JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE

(An Autonomous College of University of Mysore, Re-accredited by NAAC with 'A' Grade)

Ooty Road, Mysuru-570025, Karnataka

A REPORT SUBMITTED TO
DEPARTMENT OF ENVIRONMENTAL STUDIES

SUBMITTED TO:

The Dept. Of Environmental studies
JSSCACS (Autonomous)
Ooty Road, Mysuru -25

SUBMITTED BY:

Name: ---Ankitha---
Programme: ..B..Sc..(..BT)
Year/Sem:...I..year....I..Sem

JSSCACS, Mysuru-25

JSS MAHAVIDYAPEETHA

JSS COLLEGE OF ARTS, COMMERCE & SCIENCE

Autonomous, 'A' Grade and 'College with Potential for Excellence'

OOTY ROAD, MYSURU-570 025, KARNATAKA

Ph: 0821-2548236 & 2548380. FAX: 0821-2548238

E-mail: jssautonomous@gmail.com; Website: jsscacs.edu.in

CERTIFICATE

It is hereby certified that Mr/Ms Ankitha of B.Sc(CBt) has undergone and completed field visit of Municipal Water Purification System at Mysuru, as part of the curriculum in the course Environmental Studies in FIRST SEMESTER of the year 2021-2022.

Principal
J. S. S COLLEGE
Ooty Road, Mysore-570 025

2. MUNICIPAL DRINKING WATER TREATMENT PROCESS

Panchayats, Municipalities and Corporations supply drinking water to hundreds of households everyday. The water requires a number of treatments before the supply. The main steps involved in the purification of drinking water involves:

STEP-1 – FLOCCULATION

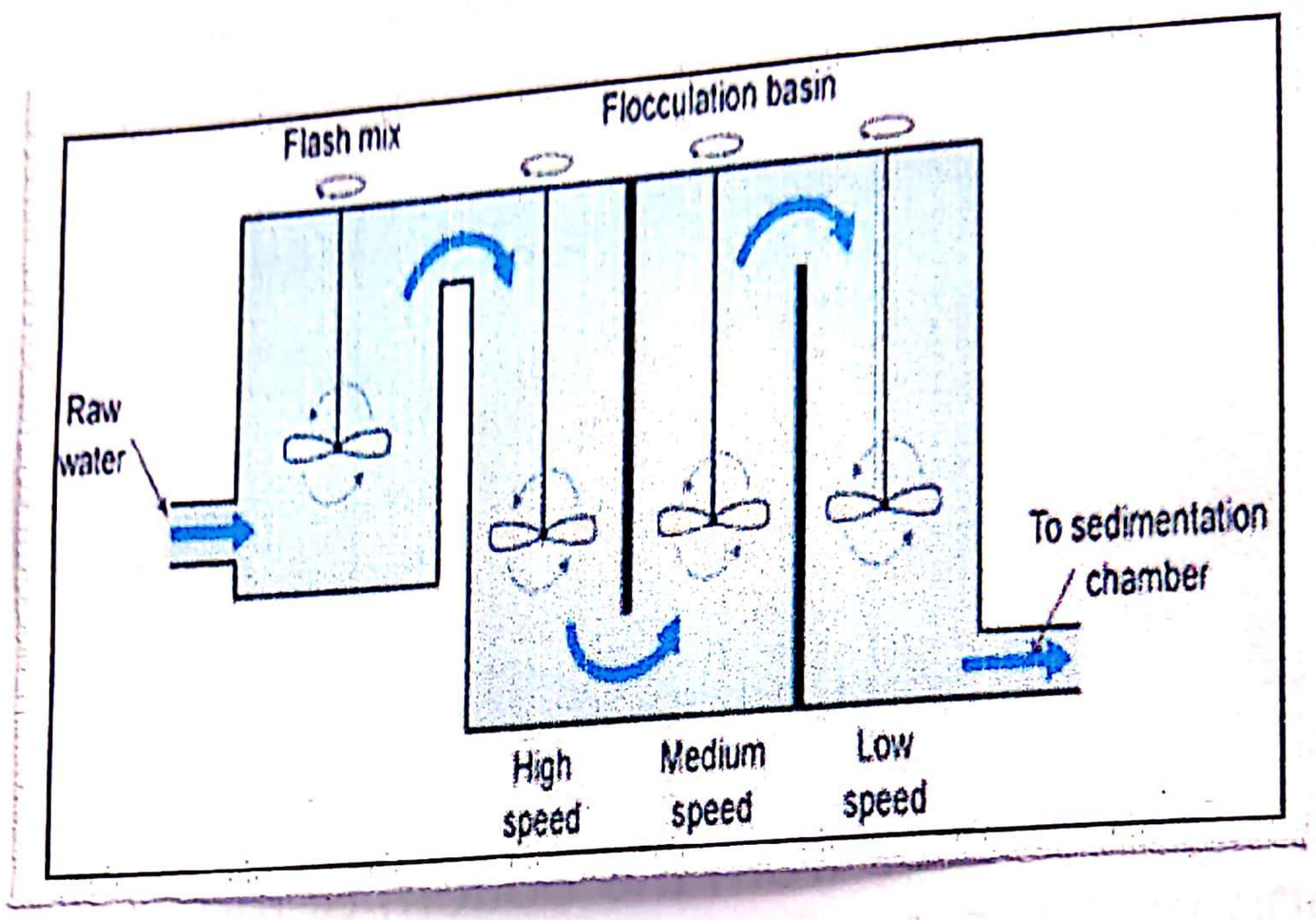
Water from natural reservoir is collected in large tanks or basins for a sufficient period of time to permit large particulate matter to settle down at the bottom. The particles that settle down are removed. The water is then treated with flocculent chemicals that promote flocculation by forming flocs. Flocs are formed causing colloids and other suspended particles in liquid to aggregate. This process is called *flocculation*. Commonly used flocculants are Aluminium sulphate, Alum, Calcium, Sodium Aluminate etc.

