

Wastewater Treatment

- Where does wastewater go when it leaves your house?



Let's take a look

- The process includes:
 - Collection of wastewater
 - Primary Treatment
 - Secondary Treatment
 - Solids Handling
 - Influent and Effluent Monitoring

Wastewater Collection

- It is very important that wastewater arrive at the treatment plant in relatively good condition.
- A collection system will have miles of pipeline with the common goal of bringing the used water to the treatment facility.



Collection



- Lift Stations are an asset to a collection system.
- Lift Stations will lift the wastewater from an area where the water can no longer move by gravity force, and pump it to a higher level where it will resume gravity fall.

We made it to the Treatment Plant

- At the City of Brenham Wastewater Treatment Plant, treatment begins at the influent pump station.
- Wastewater is pumped up into the facility by Submersible Pumps so the remaining processes are primarily gravity fed.



Removal of Large Particles



- After wastewater is pumped into the Headworks of the plant, it will flow through a fine screen to remove large particles of waste.

Primary Treatment

- For proper treatment, inorganics should be removed prior to secondary treatment.
- This occurs in a cone shaped chamber.
- The sand and grit will settle to the bottom and be pumped out.



Secondary Treatment



- Secondary or Biological Treatment is where the magic happens.
- This is where the prescreened wastewater meets the “bugs”.
- In the wastewater business, “bugs” refer to the bacteria, protozoa, and other microorganisms that feed on bacteria found in wastewater.

Secondary Treatment

- Secondary Treatment occurs in an Aeration Basin.
- Large blowers force air into these basins to keep the “bugs” happy.
- A good dissolved oxygen level is between 2 and 4 mg/l.



Regulating Conditions in the Aeration Basin

- Air can be regulated using the blowers, however we must also regulate the amount of "bugs" in the aeration basin.
- "Bugs" are removed and brought back to the aeration basin, a process that will be evident soon.
- Due to constant reproduction, some "bugs" must be removed and disposed of, also covered soon.



Clarification



- When the treated water leaves the aeration basin, it flows into a clarifier.
- The clarifier is designed for solids settling so there is not any air being forced into the clarifiers.
- The “bugs” that traveled over to the clarifier settle to the bottom and the clear water flows over the weirs.

Return Activated Sludge

- Return Activated Sludge (RAS), the “bugs” that collect on the floor of the clarifier are returned to the aeration basin to continue breaking down bacteria in the wastewater.



Waste Activated Sludge



- As mentioned previously, constant reproduction will force an operator to dispose of or “waste” some of the “bugs” in the process in order to keep the food to microorganism ratio at a sustainable level.
- The product of this wasting is called Waste Activated Sludge (WAS) and it will be sent to a digester which will be visited later.

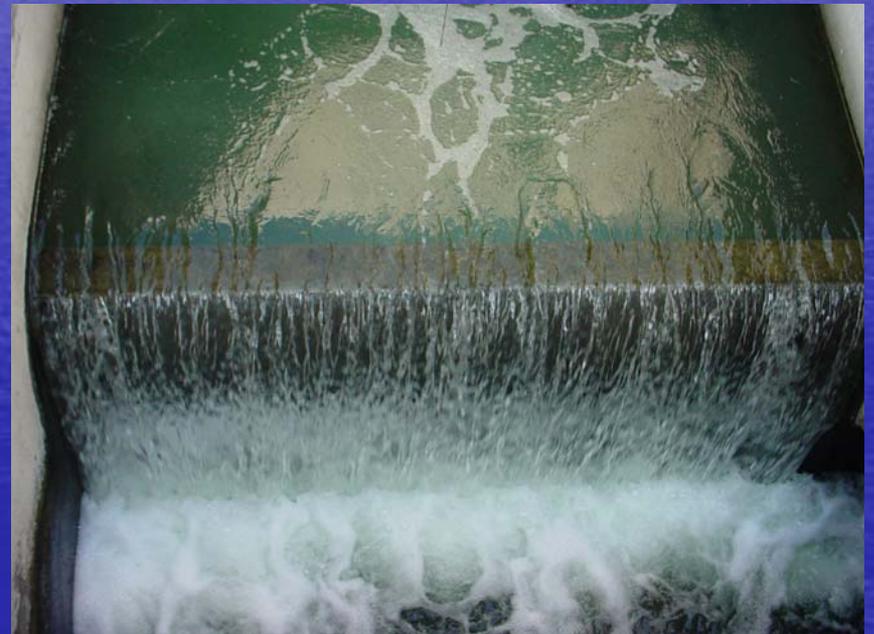
Disinfection



- The treated water must be disinfected before it leaves the facility.
- The City of Brenham uses chlorine to disinfect the treated water.
- Once disinfection has been achieved, sulfur dioxide is applied to remove any residual chlorine that could be harmful to wildlife.

Effluent

- It is our goal to produce a clean environmentally safe effluent.
- We want to see a low BOD, a neutral pH, low TSS, as well as low ammonia in the effluent.
- Quality control tests are run to ensure the plant is running within permit regulations.



Lab Tests

- BOD-Biochemical Oxygen Demand
- TSS-Total Suspended Solids
- Ammonia
- Chlorine Residual
- Temperature
- Dissolved Oxygen



Lab Tests

- BOD-indicates strength of wastewater; can tell an operator how much oxygen will be used by the biomass found in wastewater and wastewater effluent.
- TSS-measure the total suspended solids or what will become oxygen demanders in receiving stream
- Ammonia is extremely toxic to fish and wildlife
- Chlorine residual ensures disinfection is occurring
- Temperature shifts can alter receiving streams and magnify effects of other factors in stream health
- Dissolved oxygen is critical in plant and fish survival

What's next?

- We have treated the water better than the State standards
- Now it is time to take care of the solids that were wasted out of the clarifier, the Waste Activated Sludge.
- Let's go back to the clarifier and pick up the process of solids handling.

Solids Handling



- The purpose of solids handling is to dewater and reduce pathogens present in activated sludge.
- The Waste Activated Sludge is moved from the clarifiers to the digester.
- There are several parts to the digester.

Digester

- The waste activated sludge will enter the rapid mix chamber.
- From the mix chamber, it will move into the gravity thickener.
- In the gravity thickener, the solids will settle to the bottom and be removed by air lift pumps.
- The solids go into the large digestion basins.



Digester



- The thickened sludge will stay in the digester approximately 30 days.
- After digestion, the sludge is ready to be dewatered.

Belt Press



- Digested sludge is mixed with polymer and applied to the belt press.
- Excess water is squeezed out by the two belts.

Lime Stabilization

- The City of Brenham uses lime stabilization to achieve Class A Biosolids.
- Lime is added and the sludge is sent through ovens to achieve a specified temperature to reduce pathogens as well as vector attraction.



Land Application

- The sludge is ready to be taken out and applied as a soil amendment.
- It can be used on ranchland, but not on anything that will be directly involved in food for human consumption.



Importance of Treatment

- It is vital to treat our wastewater in order to keep our streams and rivers healthy.
- Our permit requires that we treat the wastewater in accordance with very high standards to help dilute pollution from non-point sources which also makes its way to streams and rivers.
- The stream that wastewater effluent is discharged into at one location may be a source of drinking water to another community.