Biological Treatment – Details of Activated Sludge Process

It is to everyone's advantage for a community to be able to treat its wastewater in the most economical way. The activated sludge process has the advantage of producing a high quality effluent for a reasonable operating and maintenance costs. The activated sludge process uses microorganisms to feed on organic contaminants in wastewater, producing a high-quality effluent. The basic principle behind all activated sludge processes is that as micro-organisms grow, they form particles that clump together. These particles (floc) are allowed to settle to the bottom of the activated sludge process uses microorganisms to feed on organic contaminants in wastewater, producing a high-quality effluent. The basic principle behind all activated sludge processes is that as microorganisms grow, they form particles that clump together. These particles (floc) are allowed to settle to the bottom of the tank, leaving a relatively clear liquid free of organic material and suspended solids.

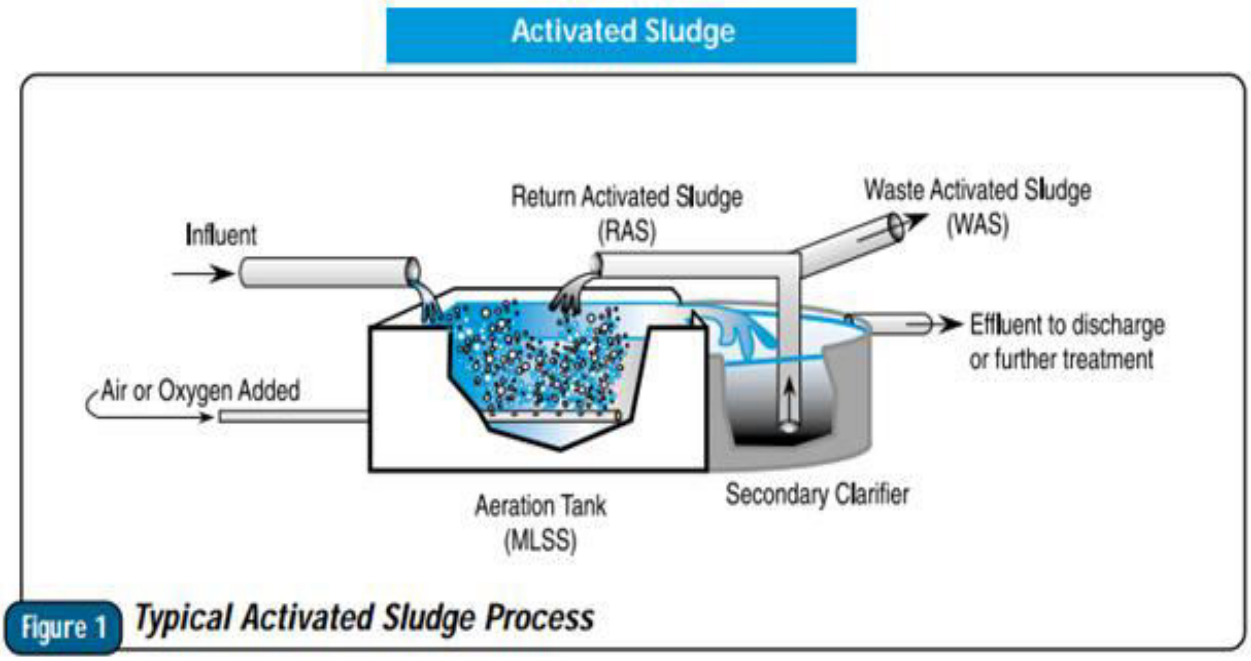

Figure 1 *Typical Activated Sludge Process*

Described simply, screened wastewater is mixed with varying amounts of recycled liquid containing a high proportion of organisms taken from a secondary clarifying tank, and it becomes a product called mixed liquor. This mixture is stirred and injected with large quantities of air, to provide oxygen and keep

solids in suspension. After a period of time, mixed liquor flows to a clarifier where it is allowed to settle. A portion of the bacteria is removed as it settles, and the partially cleaned water flows on for further treatment. The resulting settled solids, the activated sludge, are returned to the first tank to begin the process again. Initially developed in England in the early 1900s, the activated sludge process did not become widespread in the U.S. until the 1940s. Today a number of variations of the basic process have been developed.

Picture: Showing Activate Sludge Process (Diffuse Aeration)

Variations in Activated Sludge process:

1. Conventional activated sludge
2. Extended aeration
3. Completely mixed activated sludge
4. The contact stabilization process

We have already discussed the conventional activated sludge process. Here we will brief about extended aeration & contact stabilization.

Extended Aeration Activated Sludge Waste Water Treatment Systems:

The extended aeration activated sludge process, as shown in the diagram at the left, doesn't use a primary clarifier. A longer detention time in the aeration tank is substituted, so the settle able organic matter (which remains in the wastewater) will be biologically oxidized in the aeration tank along with the dissolved and fine suspended matter. The aeration tank for an extended aeration process must be larger than that for a conventional activated sludge process, in order to give a detention time of about 24 hours instead of the 6 to 8 hours used for a conventional activated sludge process. The operation of the plant is simplified, however, due to elimination of the primary clarifier and the sludge treatment and disposal that goes with it.

Contact Stabilization Activated Sludge Wastewater Treatment Systems:

The contact stabilization activated sludge process requires less total aeration tank volume than the conventional activated sludge process. This is accomplished by treating the full wastewater flow for only 0.5 to 2 hours in an aerated 'contact' tank. In order to complete the biological oxidation process (removal of biochemical oxygen demand), the recycled activated sludge (a smaller flow rate than the full wastewater flow) is aerated for 3 to 8 hours in a 'stabilization' tank. For a given influent waste water flow rate, the total volume of the contact tank and stabilization tank for the contact stabilization process is typically less than the conventional activated sludge aeration tank volume needed for the same flow rate. The flow diagram at the left shows this process.

Source:

http://www.nesc.wvu.edu/pdf/WW/publications/pipline/PL_SP03.pdf

http://www.brighthub.com/environment/science-environmental/articles/66157.aspx

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