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Indian Standard (Reaffirmed 1996)

METHODS OF SAMPLING AND TEST (PHYSICAL AND CHEMICAL) FOR WATER AND WASTE WATER

PART 20 DISPERSION CHARACTERISTICS (FLOW PATTERNS)

(First Revision)

Water Sectional Committee, CDC 26 and Panel for Methods of Test for Water and Effluents, CDC 26 : P1 [Ref : Doc : CDC 26 (8857)]

1. Scope — Prescribes dye dispersion method for determination of dispersion characteristics of a water body.

2. Principle — Dispersion characteristics of a water body are determined using the organic pigment rhodamine-B.

3. Apparatus — Fluorometer.

4. Reagents

4.1 *Sodium Chloride* — saturated solution.

4.2 *Dye* — Rhodamine-B dissolved in methanol in the proportion 1 : 5 resulting in a solution of density 0·8 g/ml approximately.

5. Procedure

5.1 Increase the density of rhodamine-B solution, by adding saturated sodium chloride solution, to the value of the density of the water body. Inject this solution into the water body.

5.2 At regular intervals, draw a sample from the centre of the patch ($r = 0$) and determine the concentration of rhodamine-B using a fluorometer, which measures the fluorescence of the dye present in the sample. Hence obtain the concentration of the dye.

5.3 *Precautions* — The following should be noted before the results are interpreted:

a) Fluorescence of rhodamine-B decreases by about 2 percent per °C increase in temperature;

b) Effect of the chlorinity of water is insignificant;

c) The dye is heavily adsorbed by organic suspended matter and this adsorption decreases with increasing chlorinity;

d) In bright sunlight the fluorescence decreases by about 2 percent per hour and by about 0·5 percent per hour in cloudy conditions;

e) It may be noted that the position of the centre of the patch of the dye is an indicator of the movement of the water body; and

f) The dispersion can also be measured directly by using an *in-situ* fluorometer, which is commercially available.

6. Calculation — Calculate the diffusion parameter using the following equation :

$$C(r, t) = \frac{M \; e^{-r/t}}{2\pi (pt)^2}$$

where

M = mass of rhodamine-B injected into a layer of unit thickness in g/cm,

r = distance from the centre of the patch (point of maximum concentration) in cm,

t = time in s,

p = diffusion parameter in cm/s, and

C = concentration of rhodamine-B dye in g/cm.

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