City of Fort Atkinson
Wastewater Treatment Plant

Plant history

The City of Fort Atkinson Wastewater Treatment Plant was built in 1972. The plant at that time was a conventional activated sludge plant. The plant was modified in 1981 to a diffused air system for the digesters, and in 1982 there was the addition of a 890,000 gallon liquid storage tank. In 1989 there was another upgrade to the plant that included a diffused aeration system for the activated sludge process. Currently the City of Fort Atkinson Wastewater Plant is operating under the modifications and expansions it received when it was constructed in 1991 and 1992. It was necessary to upgrade the plant to accommodate the increasing wastewater loads from families and industries. With the new plant upgrades the city was also able to focus on important issues like dechlorination, nitrification, and a better solids processing procedure.

Raw wastewater

Raw wastewater that enters the plant comes from many different places. The bulk of our city's wastewater comes from residential homes, commercial establishments and industry located in Fort Atkinson. Wastewater flows mainly by gravity to the plant. However, there are places in the city where this is not possible, so there are three lift stations located throughout the city. A lift station pumps the wastewater to a higher level where it can then flow by gravity to the plant. The average flow of wastewater entering the treatment plant in 2007 was 2.43 mgd. In 2008 with the flooding that happened to the Rock River our daily flow averaged 3.29 mgd. When flooding was at its worst in June the plant flow peaked to 9.6 mgd and averaged 6.84 mgd for the month. Due to the extreme conditions of the 2008 flood, 2007 numbers will be used in this article. The strength of the wastewater entering the plant is measured under several different parameters: Total Suspended Solids (TSS), Biological Oxygen Demand (BOD), Total Kjeldahl Nitrogen (TKN) and Phosphorous. In 2007 the BOD averaged 373mg/L, TSS averaged 210 mg/L, Phosphorous averaged 8 mg/L and TKN averaged 33mg/L.

Primary clarification

Primary clarifiers remove settled and floating solids from the wastewater. On average 65% of solids and 30% of the organic load are removed by flowing into these large, calm tanks. Once solids either float to the top or settle to the bottom they travel out to the digesters and the flow then travels to the activated sludge system.

Aerobic digesters

Aerobic digesters are used to stabilize the sludge prior to land application. Primary sludge from the primary clarifiers and thickened activated sludge from the secondary clarifiers is fed to the digesters. Air is then introduced to the sludge to provide oxygen to the bacteria and stabilize the biosolids. This turns the biosolids into a natural organic soil conditioner.

Phosphorous removal

Phosphorous removal is also required here at the treatment plant. Instead of using chemical to eliminate the phosphorous we remove ours biologically. In the front of our first two aerations tanks are what we call anaerobic zones. Anaerobic areas are where oxygen is only available in forms such as nitrate, nitrite and sulfate. The micro-organisms are so starved that they are able to uptake a larger concentration of phosphorous than they require. This then lowers the amount of phosphorous discharged into the river. A chemical feed system is also on hand, but is only used to assist phosphorous removal when we may be struggling to meet our DNR limits.

Activated sludge system

These large tanks contain what is a very important step to our treatment process called the activated sludge system. We have six of these tanks in all. In this system, bacteria and micro-organisms feed on organic material in the wastewater. From this feeding, the waste materials are reduced by 80-90%. The micro-organisms that perform the treatment process are a population of bacteria, protozoa and other life forms. These life forms use the organic matter as food to grow and reproduce. Once the micro-organisms are fed they digest the food, relax and then they feed again in this continuous cycle. As required here at the treatment plant we have to remove ammonia. To do this we use the bacteria to convert the ammonia to another form of nitrogen called nitrate. This is called nitrification. Nitrification takes up a lot of oxygen, so in these tanks we supply a lot of air to keep the bacteria converting the ammonia to nitrate.

Secondary clarification and disinfection

Secondary clarifiers are used to separate the activated sludge micro-organisms

from the treated water. This is done by letting the mixed liquor flow into these large calm tanks. Here the heavier solids (micro-organisms) sink to the bottom of the tank leaving a clear effluent to head to disinfection. The secondary effluent always runs to the disinfection area but is only chlorinated in the summer months of May through September. The micro-organisms now get pumped from the bottom of the clarifier and returned into the activated sludge system with the primary effluent before they discharge back into the aeration basins. Mixing the primary and the secondary return provides the activated sludge system with healthy organisms at all times to feed the incoming waste.

Biosolids thickening

A portion of the biosolids that doesn't get returned into the system from the secondary clarifiers is wasted out of the system on a daily basis. It is transported to the gravity belt thickener. Once thickened it goes into our digesters. We waste everyday to maintain balance between the amount of waste coming into the plant and the amount of microorganisms we have to feed on the waste.

Gravity belt thickener

The belt press is also desinged to remove the water from the biosolids. With the belt thickener we take digested biosolids and it is pumped into the belt press and thickened with polymer. It is then squeezed between the two belts to dewater it. By doing this we end up with a end biosolids product of approximately 13% solids and 87% water. From this point the solids are either taken directly to a farmers field or we will store in on site in our biosolids storage area. CS

To learn more about the City of Fort Atkinson WWTP

www.fortatkinsonwi.net