STEP-2 – SEDIMENTATION

The second stage of purification of water is sedimentation. The water is left in the settling basin for further sufficient period to allow sedimentation of remaining materials. The surface water is stored in large storage ponds which allows the suspended particles and microorganisms to settle at the bottom of the tank. It considerably reduces the microbial population of water, besides removing most of the suspended particles. Sedimentation can be enhanced by the addition of alum (aluminium sulphate). Activated carbon is used to remove the undesirable taste and odour.

STEP-3 – FILTRATION

The third stage of water purification is filtration. Here, water is subject to sand filters to remove flocs. Microorganisms and suspended particles are removed in this step. Most commonly used filter for this purpose is sand filter, which is the most effective filter.



FLOCCULATION

SEDIMENTATION TANKS

(a) Slow Sand Filters

A concrete floor with drainage tiles are used for this process. These have layers of fine sand, coarse sand, fine gravel and coarse gravel. The uppermost fine sand layer acts as biological filters. Its interspaces are clogged by colloidal floccules, capsulated microorganisms, algae, retains 99% of bacteria, thus making the water free from them. The mechanism by which this works is that the negatively charged bacteria are held by the positively charged colloids.

(b) Rapid Sand Filters

This involves the same equipments as the slow sand filters, but the sand filtration area is much more smaller than the slow sand filters with the provision for frequent backwashing.
Backwashing is a process in which filtered water with a great pressure of air is passed through the sand bed in opposite direction to remove the accumulated flocs.

