

Example 6.2

For an activated sludge system operating at a short sludge age ($f_{av} = 0.9$), sludge settling volumes were determined for several concentrations:

- Experiment 1: $X_i = 8.4 \text{ g.l}^{-1}$ and the sludge volume = 512 ml.l^{-1}
- Experiment 2: $X_i = 4.2 \text{ g.l}^{-1}$ and the sludge volume = 364 ml.l^{-1}
- Experiment 3: $X_i = 2.1 \text{ g.l}^{-1}$ and the sludge volume = 192 ml.l^{-1}

Estimate the values of the Vesilind constants.

Solution:

The SVI values are calculated as:

- Experiment 1: $\text{SVI} = 512/8.4 = 61 \text{ ml.g}^{-1}$
- Experiment 2: $\text{SVI} = 364/4.2 = 87 \text{ ml.g}^{-1}$
- Experiment 3: $\text{SVI} = 192/2.1 = 91 \text{ ml.g}^{-1}$

As the sludge volume of experiment 3 was less than 200 ml.l^{-1} after sedimentation, the value of the SVI represents the value of I_{dsv} as well. Thus for this sludge $I_{dsv} = 91 \text{ ml.l}^{-1}$. For the active fraction of the volatile sludge ($f_{av} = 0.9$), the value of I_{ssv} can now be calculated as:

$$I_{ssv} = I_{dsv} \cdot (1 - 0.35 \cdot f_{av}) = 91 \cdot (1 - 0.35 \cdot 0.9) = 62 \text{ ml.l}^{-1}$$

Using Eq. (6.9c and d):

$$k = 0.16 + 0.003 \cdot I_{ssv} = 0.35 \text{ g.l}^{-1}$$

$$v_0 = 16 - 0.1 \cdot I_{ssv} = 9.8 \text{ m.h}^{-1}$$