LIFT – INNOVATION EXPERIENCE ABROAD

Fond du Lac WTRRF and the LIFT SEE IT Program

By Autumn Fisher

Water resource recovery facilities (WRRFs) are transforming themselves into utilities of the future and becoming drivers of resource recovery, economic growth, and improved environmental performance. The implementation of innovative technologies, processes, and approaches is paving the way for this transformation. An effective way for utilities to learn about, gain confidence in, and adopt new technologies and approaches more quickly is to be able to visit and see them in action at peer facilities. However, many utilities, especially smaller ones, have limited travel budgets or travel restrictions, thus resulting in a reduced ability to visit facilities nationally or internationally. This impedes the ability to learn best practices and adopt new technologies.

The LIFT Scholarship Exchange Experience for Innovation & Technology, otherwise known as the LIFT SEE IT program is an initiative spearheaded by WRF, WEF, and NACWA to provide scholarships for utility personnel to visit other utilities with innovations of interest and to share experiences with their peers. Innovations may include new technologies and processes, but also novel approaches to service, operations, and finance.

LIFT has identified 12 Technology Focus Areas as priorities, though SEE IT applications are not necessarily limited to the following topics:

- Biological Nutrient Removal
- Phosphorus Recovery
- Digestion Enhancements
- Energy from Wastewater
- Biosolids to Energy
- Collection Systems
- Stormwater and Green Infrastructure
- Small Facilities
- Odor Control
- Disinfection
- Water Reuse
- Intelligent Water Systems

LIFT SEE IT provides hands-on interaction with innovative technologies and enables utilities with plans to implement new technologies with the needed perspective and information to accelerate adoption at their own facilities. LIFT SEE IT is a tool and resource supporting the transformation of water resource recovery facilities into utilities of the future.

In 2018, LIFT awarded 10 utilities and 28 total staff members with SEE IT travel scholarships. One utility awarded the scholarship was the Fond du Lac Wastewater Treatment and Resource Recovery Facility (WTRRF) located right here in our very own CSWEA region.

BACKGROUND

The Fond du Lac WTRRF first learned of the LIFT SEE IT program in 2017 and quickly began making plans on how to apply and take advantage of the opportunity. The facility was approaching the design and construction of an on-site deammonification system and would be undertaking a facility master-planning project in the near term. Therefore, the goal of a trip and various site visits could serve multiple purposes.

The primary goal, learning about technologies that were nearing planning or construction, included proposed site visits of various Paques

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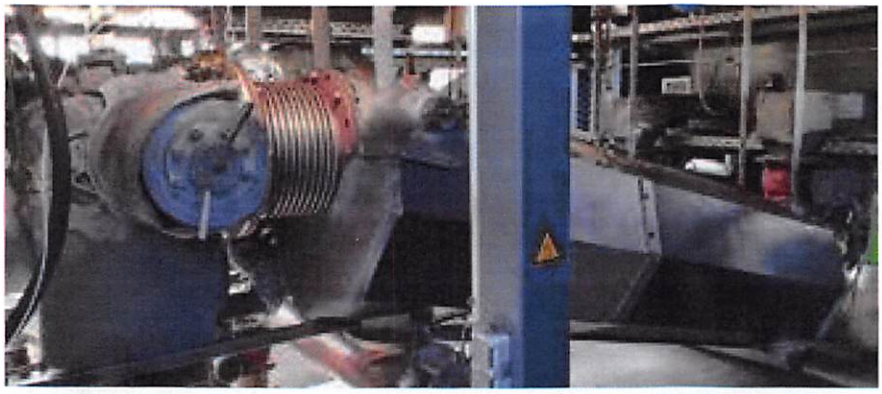
Lingen Digester-Nutrient Harvesting Complex

Paques Headquarters



Pyreg Incinerator

AnammoPAQ™ installations. While there are a number of sidestream ammonia removal processes now operating in the US, Fond du Lac WTRRF will be the first AnammoPAQ™ installation in the country and the opportunity for a site visit provided the staff with a gained understanding of lessons learned during start-up and daily operation from facilities that have been operating for many years.

In addition to the projects in the nearest term, Fond du Lac's facility master planning project provided a secondary goal of exploring innovative solutions for nutrient harvesting/sequestration, biosolids, and biogas upgrades. While there are several struvite harvesting/sequestration systems operating, in design and/or early construction in the US, there are currently no installations in operation of either Airprex or NuReSys. Additionally, there are no deammonification systems that are operating in conjunction with struvite harvesting/sequestration in the US.