STEP- 4 – DISINFECTION

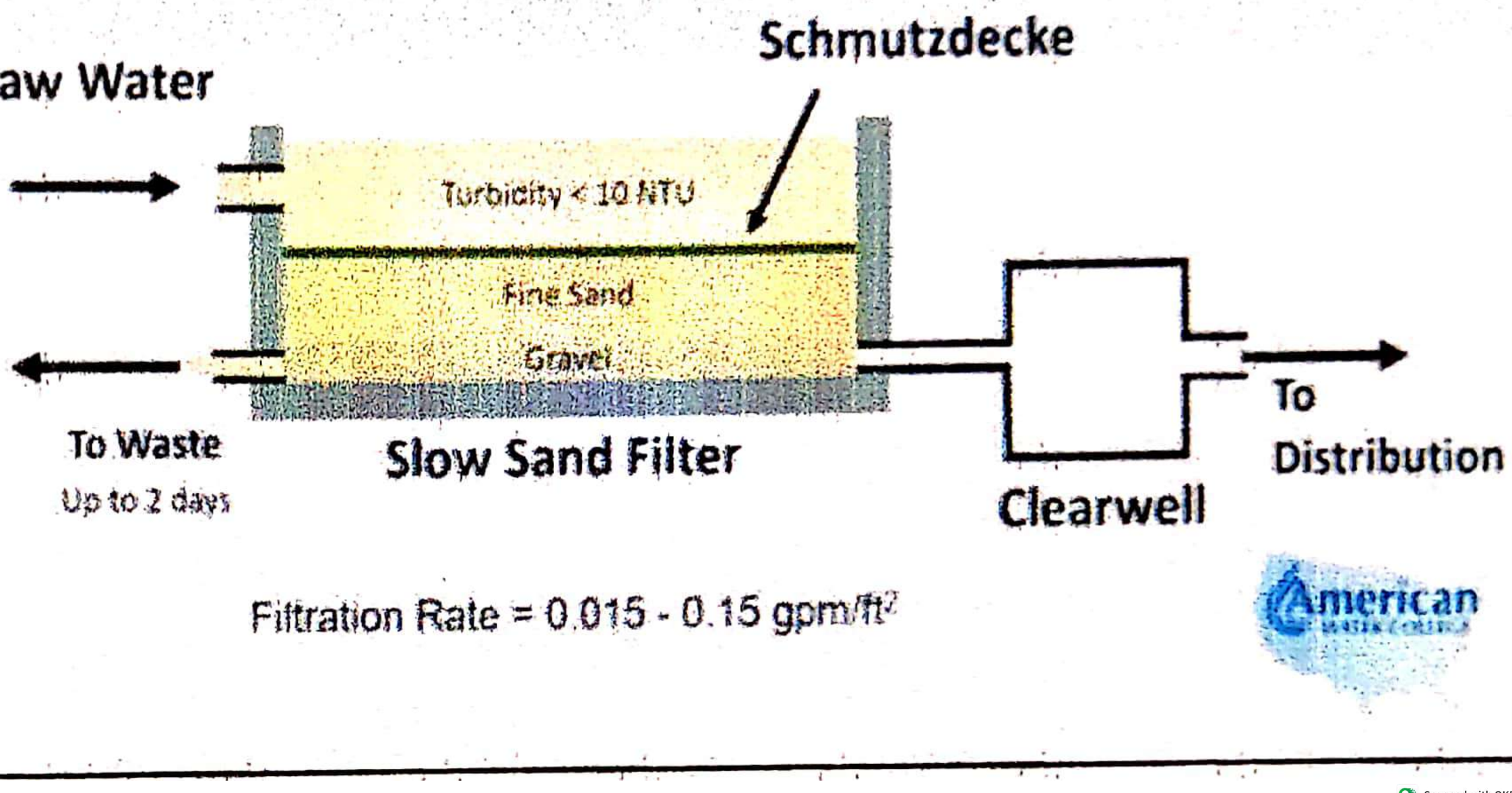
Disinfection is the final step in municipal water treatment process. It ensures that no pathogenic microorganisms are carried through water. Disinfection is carried out by thr following processes:

(i) Chloination
(ii) Ozonation
(iii) UV-Light Irradiation
(iv) Boiling Disinfection
(v) Chemical Disinfection (Calcium/Sodium Hypochlorite)

The most commonly used method of disinfection is chlorination. It is the traditional method used to disinfect water for larger cities. Chlorination is the use of chlorine for disinfection.

