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TYPES OF SEWAGES AND REVIEWS OF WASTES BIOLOGICAL FILTRATION METHODS

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ABSTRACT

Industrial wastewater pollution has been one of the main concerns of human life. Biological methods of wastewater treatment are methods based on pollution removal by microorganisms that are generally divided into two categories: aerobic and anaerobic. The aerobic microorganisms need dissolved oxygen, as a result oxygen (Air) should continuously enter environment (Sewer).While the method of anaerobic, microorganisms supply their oxygen from other oxygen sources including chemical materials, thus they don't need dissolved oxygen.In this paper the general principles and methods, including aerobic and anaerobic methods are put to overview and also mentioned each method's advantages and disadvantages over other methods.

Keywords: Wastewater, biological filtration, aerobic, anaerobic

INTRODUCTION

Water that is affected by pollution particles is one of the biggest concerns. Wastewater includes water discharged from domestic waste, industrial and agricultural. Wastewater usually includes a wide range of contaminants. Both inorganic contaminants as well as organic pollutants are in industrial wastewater that show its toxic effects on the microbiological operating wastewater treatment plants and often are stable against biological attacks and mineralization (1). Wastewater treatment takes place in different methods and processes that among them biological methods are our favorite. The main pollutants in Wastewater are nitrogen (organic or inorganic) in form urea, ammonia, nitrites, and nitrates, phosphorus, proteins, drugs sea salt, cyanides, cyanides Tello, Tello sulfates; pathogenic substances such as bacterial, viral, and parasitic worms; inorganic particles such as sand, gravel, metal and ceramic particles; gases such as hydrogen sulfide, carbon dioxide, methane; Emulsifiers such as paints, adhesives, color of hair, and oil emulsifier. Research shows that due to the increasing of population in the near future, water will be a scarce resource (2). Collecting wastewater was considered since old ages. However, purification slightly expanded it in late 1800 and early 1900 (3).In recent years much research has been done in this area that each of them gave detail about one of the biological filtration of wastewater.

2. The classification of wastewater

In terms of the location of production, wastewater can be divided into three categories:

2.1. Agricultural wastewater

There are pesticides such as halogenated hydrocarbons, allodynia, phosphorus compounds such as parathion in these wastes. Halogenated compounds are particularly dangerous that cause agricultural waste to be extremely dangerous.

2.2. Municipal wastewater

These wastewaters come from households. In this wastewater there are variety of organisms, bacteria and viruses and some types of chemical materials that ammonia and urea are the most important.

2.3. Industrial wastewater

Industrial wastewaters are sewage which is derived from different industries and depending on the companies and their products, chemical compounds and their percentage in different industrial wastewater are different. The most important of these compounds include arsenic, lead, cadmium and mercury. These materials go into the water and environment through wastewater paper mills, plastics, pesticides, mining (4).

3. Process of biological filtration of wastewater

Process of wastewater treatment is classified into preliminary, primary, secondary and advanced stages (Figure 1).All these processes include biological factors.

3.1. Preliminary purification:

At this stage, large floating objects that may clog small pumps and pipes are easily removed [5].

3.2. Primary purification

At this stage, suspended solids and grease are separated from wastewater [5].Primary and preliminary process of may be combined with each other and become a basic operation. After the pebbles have been removed, wastewater still has some inorganic and organic materials and suspended solids within itself. Wastewater relaxes in sedimentation tank. Suspended solids in wastewater sludge are slowly and gradually deposited. The sludge can be removed in different ways [6].Primary purification removes almost 5-50% of the oxygen input, 65% of grease and oil, and 50-70% of all suspended solids.

3.3. Secondary purification

At this point, insoluble organic matter is removed and this process is responsible for the removal of more than 90% of organic matter in the waste water. Attached growth processes, suspended growth processes, and lagoon systems are three methods common in secondary treatment (7).

3.1. Advanced purification

Advanced purification is an additional step after secondary treatment to remove suspended solids and insoluble that still remains in aqueous solution (6).

3.5. Disinfection

Sometimes, wastewaters are not purified so good and have pathogen and disease-causing particles in themselves. Disinfection is a process that kills or disables disease-causing particles. Factors that are commonly used in disinfection are chlorine. Chlorine as a gas, liquid, and solid were added in wastewater and by removing microorganisms that cause their destruction. Free chlorine or unused sometimes remains in water, even in low concentrations, can be hazardous to marine life (8).

4. Biological methods of wastewater purification

1.4. Aerobic methods

Microorganisms need dissolved oxygen, as a result oxygen (Air) should continuously enter environment (Sewer).In fact, in this way, the organic materials in the presence of dissolved oxygen are converted into mineral. Oxygenation action will be done through mechanical systems (such as surface aerators or compressor supplying compressed air) or through gravity sewer by passing the substrate of microorganisms.

4.1.1. Active sludge

This process is one of the most common methods for biological treatment of sewage. Due to high performance in various environmental conditions and the ability to remove a wide range of pollutants in wastewater, it is widely used in biological treatment field. However, this method has problems like: Dispersed growth, needle clots, non-disciplinary Balkyng, interdisciplinary Balkyng, rising sludge and its foam that the most common of these problems Balkyng sludge and lack of rapid sedimentation of sludge in secondary tank which is distinguished into two types of disciplinary and non-disciplinary. Among other forms of the system the need to return the device and pumping sludge and low resistance in contrast of second hydraulic charges. To fix this bug, which mostly happens due to the distribution of microorganisms in the reactor, recently, the use of fixed bed systems is considered (9,10).

