e-ISSN : 2347 - 9671, p- ISSN : 2349 - 0187
EPRA International Journal of Economic and Business Review | Vol - 3, Issue- 5, May 2015
Inno Space (SJIF) Impact Factor : 4.618(Morocco) ISI Impact Factor : 1.259 (Dubai, UAE)

SEWAGE AND WASTEWATER TREATMENT IN MICROBIOLOGIST

Mrs.M.Mahila Adline[1]

Nursing Superintendent
SLRTC Hospital
Karigiri,Vellore
Tamil Nadu, India

ABSTRACT

Human activities generate a tremendous volume of sewage and wastewater that require treatment before discharge into waterways. Often this wastewater contains excessive amounts of nitrogen, phosphorus, and metal compounds, as well as organic pollutants that would overwhelm waterways with an unreasonable burden. Wastewater also contains chemical wastes that are not biodegradable, as well as pathogenic microorganisms that can cause infectious disease.

KEYWORDS: *Sewage, Wastewater, Biological Waste, Waterborne Disease, Bacteria.*

INTRODUCTION

Human activities generate a tremendous volume of sewage and wastewater that require treatment before discharge into waterways. Often this wastewater contains excessive amounts of nitrogen, phosphorus, and metal compounds, as well as organic pollutants that would overwhelm waterways with an unreasonable burden. Wastewater also contains chemical wastes that are not biodegradable, as well as pathogenic microorganisms that can cause infectious disease. The chemical and biological waste in sewage and water must be broken down before it is deposited to the soil and environment. This breakdown can effectively be controlled by managing the microbial population in waters and encouraging microorganisms to digest the organic matter. The water must then be purified before it is considered fit to drink. Water taken from ground sources must also be treated before consumption.

MICROBIOLOGICAL COMPOSITION OF SEWAGE

The field of environmental microbiology deals with different pathogenic microorganisms (viruses, bacteria, parasitic protozoan and helminthes) involved in different environments. Basically, the area concentrates in water milieu, but soil and air are also included. The spread, survival, growth and interaction with different environmental parameters of these pathogens are the main focus of research. In addition, environmental microbiology looks upon the methodology of isolation and identification of these pathogens from water, soil and air, using classical and new molecular biology methods. Indicators of these pathogens are also investigated in depth to simplify environmental monitoring. Among the environmental systems related to environmental microbiology are biofilms, wastewater and water treatment, sludge and compost manipulation, food microbiology, agriculture and water reuse. In the 1970's IWA established a group of international experts, which is well established today. Called: "Health-Related Water Microbiology" (HRWM), the group holds bi-annual meetings globally.

Wastewater environment is an ideal media for a wide range of microorganisms specially bacteria, viruses and protozoa. The majority is harmless and can be used in biological sewage treatment, but sewage also contains pathogenic microorganisms, which are excreted in large numbers by sick individuals and a symptomic carrier. Bacteria which cause cholera, typhoid and tuberculosis; viruses which cause infectious hepatitis; protozoa which cause dysentery and the eggs of parasitic worms are all found in sewage (Glynn Henery, 1989 and Shaaban et al., 2004). The efficiency of disinfecting sewage is generally estimated by the extent of removal of total coliform organisms.

Wastewater is teaming with microbes. Many of which are necessary for the degradation and stabilization of organic matter and are beneficial. On the other hand, wastewater may also contain pathogenic or potentially pathogenic microorganisms, which pose a threat to public health. Waterborne and water-related diseases caused by pathogenic microbes are among the most serious threats to public health today. Waterborne diseases whose pathogens are spread by the fecal-oral route (with water as the intermediate medium) can be caused by bacteria, viruses, and parasites (including protozoa, worms and rotifers).

Diarrhea is one of the most common features of waterborne disease. Fecal pollution is one of the primary contributors to diarrhea. Examples of bacteria commonly associated with diarrheal disease are *Shigella dysenteriae* and *Salmonella typhi*. Two protozoans commonly associated with diarrheal disease are *Giardia lamblia* and members of the genus *Cryptosporidium*.

