LIFT Scholarship Exchange Experience for Innovation & Technology (SEE IT)
Sponsored by: WRF, WEF, and NACWA

TRIP REPORT

SCHOLARSHIP UTILITY: Fond du Lac Regional Wastewater Treatment and Resource Recovery Facility (WTRRF) Fond du Lac, Wisconsin

SCHOLARSHIP UTILITY CONTACT: Cody Schoepke, Wastewater Superintendent, cschoepke@fdl.wi.gov

ATTENDEES: Cody Schoepke, Ben Propson (Assistant Superintendent)

TRIP DATES: 9/23 – 10/5, 2018

UTILITIES/SITES VISITED:
Linz-Unkel, Germany: Linz-Unkel WWTP
Lingen, Germany: Lingen WWTP
Amersfoort, Netherlands: Amersfoort WWTP
Olburgen, Netherlands: Olburgen WWTP
Balk, Netherlands: Paques Headquarters
Munich, Germany: Augustiner Brewery WWTP

TECHNOLOGIES/INNOVATIONS SEEN:
EloDry - Dryer
Pyreg – Incinerator
Lysotherm – THP
Elophos – Nutrient Harvesting
EloVac – Vacuum Degassing
Ostara – Nutrient Harvesting
Demon – Deammonification
AnnamoPAQ – Deammonification
PhosPAQ – Nutrient Harvesting
ThioPAQ – Biogas Cleaning

TRIP BACKGROUND and RATIONALE (250 WORDS): *What technology did you select to visit? What is the problem you are trying to address? How did you envision the LIFT SEE IT scholarship trip helping your utility?*

We are undergoing a Facility Master Plan that will encompass the next 15-20 years here at the Fond du Lac WTRRF. At the top of this list is phosphorus and how we are going to meet our future discharge limits. We selected a variety of technologies to focus on current and future issues in Fond du Lac. Those issues and new innovations include Phosphorus (Bio-P Basin Configurations), Nitrogen (AnammoPAQ), increased Struvite/Vivianite formation (ELOPhos, OSTARA, and PhosPAQ),

Biogas Cleaning (ThioPAQ), Gas Production and Utilization (Lysotherm and ELOVac, and Biosolids Handling and Disposal (ELODry, Pyreg, and Offloading options). We perform biological phosphorus removal intermittently and will move towards a full Bio-P plant in the future with some plant modifications. Because we utilize Bio-P and have a high strength waste receiving program we have significant Struvite issues which cause maintenance headaches and operational problems. With the high loading of our sidestream to our mainstream in both ammonia and phosphorus we are moving to reduce those levels. In turn this will reduce energy, chemical usage, and additional capital expenditures to meet our lower phosphorus discharge limits.

Nothing is more beneficial than real world experience and speaking with people who utilize these specialized equipment/processes on a daily basis. Witnessing plants that have similar setups to ours who utilize bio-p and have anaerobic digestion and to see how these new technologies are affected by these unique systems really brings it close to home. When making these decisions to move forward with capital improvement projects those firsthand accounts of the operators make it easier for our staff to understand which technologies will be better suited for our situation.

TRIP SUMMARY (1 page max. Please include 10 photos and a 1-2 minute video montage from the trip. The video does not need to be professional, however if you have the means to create a professional video feel free to do so): *Why did you select the specific utility and technology for the visit? Based on your visit, do you think this technology/approach works for your utility? How useful was the trip in your decision making process? What were some of the trip highlights and takeaways?*

We are undergoing a Facility Master Plan that will encompass the next 15-20 years here at the Fond du Lac WTRRF. At the top of this list is phosphorus and how we are going to meet our future discharge limits. Unfortunately a variety of processes are affected by phosphorus and its removal in wastewater. How we plan to address the potential increase in Struvite/Vivianite and the extra biosolids caused by poorer dewatering will be high on the list as we move through the plan process.

We chose these specific facilities because they had newer technologies that address these issues we are facing. Linz-Unkel WWTP was a great example of producing a Class A product and significant volume reduction via EloDry (Biosolids Dryer) and Pyreg (Incinerator). A big issue in Europe is land application. As of the end of September biosolids are no longer able to be land applied in Germany. Landfill costs are astronomical at numbers approaching 125+ euros/ ton or $144/ton. The significant cost of hauling and disposal were a big reason this plant went forward with this setup. This equipment allows them to cut their volume down to approximately 10%.