Chlorine obtained as liquid under pressure, releases into water as gas. It easily dissolves in water, reacts with it to form hypochlorous acid, a potent microbicide. In addition to killing microbes, it is also effective in oxidizing the organic matter. Hypochlorous acid quickly relaeases nascent oxygen, which oxidizes cellular and organic components in the water.

Slow Sand Filter



Filtration Rate = 0.015 - 0.15 gpm/ft²

An overdose of Chlorine changes the odour and taste of drinking water. Excess chlorine also produces Trihalomethane (THM), a suspected carcinogen, which can be removed by chloroamination.

After disinfection, the purified water is stored in large reservoirs and is supplied to households for domestic consumption through gravity taps.

3. COMPOSTING PROCESS

Composting is an aerobic method (meaning that it requires the presence of air) method of decomposing organic solid wastes. It can therefore be used to recycle organic material. The process involves decomposition of organic material into a humus-like material, known as compost, which is a good fertilizer for plants. It is carried out by various microorganisms and worms present in the soil.

There are three kinds: aerobic, anaerobic, and vermicomposting. With ***aerobic composting***, air is introduced to help break down materials quickly. ***Anaerobic composting*** takes almost no effort at all, scraps are made into a compost pile or composter for a year or more. ***Vermicomposting*** uses worms, oxygen, moisture and bacteria to safely break down organic material with few odors.

The Phases of Composting

In the process of composting, microorganisms break down organic matter and produce carbon dioxide, water, heat, and humus, the relatively stable organic end product. Under optimal conditions, composting proceeds through three phases:

1) ***The Mesophilic Phase***, or moderate-temperature phase, which lasts for a couple of days

2) ***The Thermophilic Phase***, or high-temperature phase, which can last from a few days to several months, and finally,

3) ***The Cooling and Maturation Phase*** - a several-month cooling and maturation phase.

1. MESOPHILIC PHASE

Different communities of microorganisms predominate during the various composting phases. Initial decomposition is carried out by mesophilic microorganisms, which rapidly break down the soluble, readily degradable compounds. The heat they produce causes the compost temperature to rapidly rise. At the beginning of the composting process (0-40°C), mesophilic bacteria predominate. Most of these are forms that can also be found in topsoil.