Purification of drinking water is one of the most successful means of preventing the spread of disease in a society. Effective water purification eliminates waterborne pathogens. However, if treatment facilities fail in their goal of purifying water, widespread epidemics may result with serious consequences.

WATER PURIFICATION

To purify water for drinking, a number of processes are conducted to reduce the microbial population and maintain that population at a safe level. First, the solid matter is allowed to settle out in a **sedimentation tank.** Flocculating materials such as alum are used to drag microorganisms to the bottom of the tank.

Then the filtration process is begun. Water is filtered through either a **slow sand filter** or a **rapid sand filter.** These processes remove 99 percent of the microorganisms. The slow sand filter is composed of finer grains of sand, and the filtration process takes longer than in the rapid sand filter, where larger grains are used.

Many communities then purify the water by **chlorination.** When added to water, chlorine maintains the low microbial count and ensures that the water remains safe for drinking purposes. Chlorine gas or hypochlorite (NaOCl) is used for chlorination purposes. The water is chlorinated until a slight residue of chlorine remains.

Sewage treatment:-

Sewage treatment involves a more complex set of procedures than are needed for water purification because the volume of organic matter and the variety of microorganisms are much greater.

Primary Treatment:-

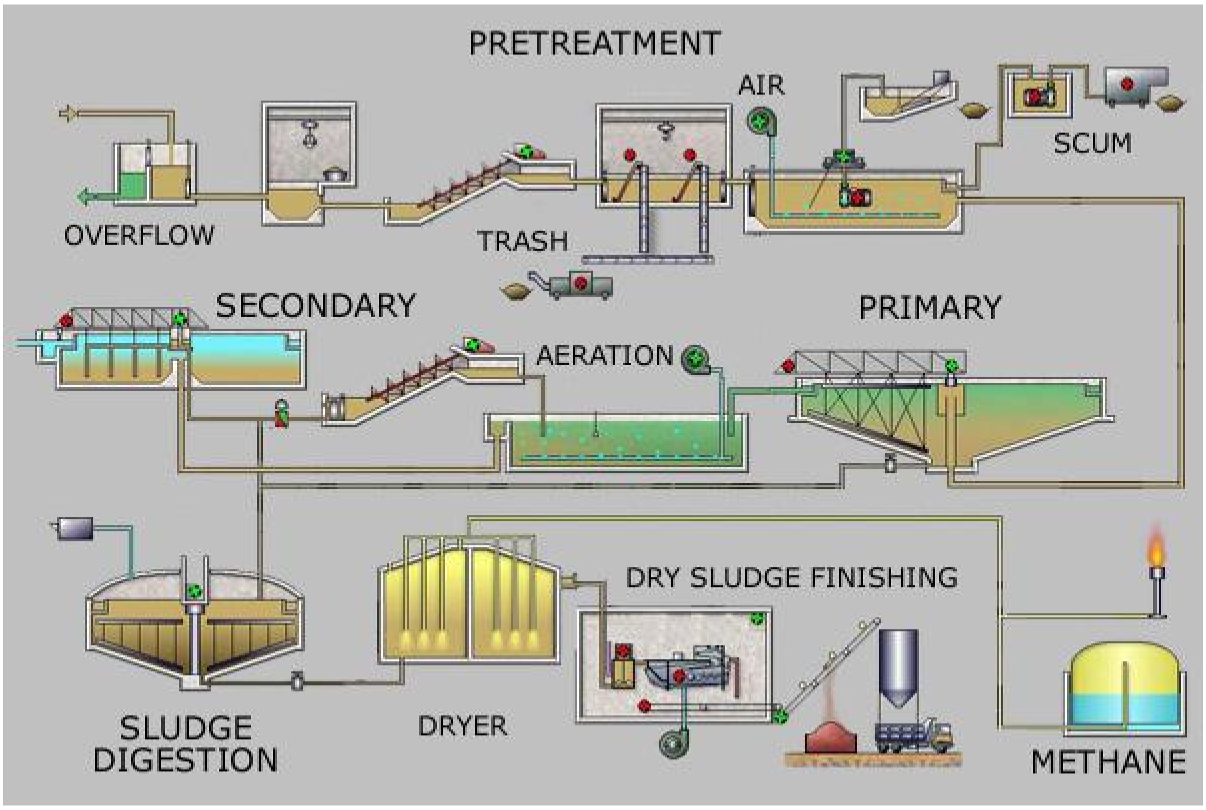
In primary treatment, sewage is stored in a basin where solids (sludge) can settle to the bottom and oil and lighter substances can rise to the top. These layers are then removed and then the remaining liquid can be sent to secondary treatment. Sewage sludge is treated in a separate process called sludge digestion.

