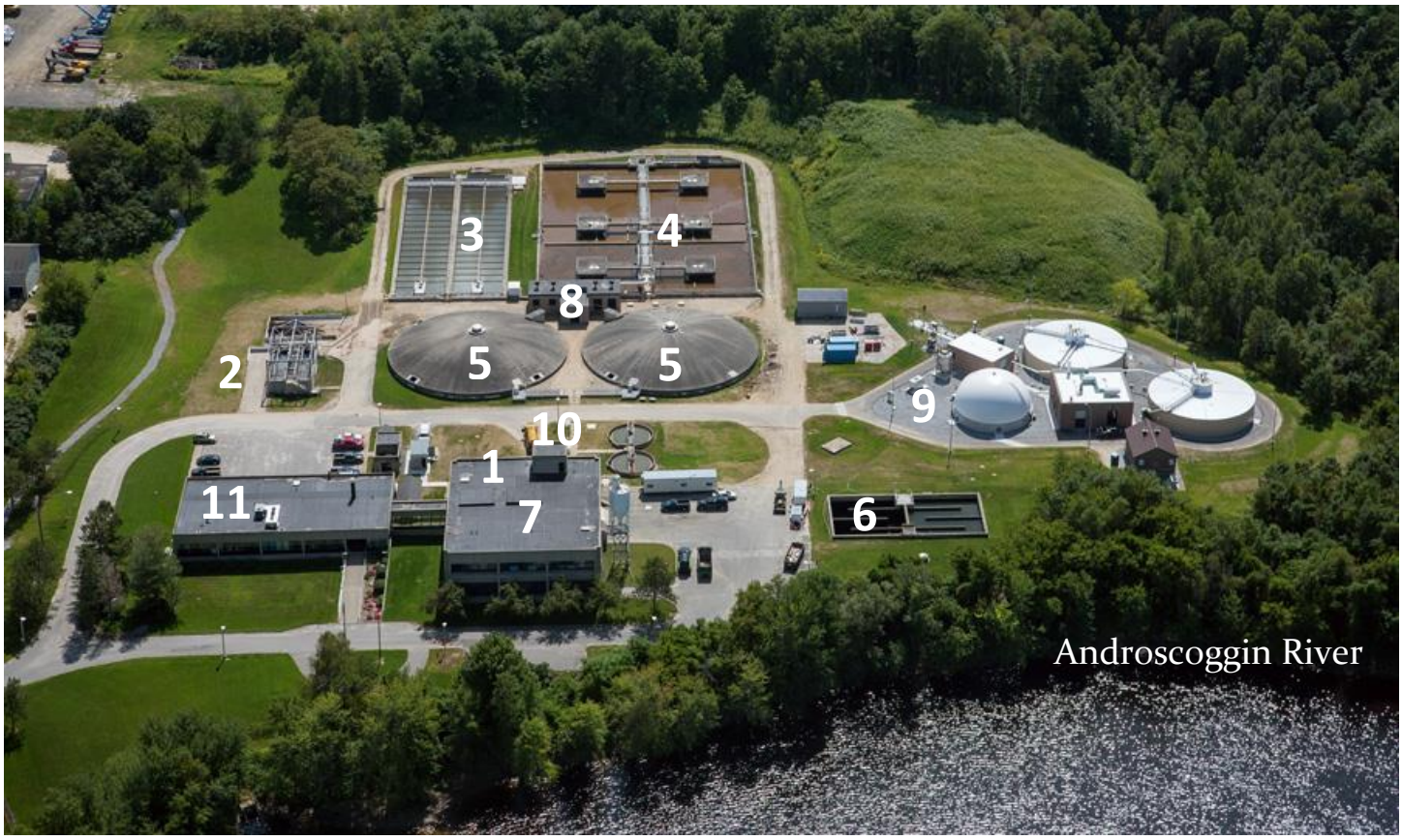
LACWA has been in operation since 1974 as a wastewater treatment plant. At that time, the Clean Water Act was brand new and the Androscoggin River was one of the top 10 polluted rivers in the country. In addition to environmental protection, treatment plants are considered one of the greatest public health advances in the past 150 years. LACWA services over 35,000 domestic users in Lewiston and Auburn, 18 significant industrial users, and 26 surrounding communities from which septic waste is received. Sources of wastewater include residential (toilet, sink, washing machines), commercial (car washes), industrial (manufacturing, wash downs), but also include sources such as rainwater and groundwater infiltration. The plant is designed to handle an instantaneous flow of 14.2 million gallons per day (MGD) but can handle a maximum of 32 MGD. Flow over 32 MGD goes to combined sewer overflow (CSO). LACWA is a quasi-municipal entity with a 7-member board of directors. The plant currently has 14 staff members and operates 24 hours per day, 7 days/week, often unattended while relying on technology for remote control and monitoring. The facility is highly automated and controlled by a network of minicomputers called PLCs connected to a SCADA (supervisory control and data acquisition) system.



