**Problem 1.** A surface water containing 500 mg/L Total Solids (TS) with a flow rate (Q) of 5000 m3/d will be treated in a conventional Drinking Water Treatment Plant. It is assumed that 30% of the total solids is dissolved and no organic substances are presented in water. The schematic diagram of the Drinking water Treatment Plant is shown below:

Sand filtration

Clean water

Rapid mixing

(coagulation)

Slow mixing

(Flocculation)

Sludge discharge

Raw water

Sedimentation

The TSS removal efficiency of the combined coagulation-flocculation and sedimentation process is given as 85%, while TSS removal efficiency of sand filtration unit is 99%.

According to the information given in the problem, calculate:

1. TSS and TDS of raw water as mg/L
2. TSS, TS, and TDS concentrations of water as mg/L after sedimentation
3. TSS, TS, and TDS concentrations of water as mg/L after filtration
4. How many kilograms (kg) of dry-sludge is produced daily in the sedimentation tank
5. How many kilograms (kg) of dry sludge is produced daily in the sand filtration bed
6. Assuming TSS removal capacity of sand filter is maximum 60 kg, how often do you think filter bed should be backwashed?

**Problem 2.** A domestic wastewater sample contains 400 mg/L of Total Inorganic Solid (ITS) and 200 mg/L of Organic Dissolved Solids (ODS). The specific conductivity of wastewater sample is 800 μs/cm, which is an indirect measure of all Inorganic Dissolved Solids (IDS) in water. Assuming 25% of Total Solids (TS) is volatile; calculate

1. Total Dissolved Solid (TDS) as mg/L.
2. Total Suspended Solid (TSS) as mg/L.
3. Total Solids (TS) as mg/L.

**Problem 3.** The settleable solid concentration of a wastewater is measured around 200 ml/L with a density of 1.05 kg/L based on Imhoff Cone analysis. Assuming that the liquid settleable solid (200 ml/L) contains about 2% of dried suspended-solid, and 30% of total suspended solids (TSS) is non-settleable on a mass base:

1. Calculate settleable solid concentration (SETs) as mg/L in 1-L wastewater.
2. Calculate total suspended solid (TSS) concentration of this wastewater as mg/L.