The Lingen WWTP was similar to ours both in sizing and operation. They perform Bio-P about 75% of the time due to influxes in loading to the plant from industry and the colder climate they endure. In 2012 this plant installed Lysotherm which is a thermal hydrolysis process that uses hot oil to heat up the sludge. It is a modular system so it can be expanded as needed. We were told that it doubled their biogas production and volatile solids reduction. They use waste heat from the CHP unit to heat the oil. There is a clean in place unit for this system with which they are able to isolate one module and keep the system online. This type of system may be advantageous to us for increasing digester capacity as we look to take in more high strength waste. We currently have waste heat from a CHP unit that we could use for this process. This plant also has a mesophilic anaerobic digestion complex combined with a sludge based nutrient harvesting process known as EloPhos. EloPhos takes sludge after digestion and sequesters the Struvite putting it in

their biosolids. They chose to sequester instead of harvest because there was no financial benefit for it where they are. EloVac is a system used in conjunction with the nutrient harvesting system in place of aeration in the reactor. It is a degassing system to strip out CO2 and other gases. The methane that is reclaimed from this process is roughly 150kwh of savings/day. It is not an energy positive system, but does provide some real savings.

We visited the Amersfoort Netherlands WWTP. This facility sees an average flow of 11.5 MGD so slightly larger than our facility. This plant performs Bio-P nearly 95% of the time and polishes with some ferric. Along with their own sludge Amersfoort takes hauled in sludge from nearby communities which adds up to about 11,800 DS/yr. They too have Lysotherm THP units (3) which they installed to reduce the amount of sludge to dewater. Their claim was also a doubling of the biogas production and VSR. This process was installed in 2014 and is expecting an ROI of 7-8 years. They have 3 CHP units (500 KW each) with which they sell back to the grid and utilize the waste heat for Lysotherm and other process heat. They see an average of 5,400 DS/yr of cake with a centrate containing approximately 100 mg/l OP. They installed the OSTARA nutrient harvesting system to minimize their Struvite maintenance issues and also provide a revenue source for the city. They produce approximately 2 tons/day of Struvite which is dried, bagged, and sold. With the Lysotherm and OSTARA systems utilizing WASSTRIP they are seeing upwards of 30% DS for cake. Amersfoort WWTP utilizes the DEMON Deammonification System for Sidestream Ammonia removal. It consisted of the above ground reactor tank, and a hydrocyclone. Unfortunately there wasn't much to see because the system was not in operation while we were there. It was good to hear from the operations staff that the biomass rebound quickly from temporary outages.

We visited the Olburgen WWTP in the Netherlands. It is a combination of municipal and industrial and receives high loading form a local potato plant. They have a THIOPAQ system for H2S removal in biogas which is a biological system with similar concepts to ours and may be a potential option in the future when we look to expand. This plant has Paques's 1st installation of the AnammoPAQ deammonification system which is now 13 years old. This system is in series with their PhosPAQ nutrient harvesting process which provides a great slow release fertilizer for its customers. The AnammoPAQ system hadn't been taken offline in over ten years. They took the system down for 2-3 days for maintenance/inspection and removed all the biomass. Once the biomass was returned to the reactor and the system was restarted it took only 24 hours to see nutrient removal taking place. This is something that we were happy to hear because we don't know how often we may need to take our system down and how the biomass will react. This visit in particular was important because we were able to see the process functioning and providing expected results for a system that we are currently building. Also, it was great to see nutrient harvesting working as expected in line with deammonification and that there are no Struvite concerns in their Anammox piping and reactor. We have nutrient harvesting next on the list of projects so it is prudent to make sure all these systems play nicely together.

We visited the Paques headquarters in Balk, Netherlands. We were able to tour their facility and discuss not only our project, but also to see that all the Paques equipment and processes are designed and built onsite….by hand. Paques has several different technologies that are produced at that facility so their footprint is quite large. Paques works with a black polyurethane material for some of its tanks and piping which we were told is much cheaper than stainless and is corrosion resistant. We were not aware of this and will be something we look at as an option in future projects.

The final wastewater plant we visited was in Munich Germany at the Augustiner Brewery. The brewery was discharging 10,000+lbs/BOD/day and receiving hefty surcharges from the local municipal wastewater plant and rightfully so, but they knew they needed to do something about their setup to cut down on those costs. This brewery is one of the oldest and largest in Germany. Their buildings are pre WWII and made up of thick concrete walls and thick roof trusses/beams. It is evident on some of the roof trusses which were charred from being burnt during the war that this area took on some damage. They are land locked where they are so expanding to a nearby site was not an option. The only thing that made sense was to remove some of their malt storage tanks to a different building and put in their own pretreatment wastewater plant utilizing existing space. After much discussion they decided the only way was to take a section of roof off and drop the tanks in through the ceiling section by section. The wastewater plant makes up a portion of the 6 floors that are above ground while there are 4 more floors below. It was impressive to see the size of the tanks, the piping, and process equipment that were designed to fit in a very compact area and be able to produce the treatment they were looking for. The lesson learned here is that making use of existing infrastructure saves money, both in materials and time to construct. It was also good to hear the industries side of things in situations facing hefty sewer surcharges and how they can address them with a quick ROI (2 years) without affecting their process.