

at approximately 0.5 m (1.5 ft) intervals. At various time intervals, samples are withdrawn from the ports and analyzed for suspended solids. The percent removal is computed for each sample analyzed and is plotted as a number against time and depth, as elevations are plotted on a survey grid. Curves of equal percent removal are drawn as shown on Fig. 5-24. From the curves shown on Fig. 5-24, the overflow rate for various settling is determined by noting the value where the curve intersects the x axis. The settling velocity v_c is

$$v_c = \frac{H}{t_c} \tag{5-31}$$

where H = height of the settling column, L (m)

t_c = time required for a given degree of removal to be achieved, T (min)

The fraction of particles removed is given by

$$R, \% = \sum_{h=1}^n \left(\frac{\Delta h_n}{H} \right) \left(\frac{R_n + R_{n+1}}{2} \right) \tag{5-32}$$

where R = TSS removal, %

n = number of equal percent removal curve

Δh_n = distance between curves of equal percent removal, L (m)

H = total height of settling column, L (m)

R_n = equal percent removal curve number n

R_{n+1} = equal percent removal curve number $n + 1$

The advantage of the more traditional method is that it is possible to obtain removal data at various depths of settling. The removal percentage obtained using the curve given on Fig. 5-24 is illustrated in Example 5-7.

EXAMPLE 5-7 Removal of Flocculent Suspended Solids Using the results of the settling test shown on Fig. 5-24, determine the overall removal of solids if the detention time is t_2 and the depth is h_5 . Also demonstrate that the same result is obtained when the solids are measured after settling has occurred.

Solution

1. Determine the percent removal.

Percent removal

$$= \frac{\Delta h_1}{h_5} \times \frac{R_1 + R_2}{2} + \frac{\Delta h_2}{h_5} \times \frac{R_2 + R_3}{2} + \frac{\Delta h_3}{h_5} \times \frac{R_3 + R_4}{2} + \frac{\Delta h_4}{h_5} \times \frac{R_4 + R_5}{2}$$

2. For the curves shown on Fig. 5-24, a total removal for quiescent settling is 65.7 percent. The computations follow.