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LIFT SEE IT Program Trip Report

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In early June, 2017, three members of the City of Boulder's (COB) Wastewater Treatment Facility staff travelled to Northwestern Oregon to visit two of Clean Water Services' (CWS) Advanced Wastewater Treatment Facilities: Rock Creek AWWTF in Hillsboro, OR and Durham AWWTF in Tigard, OR. The trip was co-sponsored by NACWA, WE&RF, and WEF as part of the Leaders Innovation Forum for Technology Scholarship Exchange Experience for Innovation & Technology (LIFT SEE IT) program.

The main objective of the trip was to learn about phosphorus removal strategies in preparation for future P regulations in Colorado. CWS's AWWTFs have been performing advanced wastewater treatment since the late 1970s protect and enhance water quality in the Tualatin River. Using innovative technologies and creative operational strategies, their industry-leading staff continue to move the needle on the competing priorities of reliable nutrient removal and carbon emissions reductions.

A second objective was to see first-hand how CWS is leading the way with respect to resource recovery by harvesting struvite and enhancing methane production through their FOG receiving program.

Below are highlights of what the COB team will take home with them from their two full days of facility tours.

EBPR Stability: The UFAT Process and S2EBPR

The Unified Fermentation and Thickening process installed at both Durham and Rock Creek AWWTFs uses a two-tank series operation to ferment, then thicken primary sludge. The underflow and overflow from the first tank are combined and fed to the second tank for thickening and elutriation. The overflow from the second tank carries the volatile fatty acids (VFAs) produced in the process back to the anaerobic zones of the enhanced biological phosphorus removal (EBPR) process, where they enhance phosphate release, resulting in increased uptake in the anoxic and oxic zones. Since the COB WWTF has two gravity thickeners and a carbon limitation for nutrient removal, the UFAT process is especially apealing.

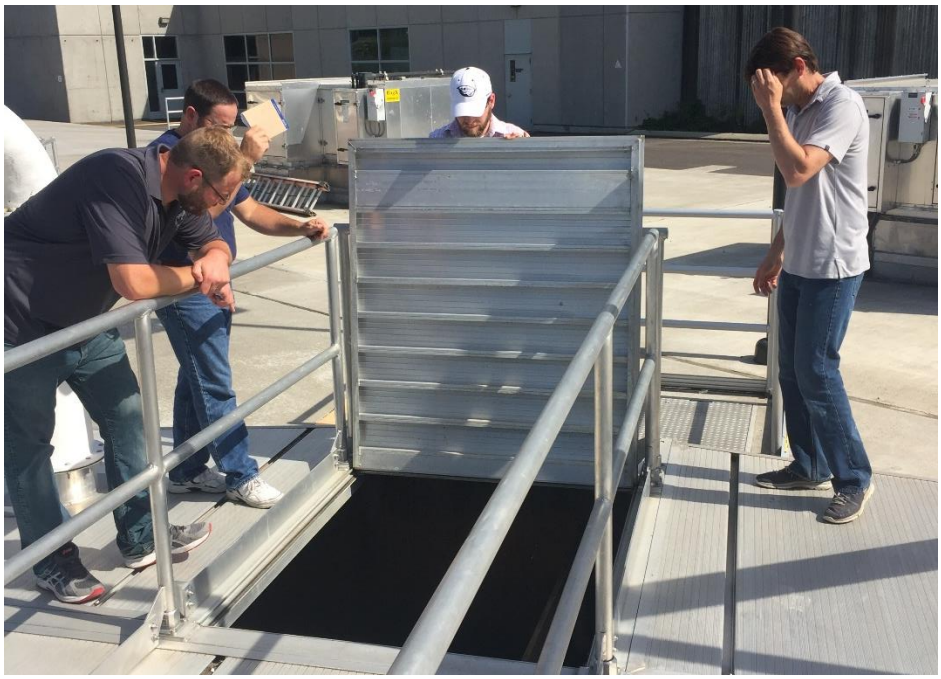

Figure 1: *COB and CWS staff tour the UFAT process.*

Another technique that CWS was investigating to increase EBPR stability is the concept of sidestream EBPR (S2EBPR). A sidestream of activated sludge mixed liquor is routed to a process tank with a long retention time to encourage fermentation and the release of VFAs. The process configuration that CWS was investigating at the time of the LIFT SEE IT tour was the West Bank configuration, where a portion of the RAS flow is diverted to a process tank that is upstream of the primary effluent inlet and the anaerobic zones. It was exciting to see the process of operating existing infrastructure in innovative ways to improve treatment.

A Holistic Approach to Phosphorus Management

Beyond the complicated challenge of carbon management, COB staff were wary of a few aspects of EBPR: high phosphorus loading in the return stream, maintenance issues from struvite precipitation, and decreased biosolids dewaterability. CWS was the first utility in the US to implement an holistic solution to these issues: Ostara's WASTRIP and Pearl systems.

Figure 2: *Staff discuss struvite harvesting technology during a tour of the Ostara Pearl System at the Durham Advanced Wastewater Treatment Facility*

The Pearl system is a struvite harvesting technology that precipitates struvite in a fluidized bed reactor into elegant bead-like spheres, dubbed Crystal Green, that are sold in the fertilizer market as a sustainable replacement to virgin fertilizer from the mining industry. The WASTRIP (Waste Activated Sludge Stripping to Recover Internal Phosphate) process releases phosphate and magnesium, which is sent over to the Pearl process to improve efficiency. It has a side benefit of reducing the amount of phosphate and magnesium being sent to anaerobic digestion. Lower phosphate and magnesium concentrations in the digester reduces struvite formation potential in the digester and increases the monovalent to divalent ratio in the biosolids, which is thought to improve dewatering.

Enhancing Methane Production – FOG Receiving Station

The COB has been operating cogeneration engines for over 30 years; however, the current infrastructure is in need of replacement and increased gas production would improve the payback on every alternative the city has considered. CWS successfully implemented a fats oils and greases (FOG) receiving station to enhance methane production, which they use to create heat and electricity. The process of getting this system up and running was fresh on CWS staff's minds – they offered many lessons learned, described ongoing challenges, and told some good stories about the evolution of their program to the success that it has become.

Figure 3: *COB and CWS staff discuss lessons learned with the FOG Receiving Station at the Durham Advanced Wastewater Treatment Facility*

Networking and Comraderie

In addition to learning a great deal about CWS's advanced nutrient removal and resource recovery systems, it was interesting to chat about similarities and differences in our org charts, our data management systems, and shared challenges that we as utility staff are having to tackle.

The breadth and depth of knowledge and experience that CWS shared with the COB about nutrient removal and resource recovery and the time that they dedicated to this program far exceeded high expectations. COB staff returned home, minds racing with new ideas, excited to share the lessons we learned with our peers and colleagues in Colorado.