

■ **EXAMPLE 12.5**

The design flow for a new two-stage trickling-filter plant is 1.2 mgd with an average BOD concentration of 450 mg/l. Determine the dimensions of the sedimentation tanks and trickling filters (surface areas and depths) for the flow scheme shown in Fig. 12.24. Calculate the volume of filter media based on a loading of 50 lb of BOD/1000 ft³/day, and divide the resulting volume equally between the primary and secondary filters. Estimate the BOD concentration in the plant effluent.

Solution

Primary Tank Criteria: (1) 500-gpd/ft² overflow rate based on raw Q or 750 gpd/ft² based on Q plus recirculation flow; (2) minimum depth of 7 ft. However, if accumulated sludge is to be retained in the bottom of the tank, increase the depth to accommodate the necessary sludge storage volume.

$$\text{area required} = \frac{1,200,000}{500} = 2400 \text{ ft}^2$$

or

$$\text{area required} = \frac{1.5 \times 1,200,000}{750} = 2400 \text{ ft}^2 \quad (\text{Use})$$

Estimate the daily sludge accumulation at 4% solids, assuming a sludge solids accumulation equal to 90% of the BOD load:

$$\text{volume} = \frac{0.9 \times 450 \times 1.2 \times 8.34}{0.04 \times 62.4} = 1620 \text{ ft}^3$$

$$\text{depth of sludge} = \frac{1620}{2400} = 0.7 \text{ ft}$$

Provide a side-wall depth of 8 ft plus freeboard.

$$\text{primary BOD removal} = 35\%$$

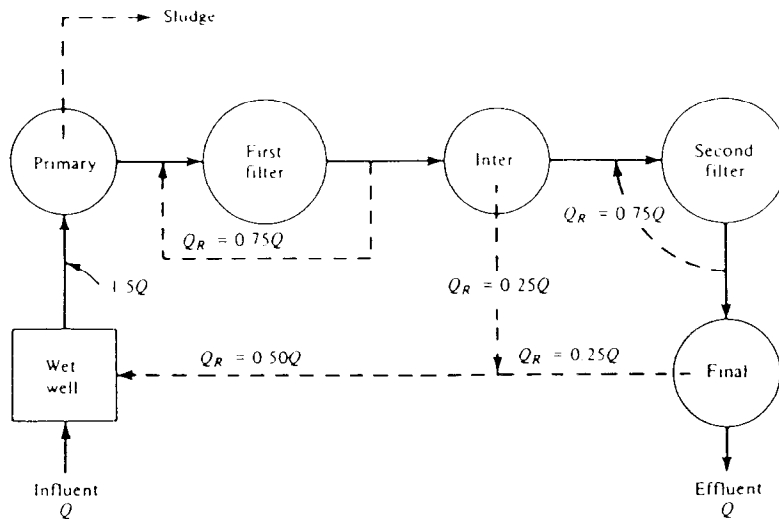


Figure 12.24 Flow scheme of the two-stage trickling-filter plant for Example 12.5.