

Wastewater Treatment

Once the wastewater has arrived at the wastewater reclamation facility, the first step in the treatment process is called Preliminary Treatment. During this phase, the flow is measured and sampled, and objects like sticks, rags, toys, rocks, coffee grinds, egg shells and sand/rocks are removed. The first preliminary treatment process that the wastewater passes through is called screening. It is designed to remove the larger items (sticks, roots, rags, toys) while at the same time allowing the wastewater and small items to pass through onto the next process. The second step in the preliminary treatment phase is grit removal. In this process, the wastewater is slowed slightly, to a velocity that allows gravity to work removing coffee grinds, egg shells and other similar materials. The settled material is pumped, dewatered and sent to the landfill for final disposal while once again allowing the wastewater and organic material to move onto the next phase called Primary Treatment.

Primary treatment uses sedimentation tanks also known as clarifiers allowing settle-able solids to fall to the bottom of the tank and lighter material to float to the water surface. This is accomplished by slowing the wastewater velocity to 0.03 feet per second. In other words, it takes approximately two hours for a gallon of wastewater to move through the clarifier and on to the next treatment process. We continuously pump the settled solids from the bottom of the tank to the solids handling process for additional treatment along with skimming the floating material off the surface of the water. The skimmed material is also pumped to the solids handling process for additional treatment. The water, however, continues to move through the treatment steps and on to the process called Secondary or Biological treatment.

Secondary treatment means that the wastewater is exposed to living organisms that eat the dissolved and nonsettle-able organic material remaining in the wastewater as their food source. The Broomfield Wastewater Reclamation Facility uses a process known as Integrated Fixed Film Activated Sludge, or IFFAS for short. Broomfield was the first plant in the United States to use this type of process where we combine a moving bed plastic carrier element with our existing aerobic basins to help grow the biomass and to maintain nitrification during year round operation. The key to successful operations is the management of the bacteria to ensure we have the right amount of bacteria available for the concentration of wastes coming into the treatment plant. Again, we slow the wastewater down to allow the bacteria enough time to work. For this treatment process, it takes approximately four hours for a gallon of wastewater to move through the treatment process. By now the bacteria are full, fat and happy, ready to settle out. The blend of wastewater and bacteria flow to the secondary sedimentation tanks/clarifiers and once again, using gravity and a reduction in the water velocity, the now heavier organisms settled to the bottom and are either pumped to the digestion step or returned to eat some more. The now-clean water flows on to be disinfected by ultra-violet (UV) light.

Disinfection is defined as a process designed to kill or inactivate pathogenic organisms. UV disinfection is highly effective. The Broomfield facility was one of the first in Colorado to switch from chlorine gas, a highly toxic chemical, to UV disinfection back in 1996. In short, UV disinfection works by exposing the wastewater to a specified wavelength and intensity for a specified contact period. The minimum exposure time is approximately 10 seconds. At this point, the water is treated to the point where it is either safely discharged to Big Dry Creek or diverted

to the wastewater reclaimed treatment process. In either case, this water is highly regulated and must meet all federal and state regulations to avoid costly penalties.

Reuse or reclaimed water is wastewater that has received additional treatment making it suitable for irrigation purposes. For us, the disinfected wastewater is pumped through sand filters similar to drinking water filters prior to pumping the water into the reclaimed water reuse system. This is an important part of managing and conserving our limited supply of water. It reduces the demands on the drinking water system and postpones costly investments for development of new water source.

Meanwhile, the solids that have been removed from both the primary and secondary clarifiers are being treated in digesters that work very similar to our bodies. The treatment units are kept at 98 degrees F for approximately 20 days during which time the bacteria continue to break down the waste by-product into a stable and beneficial organic material called biosolids. Biosolids are a nutrient-rich fertilizer and soil amendment that is used on farm ground. In addition, during the digestion process, the bacteria produce a gas made up of mostly methane gas. The methane gas is captured and reused as an energy source in the boilers used for heating the digesters.

The advancement of wastewater treatment has been a key player in the reduction and control of such epidemic diseases such as cholera, typhoid, dysentery, polio and hepatitis that has killed hundreds of thousands of people through history because of the lack of clean water.

This is not a glamorous job by any standard, but it has its rewards. Knowing that we are protecting future generations and the world they will inherit is a reward in itself.