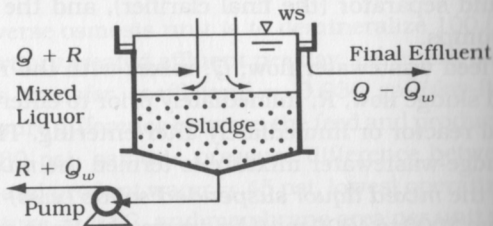
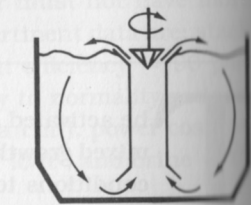
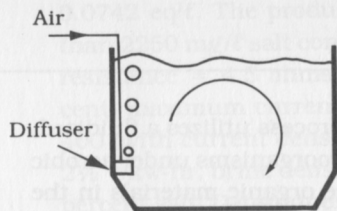
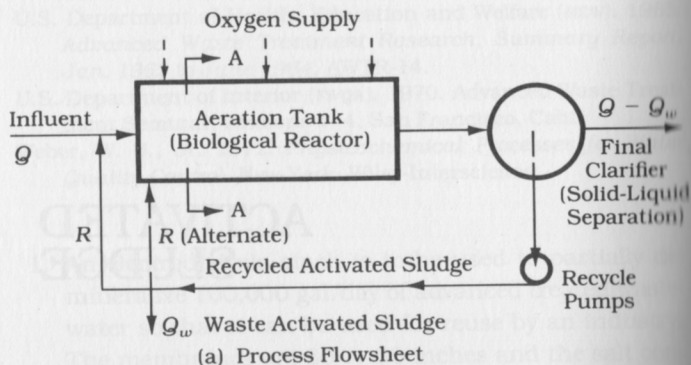


Figure 9.1. Activated Sludge Process



At the downstream end of the reactor, the adsorbed and absorbed organic materials have been bio-oxidized and the mixed liquor flows to the solid-liquid separator (the final clarifier). There, the active biological solids settle to the bottom, as shown in Figure 9.1 (d), and the separated treated wastewater spills over the peripheral weirs into the effluent channels. Usually, effluent disinfection is required for municipal effluents prior to discharge into the receiving body of water; however, many industrial effluents do not require disinfection because there are no pathogens present. The activated sludge from the bottom of the final clarifier is pumped by recycle pumps, and the recycled activated sludge flow mixes with the incoming feed wastewater flow as previously described and as shown in Figure 9.1 (a).

The desired mixed liquor suspended solids (MLSS) concentration in the biological reactor is maintained at a constant level by recycling a fixed amount of the settled activated sludge from the solid-liquid separator. The recycle ratio, R/Q , is dependent upon the desired MLSS concentration and the concentration of the settled activated sludge in the recycle flow as measured by the sludge density index (SDI). In this control test, a volume of mixed liquor is taken from the downstream end of the aeration tank and 1 liter of the mixture is placed in a 1-liter graduate cylinder. At the same time, the suspended solids concentration in the mixed liquor is determined. After the sludge has settled in the cylinder for 30 minutes, the volume occupied by the settled sludge is read from the graduations. The concentration of the settled sludge in mg/ℓ is then computed; it represents the sludge density index (SDI). This test approximates the settling that occurs in the final clarifier. If the sludge density index is $10,000 \text{ mg}/\ell$ and the desired MLSS is $2500 \text{ mg}/\ell$, a material balance for the activated sludge at the junction of the influent and recycle lines is

$$Q(0) + R(10,000) = (Q + R)(2500)$$