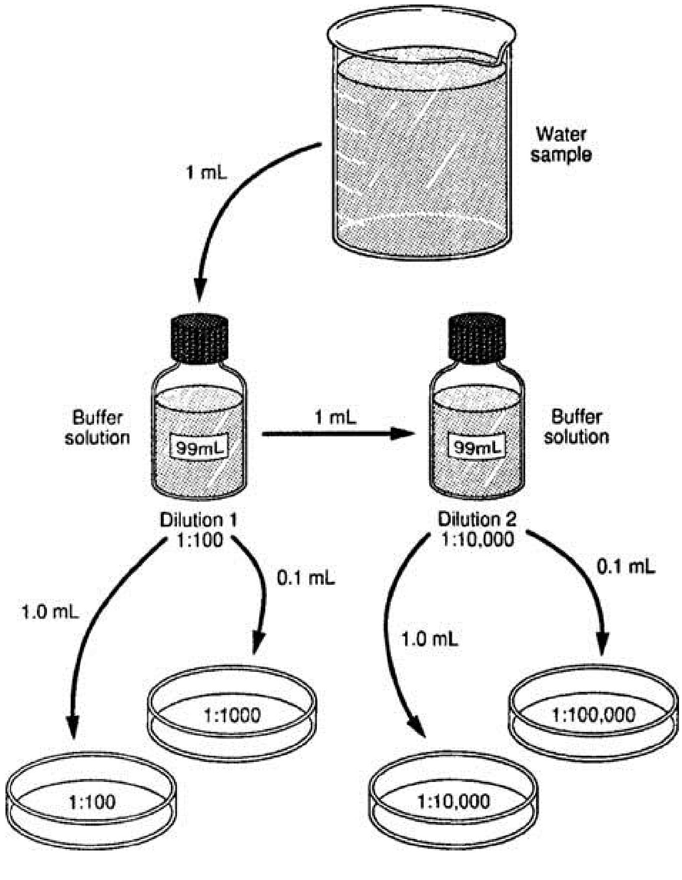
Secondary Treatment:-

Secondary treatment removes dissolved and suspended biological matter, often using microorganisms in a controlled environment. Most secondary treatment systems use aerobic bacteria, which consume the organic components of the sewage (sugar, fat, and so on). Some systems use fixed film systems, where the bacteria grow on filters, and the water passes through them. Suspended growth systems use "activated" sludge, where decomposing bacteria are mixed directly into the sewage. Because oxygen is critical to bacterial growth, the sewage is often mixed with air to facilitate decomposition.

Tertiary Treatment:-

Tertiary treatment (sometimes called "effluent polishing") is used to further clean water when it is being discharged into a sensitive ecosystem. Several methods can be used to further disinfect sewage beyond primary and secondary treatment. Sand filtration, where water is passed through a sand filter, can be used to remove particulate matter. Wastewater may still have high levels of nutrients such as nitrogen and phosphorus. These can disrupt the nutrient balance of aquatic ecosystems and cause algae blooms and excessive weed growth. Phosphorus can be removed biologically in a process called enhanced biological phosphorus removal. In this process, specific bacteria, called polyphosphate accumulate organisms that store phosphate in their tissue. When the biomass accumulated in these bacteria is separated from the treated water, these biosolids have a high fertilizer value. Nitrogen can also be removed using nitrifying bacteria. Lagooning is another method for removing nutrients and waste from sewage. Water is stored in a lagoon and native plants, bacteria, algae, and small zooplankton filter nutrients and small particles from the water.


