

Design of a trickling filter for wastewater treatment, several factors need to be considered, including the BOD and COD concentrations, hydraulic loading rate, media depth, and organic loading rate. Here's a step-by-step calculation based on the given information:

Step 1: Determine the organic loading rate (OLR):

$$\text{OLR (kg BOD/day)} = \text{BOD concentration (mg/L)} * \text{flow rate (MLD)} * 1,000 * 1,000 / 1,000,000$$

Given:

$$\text{BOD concentration} = 321 \text{ mg/L}$$

$$\text{Flow rate} = 0.675 \text{ MLD}$$

$$\text{OLR} = 321 * 0.675 * 1,000 * 1,000 / 1,000,000$$

$$\text{OLR} \approx 217.395 \text{ kg BOD/day}$$

Step 2: Determine the hydraulic loading rate (HLR):

$$\text{HLR (m}^3\text{/m}^2\text{/day)} = \text{Flow rate (MLD)} * 1,000 / \text{Filter bed area (m}^2\text{)}$$

Given:

$$\text{Flow rate} = 0.675 \text{ MLD}$$

Area is yet to be determined

Let's assume an HLR of 1.0 to 2.0 m³/m²/day for a trickling filter(Assuming Low rate filter 1-4). We'll use 1.5 m³/m²/day as a starting point.

$$\text{HLR} = 0.675 * 1,000 / \text{Area}$$

$$1.5 = 0.675 * 1,000 / \text{Area}$$

$$\text{Area} = 0.675 * 1,000 / 1.5$$

$$\text{Area} \approx 450 \text{ m}^2$$

Step 3: Determine the media depth:

The recommended media depth for trickling filters is typically between 1.5 to 2.5 meters. Let's assume a depth of 2.0 meters.

$$\text{Media volume (m}^3\text{)} = \text{Area (m}^2\text{)} * \text{Depth (m)}$$

$$\text{Media volume} = 450 * 2.0$$

$$\text{Media volume} = 900 \text{ m}^3$$

Step 4: Determine the COD loading rate:

$$\text{COD loading rate (kg COD/day)} = \text{COD concentration (mg/L)} * \text{flow rate (MLD)} * 1,000 * 1,000 / 1,000,000$$

Given:

$$\text{COD concentration} = 31 \text{ mg/L}$$

$$\text{Flow rate} = 0.675 \text{ MLD}$$

$$\text{COD loading rate} = 31 * 0.675 * 1,000 * 1,000 / 1,000,000$$

$$\text{COD loading rate} \approx 20.925 \text{ kg COD/day}$$

These calculations provide a starting point for the design of a trickling filter based on the given wastewater sample.









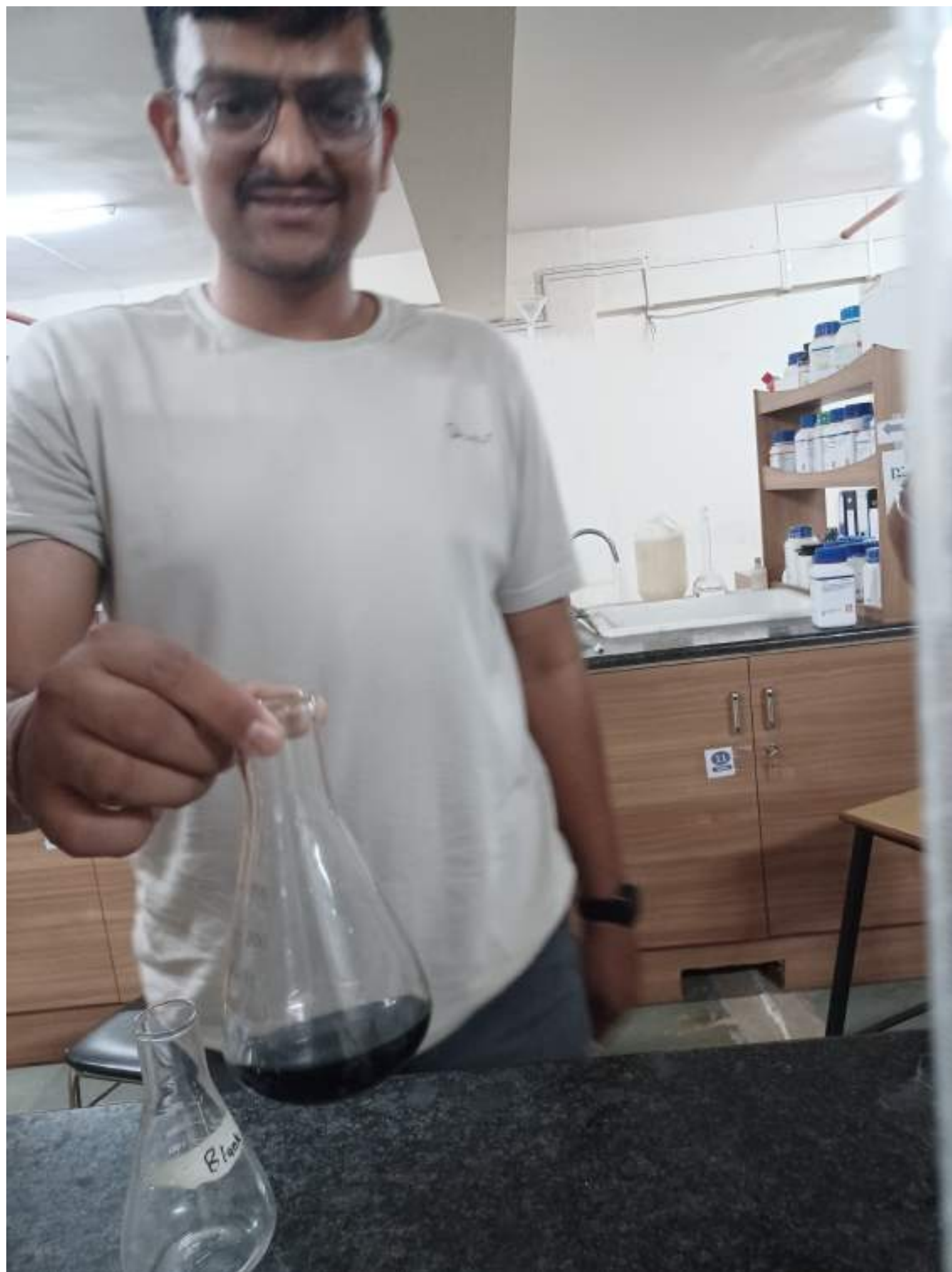














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