Roanoke Regional Water Pollution Control Plant

Treating the Valley’s Wastewater
The Roanoke Regional Water Pollution Control Plant treats an average of 37-million gallons of sanitary sewer a day from all jurisdictions in the Roanoke Valley. A drop of water entering the Regional Water Pollution Control Plant takes approximately 19 hours to move through all levels of the liquid treatment process.

Along the way, more than 3,000 lab tests are conducted every month to verify that the liquid treatment process is meeting or exceeding water quality standards. The Regional Water Pollution Control Plant has some of the most stringent requirements for treatment of any plant in Virginia.

**Headworks**

Before the wastewater begins the series of treatment processes, the flow travels up Archimedes screw pumps to begin preliminary treatment. Bar screens remove large objects which are disposed of in the landfill. This new equipment conveys and treats normal flows as well as significantly higher wet weather flows.

**Primaries**

Metal bars, known as flights, skim across the surface of the water in the settling tanks to remove the floating scum before turning downward to scrape away the material that has settled at the bottom of the tank.

**Aeration**

After leaving the primary clarifiers, wastewater travels to one of 16 aeration tanks where air is blown into the flow to raise the dissolved oxygen levels, sustaining the microorganisms that consume the organic material (carbonaceous BOD) in the wastewater. This process takes 4-6 hours; all the while microorganisms are feeding on and removing the organic matter carried in the flow.
Coagulation

By this step of the treatment process, only very small particles remain. Chemicals, such as iron salts (ferric chloride) and polymers are added to make the tiny particles bind together in masses called floc. The floc is large enough to settle to the bottom of the coagulation tanks or be caught in the filtration process.

Filtration

The flow is passed through one of ten deep bed monomedia filters as the final purification process before the flow goes to the chlorine chamber for disinfection.

Disinfection

Pathogens are removed throughout the treatment process, but the final step of chlorination guarantees the quality and safety of the water discharged into the Roanoke River. The water must remain in contact with the chlorine for 20 minutes to ensure that all the pathogens are killed. The water is then treated with sulfur dioxide to remove all chlorine before the flow enters the river.

Solids Treatment

Digestion

Sludge from primary and secondary clarifiers is heated and mixed to promote the anaerobic consumption of organic material by bacteria contained within the tanks. First, acid forming bacteria use the organic material energy supply to produce organic acids and carbon dioxide. A second group of bacteria, the gas formers, break down the organic acids to make methane and carbon dioxide gas.

Biosolid Lagoons

After the digestion is finished, the sludge is pumped to the lagoons to complete treatment. Both anaerobic and aerobic bacteria consume any remaining organic matter, and solids settle to the bottom of the ponds.

Land Application

After about nine months, the fully processed material is applied to farms as fertilizer at no cost to the farmers. The application process and quality of the biosolids is held to strict standards set forth and enforced by the DEQ.
Converting Methane to Electricity

In 2012, the Western Virginia Water Authority installed two 500 kW generators designed to run on waste methane gas from the digestion process. The combined heat and power (CHP) system supplies thermal energy to heat the existing digesters and electrical power that is used by the plant to reduce the plant’s electrical utility power usage. Excess heat not used by the digesters supplies thermal energy to absorption chillers to heat and cool the buildings located on the plant site, further reducing the plant’s electric usage.

The CHP generation system offsets approximately 7,577 MWH of purchased electrical power annually. Depending upon facility flows and energy demand, the generation capacity represents between 30% to 50% of the plant’s energy usage. This will reduce an estimated 4600 metric tons of greenhouse gas emissions annually.