June 5, 2024

1. Headworks – Bar screens remove large debris (e.g. rocks, sticks, trash, hygiene products).

2. Grit Removal - Dirt, small rocks, sand, and other coarse material such as egg shells are removed here.

3. Primary Treatment –Water then enters this tank where any floatable (primarily grease) and heavy solids removed from the process. The remaining liquid is the organic waste which we call "food" for the microorganisms. The solids are sent to another tank for further thickening. The grease material is collected at the end of the basin, removed and thickened, then periodically removed for final disposal at landfill.

4. Secondary Treatment (Biological Treatment) – Naturally occurring microorganisms, under high levels of aeration, utilize waste as a food source. The more "food", the more the microorganisms reproduce, creating a biomass called "activated sludge". Our main job at the plant is to keep the right amount and type of microorganisms happy so that they provide the best possible treatment of the waste. As these microorganisms multiply, we determine daily how many "extra" we have and pump them out of the system. The cycle never ends, and these tanks are where the majority of treatment takes place. There are numerous dissolved oxygen sensors within these tanks to ensure proper levels are maintained by sending signals to the aeration blowers.

5. Secondary Clarifiers – The activated sludge enters the clarifiers, which provide a still environment (no aeration or agitation). The biomass will floc together and settle to the bottom, and the clean water will flow out over weirs and continue on to final treatment. The solids at the bottom that contain the microorganisms are sucked off the bottom roughly every hour and are sent back to the aeration basin to break down new incoming waste.

6. Final Basin – The clean water from the secondary clarifiers flows into here. During chlorination season, the water is disinfected with sodium hypochlorite (and dechlorinated with sodium bisulfite) in order to kill any remaining microorganisms before being discharged to the Androscoggin River. It is key to remember that the wastewater entering the plant is 99% water and just 1% waste. What we do in our treatment is remove over 90% of the pollutants in that 1% of waste, making the water we discharge cleaner than the water flowing down the river past us. We take great pride in the service we provide to the environment, human health, and the citizens of Lewiston and Auburn.

7. Process Building

   Influent pumps -These pumps take all the flow that has made it to the treatment plant from gravity pipes and lifts it to a high point so that it can flow by gravity through the rest of the facility. Each pump can handle 16 MGD.

   Gravity Belt Thickeners (GBTs) - waste solids are thickened before being sent to the anaerobic digesters. The thicker the solids the less pumping we need to do and the more effective our downstream processes are. We add a cationic (positive charge) polymer to the anionic (negative charge) sludge, the opposite charges attract, and water separates on the belt leaving a much thicker solid. This material is then pumped to holding tanks where it waits to be pumped out on a timer to the digesters.

Screw Presses- waste solids are thickened and removed from the system and are sent to be composted or utilized as a soil amendment at area farms. These materials hold high values of essential nutrients such as nitrogen and phosphorus. We produce roughly 8,500 yards annually and handle all of the trucking.

Pipe Tunnel-The facility requires a lot of pumping of material, both liquids and solids, and a lot of it happens below ground to allow for better access and maintenance during cold weather. We utilize our final treated water in many processes throughout the facility. We also have two duty pumps and one standby (back up) pump for nearly every process, which provides for more operational flexibility and less emergency maintenance.

8. Block House / Aeration blowers- The blowers provide the necessary oxygen for the microorganisms that are doing the actual treatment of the waste. Like many living organisms, oxygen is critical. The air from these blowers also provides the necessary mixing to ensure the microorganisms doing the work are put in contact with the incoming waste. These blowers are extremely critical to the operation and also require a substantial amount of energy to operate.

