

Table 8.15
Final Clarifiers for Activated Sludge Processes

type of aeration	design flow (MGD)	minimum detention time (hr)	maximum overflow rate (gpd/ft ²)
conventional, high rate, and step	< 0.5	3.0	600
	0.5 to 1.5	2.5	700
	> 1.5	2.0	800
contact stabilization	< 0.5	3.6	500
	0.5 to 1.5	3.0	600
	> 1.5	2.5	700
extended aeration	< 0.05	4.0	300
	0.05 to 0.15	3.6	300
	> 0.15	3.0	600

Following sedimentation and sludge recirculation, the effluent may be treated to convert nitrates and nitrites to nitrogen gas. Methanol supplies the energy required by the denitrification bacteria.

With secondary treatment, the total sludge load will be about 0.2 pounds per capita day (when dried). This amounts to approximately 2 quarts of sludge per 100 gallons of wastewater processed.

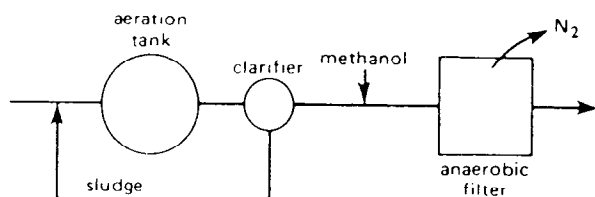


Figure 8.20 Nitrification and Denitrification Process

Ammonia can also be removed by breakpoint chlorination. Other methods of nitrogen/ammonia removal include anion ion exchange and algae ponds.

Inorganic Salt Removal: Ions from inorganic salts can be economically removed by electro dialysis and reverse osmosis.

Dissolved Solids Removal: The so-called *trace organics* or *refractory substances* are dissolved organic solids that are biologically resistant. They can be removed by filtering through activated carbon or ozonation.

16 SLUDGE DISPOSAL

A. SLUDGE QUANTITIES

Sludge removed from sedimentation basins is 95% to 99% moisture. With primary treatment only, about 0.1 pounds of dried sludge can be expected per capita day.

Table 8.16

Typical Characteristics of Domestic Sewage Sludge (also, see table 8.18)

origin of sludge	solids content of wet sludge (s in percent)	dry solids (lbm/day/capita)
primary settling tank	6	0.12
trickling filter secondary	4	0.04
mixed primary and trickling filter secondary	5	0.16
high rate activated sludge secondary	2.5-5	0.06
mixed primary and high rate activated sludge secondary	5	0.18
conventional activated sludge secondary	0.5-1	0.07
mixed primary and conventional activated sludge secondary	2-3	0.19
extended aeration secondary	2	0.02

The dry weight of solids from primary settling basins is:

$$W_p = (\text{decrease in SS})(Q_{\text{gpd}})(8.345 \text{ EE } -6) \quad 8.56$$

The dry weight of solids from secondary aeration lagoons and biological filters is:

$$W_s = K(\text{BOD})_{\text{removed}}(Q_{\text{gpd}})(8.345 \text{ EE } -6) \quad 8.57$$