

TREATMENT PROCESS

ANAEROBIC SLUDGE DIGESTION

The solids (sludge-3% solids, 97% water) and floatable material removed from the wastewater is pumped to anaerobic digesters. Anaerobic (absence of dissolved oxygen) digestion reduces wastewater solids from an objectionable, odorous mixture to a mixture that is essentially odor free, dewaterable, and capable of being disposed without causing a nuisance. During the digestion process organic solids are liquefied, solids volume is reduced, and methane (sewer gas) is produced by two groups of bacteria coexisting in the same anaerobic digester. One group is the “acid formers” and the second is the “methane formers”. The acid formers break down raw sludge composed of carbohydrates, fats, and proteins yielding carbon dioxide, water, and organic acids (and other degradation products). The methane formers breakdown the organic acids (and other degradation products) producing methane, carbon dioxide, water, hydrogen sulfide, and other end products. Digesters are mixed thoroughly to maintain a balance of both types of bacteria and to bring the bacteria in contact with the sludge.

The anaerobic digestion process is similar to the human digestion process. Temperature of the digester contents is maintained between 95-100 degrees F. The methane gas is produced from the decomposition and reduction of the volatile solids in the sludge. The methane gas is used as fuel for a boiler (to heat the sludge) and for gas powered Waukesha engines that pump raw wastewater.

Detention time of the sludge in the digesters is between 50-60 days. Volatile solids are reduced 50-60%. There are four primary digesters and one secondary digester at the wastewater treatment plant. Three primary digesters are 450,000 gallons capacity (150,000 gallons each), and one is 800,000 gallon capacity. The secondary digester is approximately 440,000 gallon capacity; it has a floating cover that provides methane storage. Once sludge is digested in the primaries, it is transferred to the secondary digester, where liquid/solid (water/sludge) separation occurs.

Sludge (5-7% total solids) is pumped from the bottom of the secondary sludge digester to one of the District's 25 sludge drying beds, which have a total area of about three acres. The water in the sludge drains through sand in the floor of the drying beds back to the headworks of the wastewater treatment plant. Water also evaporates from the surface of the sludge. An auger is used to stir the sludge occasionally to expose more of the sludge to the air to dry the sludge more rapidly. Once the sludge is dry, it resembles black soil and is removed from the drying bed and stockpiled. The wastewater plant generates about 600 dry tons of sludge per year. (A dry ton is a calculation based on 0% moisture in the sludge.) Some of the sludge is disposed at the Knox County Landfill; some is land applied on farmland owned by the Galesburg Sanitary District.