9. Anaerobic Digestion Campus –As the water is treated, solids are collected (at both primary and secondary treatment), thickened, and sent to the anaerobic digesters where bacteria further utilize the organic material available. The microorganisms in the digester include methane forming bacteria, called methanogens. They function without oxygen (anaerobic), and at a mesophilic temperature (body temp.), to break down the solids into water, carbon dioxide, biogas, and into 50% less biosolids. The methane they create during solids digestion is collected and used to generate electricity.

   Digesters - These tanks are completely full and have nothing else in them except a couple pipes. They each hold 690,000 gallons. As we pump a gallon of raw material out, it displaces a gallon of the digested sludge. The material stays in these tanks for an average of 20-25 days. The gas produced in the process is lightest, therefore it flows out of the stainless-steel pipes at the top of each digester. There are numerous gas safety devices installed to protect the equipment and most importantly our workers. We have had both digesters down for cleaning and anticipate doing this every 5-7 year.

   In addition to waste solids, we receive high strength waste to add into the digesters such as food waste, yogurt whey, spent milk, brewery waste, and airport de-icing fluid to produce biogas and make electricity which powers nearly half of our onsite power usage.

   Digested sludge and gas storage tank - The digestion process, at the right temperature and without oxygen, reduces the volume of solids by half while also producing a gas. The broken-down solids and the gas produced are stored collectively in this tank. We have a few days of sludge storage but only about five hours of gas storage in this tank. The outer membrane is fixed using outdoor air and is in-place to protect the inner membrane which fluctuates size based on the volume of gas within it.

   Digester boiler room - The digestion process requires a stable temperature of 95-98 degrees, which is the same temperature as our body. In fact, our digestion process is simply a large- scale version of what happens within our digestive system (intestines). The equipment in this room is circulating the heat from the cogens to keep them cool and the sludge in the digesters at the right temperature. The heat exchangers are tubes within tubes with hot water passed on the outside of inside tubes circulating the sludge within the digesters. The boilers serve as a back-up heat supply at times the cogens are not operating. The heat from the cogens also serves all of the buildings within the digestion complex, in other words, we are recycling "waste heat" from the cogens.

Digester equipment room - The digesters themselves have no equipment in them, just pipes, microorganisms, and suspended solids therefore all of the material handling is done via pumps in this room. All three tanks have two duty and one standby pump. The screw press feed pumps move the digested material back up to the screw presses to be dewatered, which is the equipment we started the tour with.

Cogen building - These units utilize the gas produced within the digesters to produce electricity and heat. Each unit is capable of 230 kW of power, and the power produced offsets nearly half of the power needed at the facility. There are times where we make enough power to meet all the demands of the facility and actually send power back to the grid for others to use. The heat from the engines is removed to keep the engines cool and operating properly and is sent back in to the boiler room to heat up the sludge within the digesters. The engines are standard V-8 heavy equipment motors with methane injectors installed and a coupled generator. The noise attenuation panels allow for access within three-feet of operating equipment.

Gas conditioning - The gas from the digesters is dirty, so we treat it to remove any foam, solids, hydrogen sulfide, siloxane, and moisture before boosting the pressure to a point that the cogens and/or the boilers can utilize it. If we make more than we can use, it flows into the gas storage membrane. The green and red flashing lights outside the building inform our staff whether or not the space is safe to enter.

Flare - If we have more gas in the system than we can utilize, and storage of the membrane is full, we must get rid of the extra gas. To do this safely for the environment, we send it to the flare which burns the excess gas. The flare can reach up to ten-foot flames. As you can imagine, there are also numerous safety devices included on the gas condition and flare systems. Our preference is to never waste any of the gas we produce by flaring it, however it is often difficult to fully utilize all of it.

10. Septic & feedstock receiving - We received septage from surrounding communities that are not connected to sewer systems. This waste is introduce directly into the headworks (bar screens). We have two 15,000-gallon tanks which allow us to receive high strength organic waste (i.e. feedstock) that we pump daily to the digesters. The high strength waste provides for additional gas for us to utilize. Our preference is to receive high strength and low solids feedstocks that can be handled easily with our material handling equipment while producing large volumes of biogas to then produce electricity.

11. Lab - We perform tests daily and follow strict procedures. These tests help us meet regulations, make sure our process is not upset and verify that the microorganisms doing the work have the best possible conditions. We use the data that are developed in the lab to determine what adjustments we need to make with our equipment and process.

Please visit our website at: www.lacwa.org.