

## **Experiment Name : Determination of Optimum Coagulant Dosage in Wastewater Sample by JAR Test**

**Objective:** To determine the optimum dosage of a coagulant required for effective coagulation and flocculation in a given wastewater sample as per Indian Standards (IS 3025).

### **Apparatus and Materials Required:**

1. Jar test apparatus with multiple stirring paddles
2. Beakers (1 L capacity)
3. Graduated cylinders (50 mL and 100 mL)
4. Coagulant solution (e.g., alum or ferric chloride)
5. pH meter or pH strips
6. Turbidity meter
7. Stopwatch
8. Stirring rods
9. Wastewater sample
10. Distilled water

### **Procedure:**

1. **Preparation of Coagulant Solution:**
  - Prepare a stock solution of the coagulant by dissolving a known amount of the coagulant (e.g., 10 g of alum) in 1 liter of distilled water. This creates a 1% solution.
2. **Sampling:**
  - Collect the wastewater sample and allow it to reach room temperature if it is not already.
  - Measure the initial turbidity of the wastewater sample using a turbidity meter.
3. **Jar Test Setup:**
  - Fill six beakers with 1 liter of the wastewater sample each.
  - Place the beakers on the jar test apparatus.
4. **Adding Coagulant:**
  - Using a graduated cylinder, add different volumes of the coagulant solution to each beaker to achieve varying dosages (e.g., 5 mg/L, 10 mg/L, 15 mg/L, 20 mg/L, 25 mg/L, and 30 mg/L).
5. **Mixing:**
  - Rapidly mix the contents of all beakers at 100 rpm for 1 minute to ensure uniform distribution of the coagulant.
  - Reduce the stirring speed to 30 rpm and mix gently for 15 minutes to promote floc formation.
6. **Settling:**

- Allow the beakers to stand undisturbed for 30 minutes to let the flocs settle.
- 7. **Analysis:**
  - After settling, carefully withdraw a sample from the supernatant of each beaker without disturbing the settled flocs.
  - Measure the turbidity of the supernatant using the turbidity meter.
  - Record the results.
- 8. **pH Monitoring:**
  - Measure the pH of the supernatant from each beaker.
  - Ensure the pH is within the permissible range for effective coagulation (typically 6.0 to 8.0).

#### **Observations and Calculations:**

- Tabulate the following data for each beaker:
  1. Coagulant dosage (mg/L)
  2. Initial turbidity (NTU)
  3. Final turbidity (NTU)
  4. Percentage turbidity removal

#### **Result:**

- Identify the dosage of the coagulant that provides the maximum turbidity removal with minimum residual turbidity and acceptable pH levels. This dosage is considered the optimum coagulant dosage.

#### **Precautions:**

1. Use clean and dry glassware to avoid contamination.
2. Ensure consistent stirring conditions in all beakers.
3. Avoid disturbing the settled flocs while collecting the supernatant.
4. Calibrate the turbidity meter and pH meter before use.

#### **References:**

- IS 3025 (Part 50): 1986 – Methods of Sampling and Test (Physical and Chemical) for Water and Wastewater.
- Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WEF.