PRETREATMENT
AIR
SCUM
OVERFLOW
TRASH
SECONDARY
PRIMARY
AERATION
DRY SLUDGE FINISHING
SLUDGE
DIGESTION
DRYER
METHANE


Water
sample
1 mL
Buffer
solution
99mL
1 mL
99mL
Buffer
solution
Dilution 1
1:100
Dilution 2
1:10,000
1.0 mL
0.1 mL
1.0 mL
0.1 mL
1:1000
1:100,000
1:100
1:10,000

The standard plate count procedure. A 1 mL water sample is diluted in buffer solution, and various amounts are placed with nutrient medium into Petri dishes to encourage bacterial colonies to form. The colony count is multiplied by the dilution factor to yield the total plate count.

The types of wastewaters studied have included municipal, industrial, hospital and those classified as hazardous wastes. This work has involved elements of process performance, design, operation and monitoring. Other areas of research include use of membrane bioreactors for treatment of municipal and industrial wastewater, control of chlorinated organic compound precursors, biological nutrient removal, color removal in textile wastewaters, treatment of volatile emissions from municipal wastewater treatment plants with biofilters, the stability of residual biosolids, aerobic and anaerobic digestion of sludges, and the control of trace contamainants in wastewater reuse applications. Work in environmental microbiology has focused on the microbial ecology of wastewater treatment systems, bioremediation of contaminated groundwater, control of drinking water pathogens such as viruses, Cryptosporidium, and Giardia, autotrophic biological reduction of nitrate and perchlorate, biological Fe(III) reduction for remediation of acid mine drainage sites and the study of soil microcosms containing petroleum hydrocarbons. Work has also been done on chemical transformations in biologically-active filters for drinking water treatment, and on improved bioassays for determining assimilable organic carbon (AOC) and biodegradable organic carbon.

REFERENCE

1. *E.J. Dasilva, Y.R. Dommer Gues, E.J. Nyns, C. Ratledge, Microbial Technology in Developing World, Ofxord Science Publication (1987) 261.*
2. *J. De la Noüe, D. Proulx, Tertiary treatment of urban wastewater by chitosan-immobilized Phormidium sp, T. Stadler, J. Mollion, M.C. Verdus, Y. Kamaranos, H. Morvan, D. Christaien (Eds.), Algal Biotechnology, Elsevier Applied Science, New Yourk (1988), pp. 159–168.*
3. *N. De Pauw, E. Van Vaerenbergh, Microalgal wastewater treatment systems: Potentials and limits, P.F. Ghette (Ed.), Phytodepuration and the Employment of the Biomass Produced, Centro Ric. Produz, Animali, Reggio Emilia, Italy (1983), pp. 211–287.*
4. *O. Colak, Z. Kaya, A study on the possibilities of biological wastewater treatment using algae, Doga Biyolji Serisi, 12 (1) (1988), pp. 18–29.*
5. *O. Hammouda, A. Gaber, N. Abdel-Raouf, Microalgae and wastewater treatment, Ecotoxicol. Environ. Saf., 31 (3) (1995), pp. 205–210.*
6. *P. Chevalier, J. De la Noüe, Wastewater nutrient removal with microalgae immobilized in Carrageenan, Enzyme Microb. Technol., 7 (1985), pp. 621–624.*
7. *W.M. Darley, Algal Biology; A physiological Approach, Basic Microbiology, vol. 9Blackwell Scientific Publications, Oxford (1982).*
8. *Y. Comeau, B. Rabinowitz, K.J. Hall, W.K. Oldham, Phosphate release and uptake in enhanced biological phosphorus removal from wastewater, J. Water Pollut. Control Fed., 59 (1987), pp. 707–715.*