Lewes Board of Public Works
Contingency Committee Meeting Minutes
October 23, 2023
2:00pm

Committee Members

- Barbara Curtis, BPW Assistant Treasurer, chair
- Earl Webb, BPW Board Director
- Tim Ritzert, City Council Ex-Officio
- Mark Prouty, Committee Member
- Bob Heffernan, Committee Member
- Austin Calaman, BPW General manager
- Donna Colton, Committee Member- Absent
- Sumner Crosby-Absent
- Daphne Fuentevilla, Committee Member-Absent

Others Present

- Sharon Sexton, BPW Executive Assistant
- D. Preston Lee, P.E., BPW Secretary
- Richard Nichols, BPW Treasurer
- Robin Davis, BPW Assistant Manager
- Paula Dorn, Aqua Nereda
- Bill LaPorte, Envirep, Inc
- Joshua Gritton, BPW IT Director
- Michael Wolgemuth, Inframark

The meeting was called to order at 2:19pm.

Aqua Nereda presented an overview of Aerobic Granular Sludge Technology.

Discussion/Presentation

- The meeting covered Aqua Aerobic Systems and the wastewater industry, including their products, history, licensing agreement, and operator qualifications.
- Expressed the need for maintaining a good food-to-mass ratio and balancing granulation targets with effluent objectives during long-term operation.
- Discussed the need for a redundant design to accommodate reactor downtime and meet effluent limits.
- Highlighted design considerations for operator access and compliance with current regulations.
- Discussed use of current membranes with filters for higher quality results.
- Discussed filter cleaning process and equipment placement for new plant.
- Highlight the variability in the startup process, existing systems, or new installations.

- Aqua Nereda's technology offers specific features such as rapid settling, enhanced nutrient removal, energy savings, and operational simplicity.
- The importance of continuous data organization and communication during the startup and operation of a plant.

- The design flow allows for different options, giving the client the ability to choose the best system for their needs.
- Mention the granulation process and the timeline for full granulation.
- The importance of characterizing seed sludge and being aware of effluent requirements during the startup process was discussed. The procedure for seeding a plant or starting up was highlighted, with considerations of seed sludge and effluent requirements.
- Discussed potential use of digester sludge during startup.
    - The most ideal sludge to use as seed would be conventional activated sludge (CAS) from aeration tanks, MBR systems, SBRs, etc. If not available from the site's existing system or a nearby plant then a site can also consider RAS (return activated sludge – activated sludge that is wasted from a reactor but immediately sent to another basin in flow-through CAS systems), WAS (waste activated sludge – activated sludge that is wasted from reactors of any CAS treatment technology), or digester sludge. Digester sludge is generally seen as the least desirable simply because it has already been partially digested! I warn that digester sludge can take a bit longer to "turn over" and develop a strong microbial community. The one pro is that it is more concentration so less volume of seed is required. This can be important for more rural areas that may have to haul sludge a further distance. The most ideal sludge would be CAS as the desired biology should already be present and active.
- Emphasize monitoring waste and sludge yields and adjusting settle time.
- Compare the appearance of the system after startup to the demonstration reactor, highlighting the rapid increase in granulation.
- Potential reduction in polymer uses and increase in dry solids production in dewatering.
- Advantages of the system include handling variable flows and flexibility with the number of reactors.
- Shared potential for retrofitting systems based on design, flow rates, and load requirements, implying varied cost structures.
- Emphasized company's capability to remotely control programming changes for smoother operation and desired any beneficial changes or upgrades.
- The system allows for a flexible and efficient treatment process, especially for industrial sites with variable flows.
- Provided an overview of applications and flow rates ranging from small plants (50,000-100,000 gallons/day) to a large facility in Dublin, Ireland (165,000,000 gallons/day).
- Additional tanks can be added for more flow if needed.
- The Montana plant modifies its operation during lower load months like January and February.
- The Alabama plant reached 10,000 milligrams per liter last year, causing the food to mass ratio to go too low.

    - 10,000 mg/L of mixed liquor suspended solids (MLSS) aka biomass, sludge. Food to mass (F/M) ratios are ideally within the 0.020-0.200 lb BOD/lb MLSS range. Running at too low of an F/M can lead to scum; too high can cause a surplus of dispersed sludge – this is the same for all CAS systems as well. The solution is straight-forward: if you have a low F/M, you have too much MLSS and need to waste more; if you have a high F/M, you need more MLSS and will thus reduce the waste amount. Again, this is the same approach for CAS systems. Most of our AquaNereda plants are designed to operate at a MLSS of 8,000 mg/L *at full design flow and load conditions.* Most sites will not see full design conditions for a number of years so will operate with a lower MLSS concentration just as a CAS system would. Wolf Creek let their MLSS climb too high, they started to notice some

"floaties" on their reactor surface, then they increased their wasting over a period of 1-2 weeks to bring the MLSS down to around 6,000-7,000 mg/L at the time. Problem solved and no significant impact on effluent quality!

