGD
- **STARTUP DATE:** August 2017



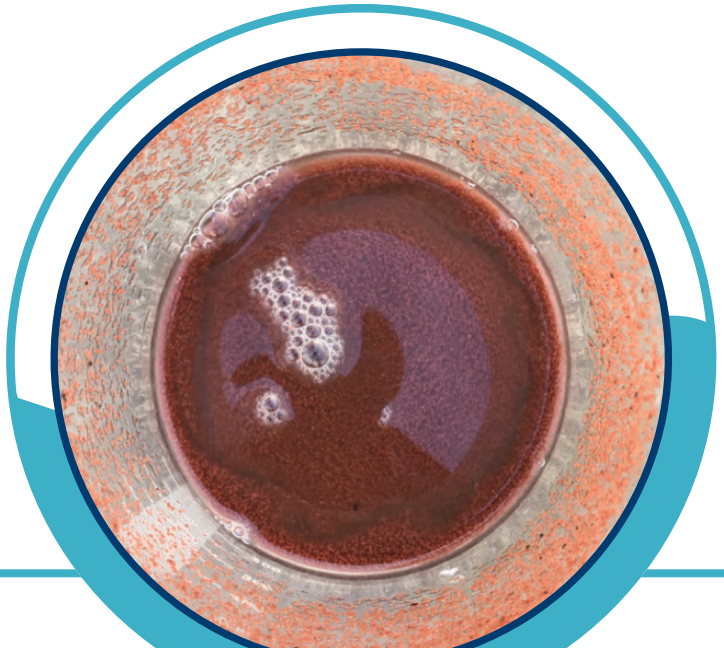
BACKGROUND

In 2011, Pierce County was exploring wastewater treatment options for dewatered centrate within a $350M facility known as Chambers Creek Regional Wastewater Treatment Plant. This new 170 ML/d (45 MGD) municipal wastewater treatment facility upgrade and World Water Works' DEMON® Anammox sidestream deammonification process allowed the plant to reduce the capital and infrastructure costs of the new facility.

The main goal of the system was to reduce the discharge of nitrogen to Puget Sound while also reducing plant operating costs while in nitrogen removal mode. At the time, there were no full-scale operating deammonification applications in North America. Pierce County agreed to conduct a four-month pilot investigation to validate the system and develop specific design criteria for the full scale Anammox treatment system. The pilot investigation proved to be successful and the detailed design began and construction following.

SOLUTION

World Water Works supplied all key components to the DEMON® process for two reactors designed to treat up to 3,190 lb NH_3-N/day of ammonia in dewatered centrate. Lessons learned during the pilot lead to multiple key design features being added to the design. One such feature was the addition of discharge cyclones which would be used when the system exhibited floating sludge to reduce the loss of Anammox bacteria.



SOLUTION CONTINUED

Prior to start up, seed sludge was collected in Europe at the start of June 2017, and arrived on-site on August 2, 2017. A single reactor was filled with final effluent, and then centrate was added until the ammonia concentration was approximately 75 mg NH_3-N/L. The seed was added to this solution, and mixed.

During the first month of operation, system loading increased from 38,000 L/d (10,000 gpd) to 151,000 L/d (40,000 gpd). With an average ammonia concentration of 1,750 mg NH_3-N/L, this equates to a specific loading rate increase from 0.10 to 0.40 kg/m^3/d. The reactor ammonia concentration was held near 300 mg NH_3-N/L, with the nitrate concentration increasing from 10 to 60 mg NO_3-N/L, and a nitrite concentration under 7 mg NO_2-N/L. The aeration demand at startup was low enough that a portion of the design air flow was blown-off to prevent over-aeration.

The system quickly ramped up from 1 cycle per day to the required 3 per day as more flow was being treated. Removal of ammonia remained greater than the target 75% the entire time and the performance test was conducted in November 2017.

CONCLUSION

The system started up in August 2017 and concluded a successful performance test by December of that year. The system continues to remove greater than 80 percent of ammonia and 75 percent of total inorganic nitrogen, equating to a reduction of over 400 tons per year of nitrogen loading to Puget Sound. In the future, if the plant needs to transition to mainstream deammonification using Anammox bacteria, the Chambers Creek facility is well positioned for bio-augmenting their Anammox bacteria from the side stream to main stream system to achieve reduced operational costs while still meeting the required effluent quality.

The following year, the plant was awarded best-in-class by the American Public Works Association 2018 Public Works Projects of the Year in the more than $75 million category for saving the county $7 million in life-cycle costs.