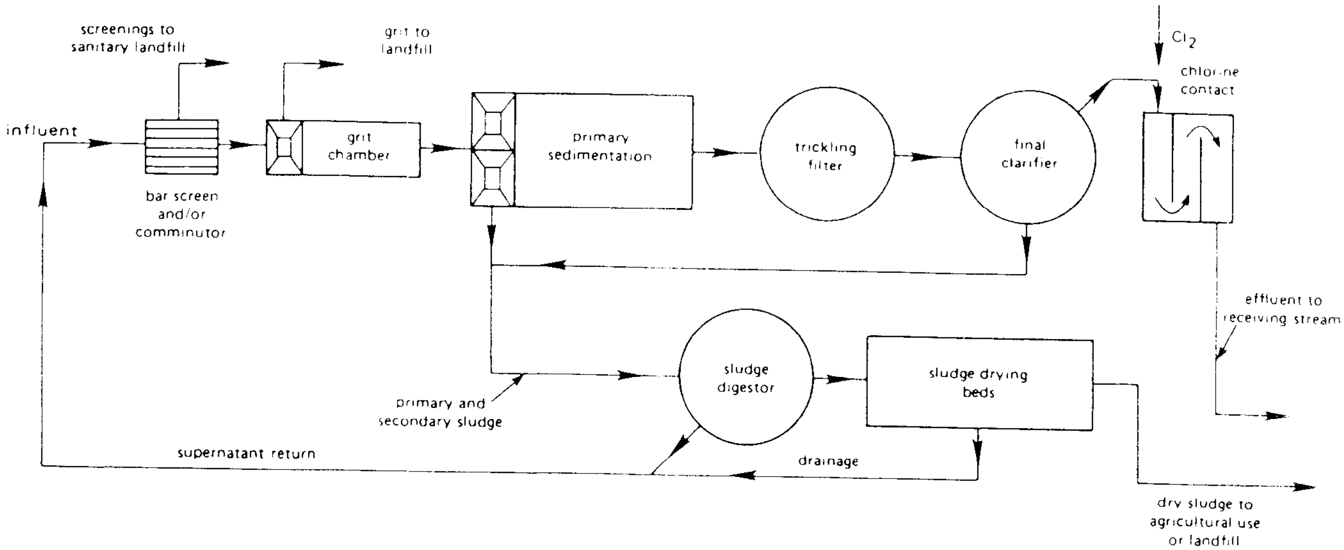

Figure 8.9 A Typical Trickling Filter Plant

loading for the filter/clarifier combination is essentially the BOD of the applied wastewater divided by the filter volume.

$$L_{\text{BOD}} = \frac{(Q_{w,\text{MGD}})(\text{BOD}_{s,t,\text{mg/l}})(8.345)(1000)}{\text{filter volume in ft}^3} \qquad 8.29$$

BOD loading is given in pounds per 1000 cubic feet per day. Typical values are 5 to 25 lbm/1000 cubic feet-day (low rate) and 30 to 90 lbm/1000 cubic feet-day (high rate.)

Significant reduction in BOD occurs in a trickling filter. Standard rate filters produce an 80%–85% reduction. Because they offer less contact area and time, high rate filters only remove 65%–80% of the BOD.

If it is assumed that the biological layer and hydraulic loading are uniform, the water is at 20°C, and the filter is single-stage rock followed by a settling tank, then the following equation developed by the National Research Council can be used to calculate the BOD removal efficiency of the filter/clarifier combination.[14] Equation 8.30 is easily solved from figure 8.10.[15]

$$\eta = \frac{\text{BOD}_{\text{removed}}}{\text{BOD}_{\text{entering}}} = \frac{1}{1 + 0.0561\sqrt{L_{\text{BOD}}/F}} \qquad 8.30$$

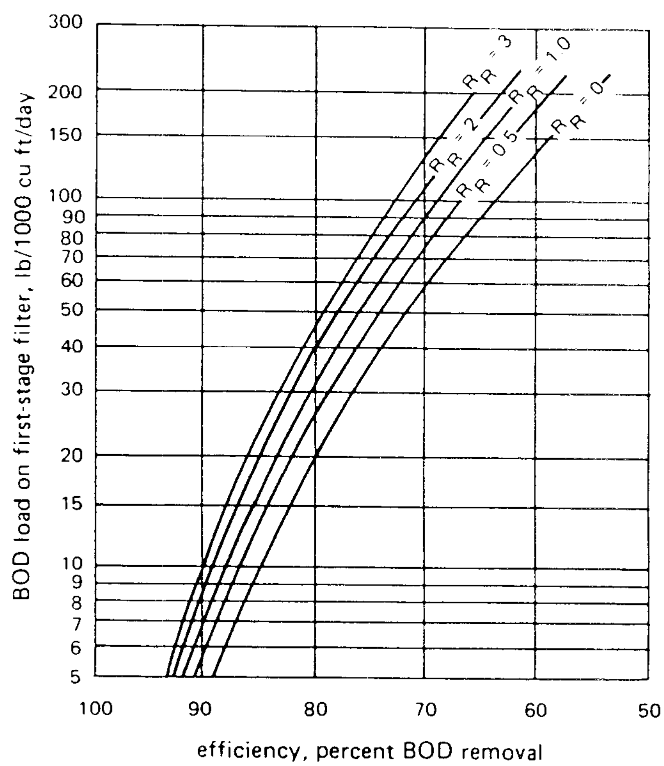

Figure 8.10 Solution of Equation 8.30

For single-stage trickling filters operating at other temperatures, calculate the efficiency assuming 20°C, and then correct the efficiency using equation 8.31.

$$\eta_T = \eta_{20^\circ\text{C}}(1.01)^{T-20} \qquad 8.31$$

[14] The National Research Council did studies in 1946 on sewage treatment plants at military installations. It concluded that the organic loading had a greater effect on removal efficiency than did volumetric loading.

[15] The constant 0.0561 in equation 8.30 is also reported as 0.0085 in the literature. However, that value is for use with media volumes expressed in acre-feet, not 1000's of ft^3.