SEDIMENTATION STUDIES APPARATUS

1. OBJECTIVE:

To study the batch sedimentation process.

2. AIM:

2.1 To determine the effect of initial concentration and initial suspension height on the sedimentation rates.

2.2 To show the effect of flocculating agent.

2.3 To show the effect of particle size distribution.

3. INTRODUCTION:

Sedimentation is the process of letting suspended material settle by gravity. Suspended material may be partials, such as clay or silts, originally present in the source water. More commonly suspended material or floc is created from material in the water and the chemical used in coagulation or in the other treatment process, such as lime softening. Sedimentation is accomplished by decreasing the velocity of the water being treated to a point below which the particle will no longer remain in suspension. When the velocity no longer supports the transport of the particles, gravity will remove them from the flow. Some of the more comman types of factors to consider are:

The size and type of particles to be removed have a significant effect on the operation of the sedimentation tank. Because of their density, sand or silt can be removed very easly. In contrast colloidal material, small particles that stay in suspension and make the water seem cloudy, will not settle until the material is coagulated and flocculated by the addition of a chemical, such as an iron salt or almunium sulphate.

The shape of the particle also affects its settling characteristics.

4. THEORY:

For any batch sedimentation experiment, on slurry of known concentration, the height of a liquid-solid interface is obtained as a function of time. Slopes of this curve at any point of time represent settling velocities of the suspension at that time and are characteristics of specific solid concentration.

At the beginning of a batch sedimentation process, the solid is uniformly distributed in the liquid. The total depth of suspension is maximum but after a short while the solid have settled to give a zone of clear liquid. After some times it is divided into three zone, clear liquid zone, partial dense zone and dense zone. Earlier dense zone increases then decreases.

In the present experimental set-up record the height with respect to time and plot the graph between them to show the various effects.

5. DESCRIPTION:

The set up consists of five cylinder made of borosilicate glass. The cylinders are mounted on vertical back-panel, which is illuminated from behind. Measuring scale are provided for each of the cylinders.

6. UTILITIES REQUIRED:

6.1 Electricity Supply: Single Phase, 220 V AC, 50 Hz, 5-15 Amp combined socket with earth connection.

6.2 Laboratory glass ware:-

Graduated cylinders (2 Lit)	:	5 Nos.
Stop watch	:	1 No.

6.3 Chemicals:-

$CaCO_3$	:	2 kg
Distilled water	:	10 Lit

7. EXPERIMENTAL PROCEDURE:

7.1 STARTING PROCEDURE (FOR CASE-1):

7.1.1 Prepare five different slurry solutions.

7.1.2 Fill the solution in cylinders.

7.1.3 For first three cylinders, take (50,100,150) gm $CaCO_3$ in 2 liter water and note down the initial height, which is same.

7.1.4 For second two cylinders, take (100,100) gm $CaCO_3$ in 2 liter water and note down the initial height which is different.

7.1.5 Connect the electric supply.

7.1.6 Switch ON the light.

7.1.7 Stir the solution of cylinder-1 until a uniform solution is achieved. Record the initial time.

7.1.8 Start the stop watch and record the height of clear liquid interface at every 5 minute interval.

7.1.9 Also note down the time.

7.1.10 Repeat the above steps for all remaining cylinders.

7.1.11 Record the final height and time for each cylinder.

7.2 Closing Procedure (For Case-1):

7.2.1 When experiment is over switch OFF the light.

7.2.2 Switch OFF the power supply.

7.2.3 Clean all the cylinders.

7.3 Starting Procedure (For Case-2):

7.3.1 Prepare five slurry solutions, take 100 gm $CaCO_3$ in 2 liter water for each cylinder with different amount of flocculants (5, 10, 15, 20, 25) ml and note down the initial height, which is same.

7.3.2 Fill the solution in cylinders.

7.3.3 Connect the electric supply.

7.3.4 Switch ON the light.

7.3.5 Stir the solution of cylinder-1 until a uniform solution is achieved. Record the initial time.

7.3.6 Start the stop watch and record the height of clear liquid interface at every 5 minute interval.

7.3.7 Also note down the time.

7.3.8 Repeat the above steps for all remaining cylinders.

7.3.9 Record the final height and time for each cylinder.

7.4 Closing Procedure (For Case-2):

7.4.1 When experiment is over switch OFF the light.

7.4.2 Switch OFF the power supply.

7.4.3 Clean all the cylinders.

7.5 Starting Procedure (For Case-3):

7.5.1 Take five different size of calcium carbonate and note down the size of it.

7.5.2 Prepare slurry solution by mixing known amount of sodium carbonate with 2 liter of water.

7.5.3 Fill the solution in cylinders.

7.5.4 Connect the electric supply.

7.5.5 Switch ON the light.

7.5.6 Stir the solution of cylinder-1 until a uniform solution is achieved. Record the initial time.

7.5.7 Start the stop watch and record the height of clear liquid interface at every 5 minute interval.

7.5.8 Also note down the time.

7.5.9 Repeat the above steps for all remaining cylinders.

7.5.10 Record the final height and time for each cylinder.

7.6 Closing Procedure (For Case-3):

7.6.1 When experiment is over switch OFF the light.

7.6.2 Switch OFF the power supply.

7.6.3 Clean all the cylinders.

8. Observation & Calculation:

8.1 Data:
Initial concentration of solution C_o = _____ kg/m^3