TRIP OVERVIEW

Approximately one month following initial application, Fond du Lac WTRRF was notified they had been awarded one of the travel scholarships through the LIFT SEE IT program. In the coming months, staff worked with various manufacturers and consultants to finalize their itinerary for travel in September 2018.

The trip included visits to the following locations and focused on the processes listed:

Amersfoort WWTP – Amersfoort, Netherlands

- Energy Neutral
- LysoTherm® – Thermal Hydrolysis Pretreatment (THP)
- DEMON® – Deammonification
- OSTARA® – Sidestream Based Nutrient Recovery

Lunz-Unkel WWTP – Cologne, Germany

- EloDry® – Biosolids Dryer
- PYREG® – Biosolids Incinerator
- Waste heat from turbines and PYREG® process are used for process/building heat

Lingen WWTP – Lingen Germany

- Lysotherm® – Thermal Hydrolysis Pretreatment (THP)
- EloPhos/EloVac® – Sludge Based Nutrient Recovery

EloVac® – Vacuum Degassing Reactor at Lingen WWTP

Olburgen WWTP – Olburgen Netherlands

- Paques AnammoPAQ® – Deammonification
- Paques PhosPAQ® – Sidestream Based Struvite Recovery
- Paques ThioPAQ® – Biogas Cleaning: Hydrogen Sulfide Removal

PAQUES Headquarters – Balk Netherlands

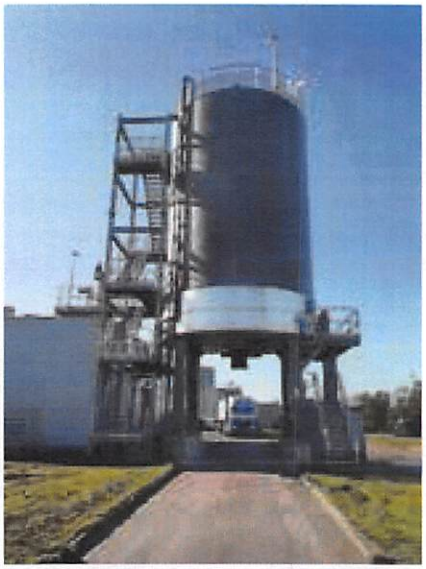
Augustiner Brewery WWTP – Munich, Germany

The brewery was being surcharged high fees for excessive biochemical oxygen demand (BOD) and nutrients to the local wastewater plant. In response, they constructed an on-site WWTP in

LysoTherm® at Amersfoort

Biosolids Offloading at Amersfoort

EloDry® – Lunz-Unkel



OSTARA® at Amersfoort

This marked the beginning of the solids treatment process at Lunz-Unkel.

Lunz Unkel Solids Handling Facility

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Pyreg Offload

EloPhos® Reactor – Nutrient Harvesting

EloPhos® Reactor – Nutrient Harvesting

Struvite Conveyor to Drying at Olburgen

The roof beams in Munich, charred from WWII fire.

a building erected prior to World War II that previously housed malt storage tanks. The ten-story building, four of which are underground, has stood the test of time and you could see some of the roof beams still charred from a fire during the war. The walls of the structure are so thick they opted to lower the treatment plant in through the roof instead. The project and WWTP facilities, having only a two-year return on investment, was a great example of how to leverage existing infrastructure and adapt to make a new process function within existing boundaries.

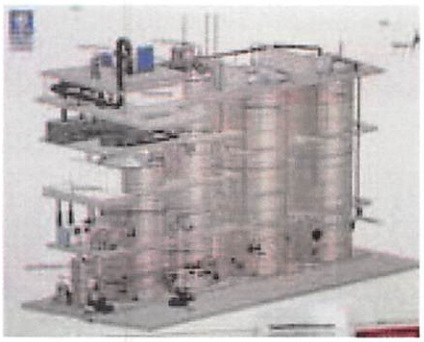
MOVING FORWARD AND IMPLEMENTATION

The LIFT SEE IT trip provided valuable hands-on opportunities to see the technologies listed above and implemented at these facilities. Staff at various locations provided anecdotal accounts of design, operations and maintenance of the systems that can be used in the decision-making process for planning and implementation at Fond du Lac WTRRF.

The following takeaways and considerations were highlighted from the Fond du Lac staff:

- Biosolid land application poses a significant problem in Europe, especially Germany. Beginning in October, land application of municipal sludge/biosolids will no longer be allowed. The governing agency is concerned with regrowth and redevelopment of pathogens once biosolids have been land applied. Wastewater facilities are being forced to incinerate sludge on site or transport to other centralized incineration facilities or landfills. The cost to landfill is upwards of €125 (euros)/ton ($140 USD) so even without incineration there is significant expense and many facilities are evaluating options to accommodate the new regulations.