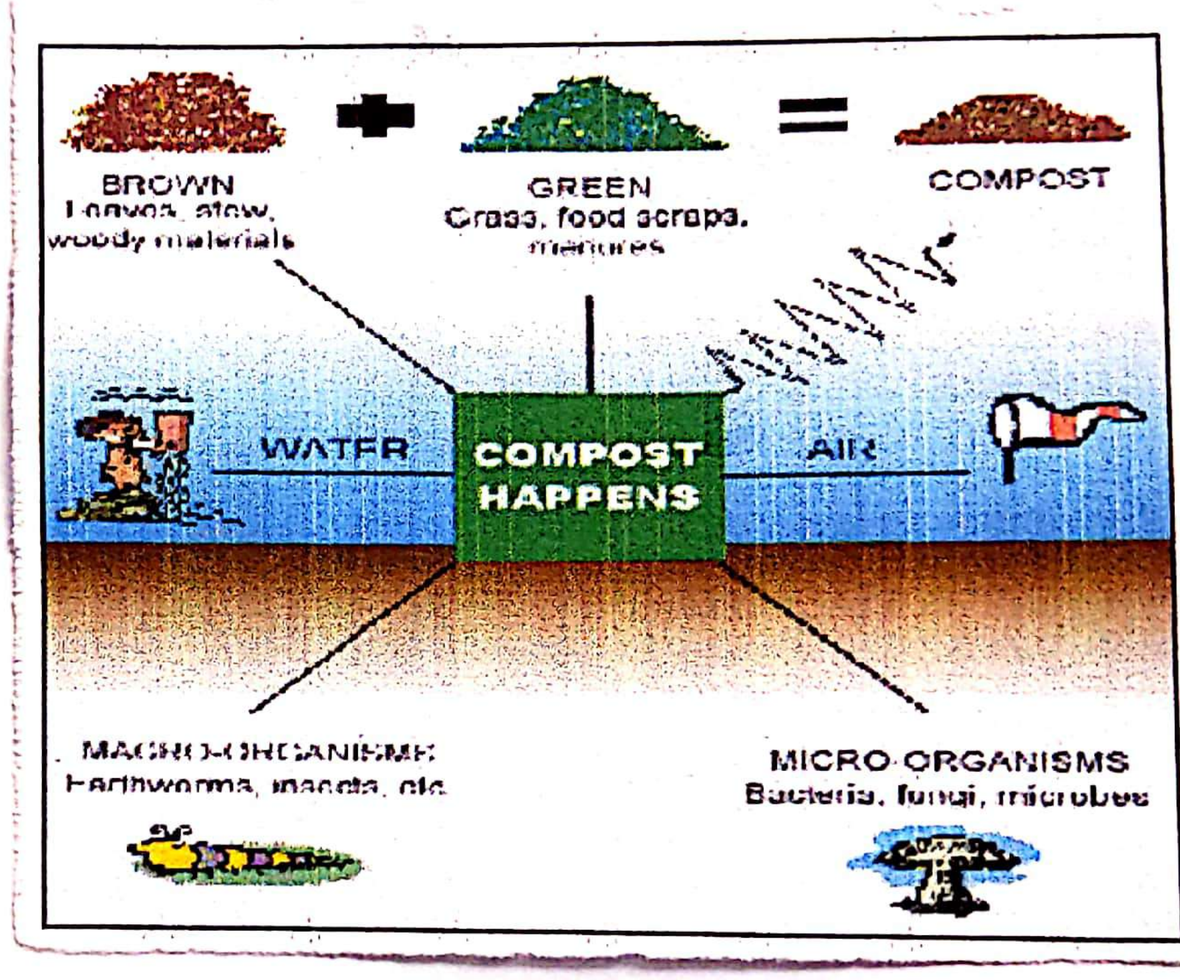
2. THERMOPHILIC PHASE

As the temperature rises above about 40°C, the mesophilic microorganisms become less competitive and are replaced by others that are thermophilic, or heat-loving. At temperatures of 55°C and above, many microorganisms that are human or plant pathogens are destroyed. Because temperatures over about 65°C kill many forms of microbes and limit the rate of decomposition, compost managers use aeration and mixing to keep the temperature below this point. The microbial populations during this phase are dominated by members of the genus Bacillus. The diversity of bacilli species is fairly high at temperatures from 50-55°C but decreases dramatically at 60°C or above. At the highest compost temperatures, bacteria of the genus *Thermus* have been isolated

3. COOLING / CURING AND MATURATION PHASE

During the thermophilic phase, high temperatures accelerate the breakdown of proteins, fats, and complex carboydrates like cellulose and hemicellulose, the major structural molecules in plants. It is carried out by soil *Actinomycetes*. Fungi include molds and yeasts, and collectively they are responsible for the decomposition of many complex plant polymers in soil and compost. In compost, fungi are important because they break down tough debris, enabling bacteria to continue the decomposition process once most of the cellulose has been exhausted.

As the supply of these high-energy compounds becomes exhausted, the compost temperature gradually decreases and mesophilic microorganisms once again take over for the final phase of "curing" or maturation of the remaining organic matter. The numbers and types of mesophilic microbes that recolonize compost as it matures depend on what spores and organisms are present in the compost as well as in the immediate environment. In general, the longer the curing or maturation phase, the more diverse the microbial community it supports.



COMPOSTING PROCESS