- The COVID situation emphasized the necessity of a process-driven approach and data tracking.
- Discussed wastewater treatment and anaerobic treatment for phosphorus removal.
- The food to mass ratio guides wastewater treatment system operation instead of solids retention time (SRT).
    - Both F/M and SRT are functions of the MLSS concentration and are good assessments of system health for both CAS and AquaNereda, but F/M considers the influent carbon load whereas the SRT only looks at solids. The main reason we let the F/M guide us is because the SRT of aerobic granular sludge is variable: tiny granules have a shorter retention time while the large granules have obviously been in the reactor longer as they have grown larger. There is still an average SRT within an AquaNereda reactor that is fairly like the SRT that would be seen in a comparable CAS system. The Idaho Springs, Colorado operator prefers to adjust his wasting strategy based off SRT which is perfectly fine if his F/M is also in an acceptable range.
- Operators use data tracking to adjust operations based on the load.

Challenges

- Retrofitting systems based on varied design, flow rates, and load dictates cost differential. Need to identify what can be reused from current site to reduce costs.
- Suggested a process focus, possibly challenging for operators used to mechanical-focused systems.
    - More focused on sites that move from fairly basic treatment such as a lagoon that requires little attention other than some pumps to move water. A plant such as Lewes is already operating advanced CAS treatment technology (MBR) so operators should be able to easily transition to AquaNereda. Experience with any type of activated sludge process is helpful as the same biological principles apply.
- The AquaNereda system has a higher concentration of slow-growing organisms which leads to better phosphorus removal rates. Phosphorus removal is also linked to granulation in the AquaNereda system; the technology is designed to favor slow-growing organisms in its operation compared to traditional CAS technologies. Expressed concern over the delay caused by additional time for sludge growth versus shipping established granules at initial startup.
- Mr. Webb questioned changes being made to the systems to balance system operation. Ms. Dorn stated on incremental changes, nothing drastic. No visual difference across plants.
- Operators need to adjust their operations based on the load, which can be challenging.
    - Any type of technology will likely need to adjust system control one way or another if there is a large enough change in influent conditions to encourage it; this is not at all challenging with the AquaNereda process. This is usually as simple as changing the cycle time or wasting rate to handle swings in flow and/or load.

Positive Moment

- Aqua Nereda's technology offers a small footprint, cost savings, manageable biological nutrient removal, operational simplicity, and data provision on energy and long-term cost savings. It improves batch processes and makes wastewater handling easier for operators.
- Aqua Nereda was able to recover quickly from a toxic shock.

- The system is designed to selectively waste every single cycle within the reactor itself.
- Aqua Nereda has the flexibility in handling uncertain future flow requirements, ensuring carbon availability for nitrogen and phosphorus removal.
- AGS has rapid recovery and offers benefits such as improved settling time, simultaneous nitrification and denitrification, and greater robustness in handling upsets.
- Complete granulation is achieved within 3 to 6 months. Plants with higher influent carbon concentrations will likely see more rapid granulation as they are bringing in more “food to feed the bugs.” Primary effluent plants (that is, those with primary clarifiers before the Nereda system) will be on the longer side as the clarifiers are removing carbon/food before the Nereda. Regardless of granule content, the system will be operated to achieve effluent conditions from start-up. Complete granulation and operation at the design MLSS (generally 8,00 mg/L mentioned under #2) is only of absolute importance when the plant is at or nearing design flow and loads which is generally not the case for a municipal plant at start-up.
- The benefit of having two or three reactors is that when doing maintenance, there are two to play with, giving more flexibility with the cycle structure.
- Demonstrated the cleaning process of the filters through an animation, showing effectiveness and simplicity.
- Highlighted the company's filter manufacturing arm in Switzerland, indicating confidence in cloth quality.
- Showed enthusiasm about the filter system and ease of maintenance, discussing the use of Velcro and cloth longevity.
- Reactor dimensions are flexible, and the volume is more important than the exact dimensions.
- Appreciated clarification on filters' chlorine resistance and efficiency in algae growth applications.
- Discussed startup timeline for Wolf Creek plant and time to meet effluent needs.

Respectfully Submitted
Sharon Sexton
Executive Assistant