  Fond du Lac WTRRF remains mindful of the potential changes for land application and how even a change from nitrogen-based application rates to phosphorus-based rates could have an impact on land availability and sludge volume.
- Low temperature drying (EloDry®) provides approximately 50% volume reduction and a Class A product. It is heated via hot water, therefore, waste heat or a boiler is necessary.



The brewery WWTP process consisted of an aerobic and anaerobic reactor.

Gas storage bubble on the top floor of the brewery.

Rooftop of Anammox Reactor and PhosPaq reactor.

Additionally, because it is low temperature, it produces very little dust.

- Biosolids incineration reduces sludge volume by 90% and generates product with phosphorus that is 100% plant available. The waste heat from the PYREG® incinerator can be used to supplement heat for the dryer.
- THP is a viable option for a facility to double biogas production, increase volatile solids destruction and increase digester capacity. The units (LysoTherm®) toured by Fond du Lac staff at two facilities use hot oil to break down the cells of the sludge. The waste heat from the CHP system is enough to maintain the temperature of the oil required for treatment. The Amersfoort facility expects a seven to eight year return on investment for their THP upgrades.
- The sludge based nutrient harvesting process known as EloPhos® uses a hydrocyclone after the reactor to capture fine struvite crystals and circulates them back into the reactor. EloVac®, a vacuum to capture off-gas including stripping of CO_2, is used in conjunction with this system rather than using a blower to provide air like other systems. The equipment supplier claims 340 liters of biogas/m^3 of sludge can be recovered. This process has also been shown to increase dewaterability up to 5% in cake solids.
- Fond du Lac WTRRF staff visited Olburgen where Paques deammonification and nutrient harvesting systems are operating in series. The Anammox reactor had removable covers to help maintain temperature in the winter months and aid in containing odors. Additionally, much of the structure/piping they use is a black polyurethane material that for them costs much less than stainless steel. The material is corrosion resistant and can withstand a wide pH range. They look like big plastic tanks molded from the factory. Upon closer inspection, the tanks had what looked like welded seams and with a special welder could be customized and each section welded piece by piece.

  Based on the design configuration with removable covers at Olburgen, Fond du Lac may need to consider something similar for their Paques installation to accommodate weather conditions. It was very valuable for the staff to see a system in operation and working well. Additionally, the corrosion resistant piping and structure material was a new innovation to Fond du Lac they may consider for future projects.

Fond du Lac WTRRF utilized the valuable opportunity provided by the LIFT SEE IT program to experience innovative process integration at the facilities visited in Europe. They have already been included on the list of site visits for other participants including tours of their Biorem® hydrogen sulfide gas cleaning system and conversations regarding experiences during piloting efforts. Fond du Lac staff looks forward to continuing to pay it forward to other facilities as AnammoPAQ™ comes online and opportunities and experience allow.

THE APPLICATION PROCESS

The staff at Fond du Lac highly recommend applying for this incredible opportunity. The process is easy and if interested the first recommended step is to sign up for the Laterals E-Newsletter through the Water Research Foundation at *www.werf.org*. The newsletter will release details of when the application for the LIFT SEE IT program opens which generally occurs in the fall of each year. Applications must be submitted by mid-December and recipients are generally notified in mid-January.

Applications are evaluated and ranked using the criteria listed below:

- **Merit:** Technical or innovation merit of site visit.
- **Importance to Utility:** Trip's importance to the utility learning about the technology or innovation for potential pilot or implementation.
- **Relevance to Staff:** Relevance of the technology or innovation to the staff member(s) participating in the visit.
- **Implementation Potential:** Reasonable chance of implementation at applicant's facility in the future.
- **Budget:** A reasonable budget that provides good value.

As part of the application process, a facility must meet the following requirements and provide the requested information:

- The facility or a staff member must be a member of WEF, WRF, or NACWA.
- The Description of the facility and customer base or service area.
- The trip must be relevant to upcoming needs or planning with a summary of implementation timing.
- A proposed itinerary with site locations and technologies/processes of interest.
- A 500 to1000 word narrative of how the facility would benefit from the trip and why.
- A list of who would participate and their role at the facility (resumes of participants must be included).
- The trip budget including cost share to be provided by the facility.

To view 2017 trip pictures, videos and highlights and start planning your LIFT SEE IT trip, visit *www.werf.org/lift/LIFT_SEE_IT*. CS

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