4.1.2. Trickling filters

Trickling filters are common fixed context treatment systems. Type of flow in such system is pipe based. Most of the biological responses are positive and causes an increase in efficiency, but, because in the waste water due to the high concentration of feed, rapid microbial growth and bacteria layers with thickness will be established, input field gets blocked and clogged and outlet part of the system remains unused.

4.1.3. Powdered Activated Carbon Treatment systems

For the treatment of industrial wastewater using activated sludge, low resistance against late biodegradable organic pollutants is one of the problems. In this case, the physical chemical modification of the system by adding powdered activated carbon to the activated sludge aeration tank is considered by many researchers. This will accelerate the absorption of pollutants and biological growth is a result of removing pollutants. In fact, along with the physical-biological chemical treatment as complementary to each other, increasing the efficiency of removal and even improve the quality of the sediment sludge. Unfortunately, an operational problem, resulting from the application of the system such as expensive carbon powder and separation of sludge and rehabilitation, prevents the application of the system of the industrial plant (11).

4.1.4. Moving Biofilm Reactors

The main characteristic of the biofilm reactor is growth on small acne that is floating aeration tanks. The coarse bubble aeration system will be carried out in addition to the amount of oxygen required for biodegradation and oxidation of organic materials in the reactor provides sufficient mixing. This method is a combination of activated sludge and biological filter. The possibility of using acne with high surface area, relatively fast start, easy to control, no need for recirculation, sludge production with high settling properties, System and heat resistant organic doubt, a good ability to remove the burden of water and nutriafika are Among issue which justify research in this area (12).

4.1.5. Packed stage reactors

This method is Corrected Mode of activated sludge. Have five separate stages from each other. Reactor steps: 1. filling phase 2.Reaction phase 3.Sedimentation phase 4.Evacuation phase 5. Resting phase. The advantages of packet-stage reactor we can mention: to lower the cost of construction, easy operation, High tolerance, does not require secondary sedimentation tanks, does not require returning the system sludge. In the definition of these systems, it can be said, what activated sludge can do in place and packed stage reactor is able to do it in a certain stage of time (13).

4.1.6. Membrane bioreactors

Membrane bioreactor (MBR) is an advanced technology in wastewater treatment. This system is a system of suspended growth activated sludge secondary structures of membrane clear that instead of Micro process to separate solid / liquid is used. An example of this type of system is shown in Figure 2.Including membranes immersed in aerated bioreactor, aerobic-anaerobic zone and returned a liquid mixture in order to be Danitrevacazion. In some treatment plants rather than external pressure membranes are immersed membranes have been used [14].

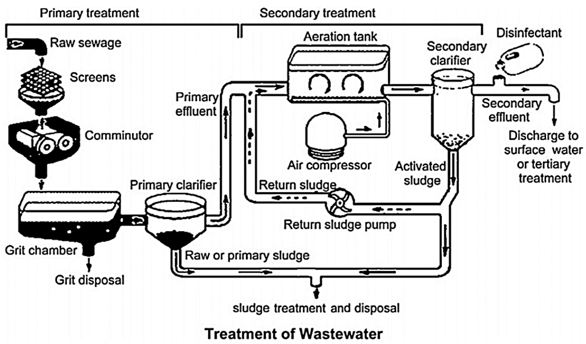

Figure 1 - Overview of biological purification of wastewater

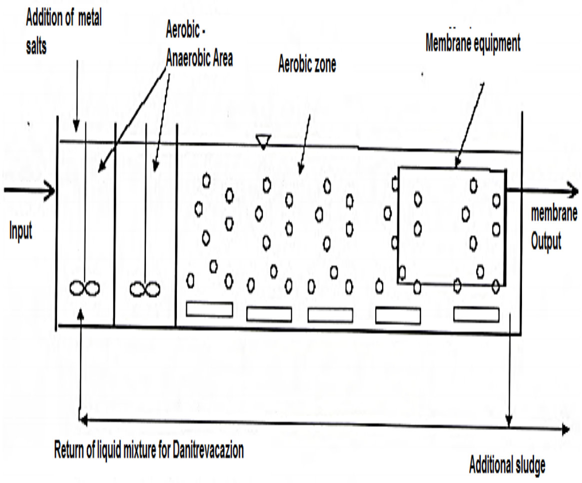

Figure 2 - An example of a membrane bioreactor system

4.2. Anaerobic methods

In the process of anaerobic microorganisms need oxygen from other sources, including chemical oxygen supply and no oxygen is required. In This method when the dissolved oxygen is present in the environment and organic matter using oxygen is combined mineralized, is used. The end product of anaerobic methods produce gases such as CO2 and gas called "biogas" is more than 60% methane. The method of anaerobic bacteria spend most of their energy to methane production, the sludge produced in this way is very slow and poor. We must not assume those bacteria in anaerobic digestion systems and certain types of bacteria, but the river is quite similar to the bacteria that can affect the decomposition of organic matter and the formation of methane. Two big disadvantages for the anaerobic treatment can be mentioned: The first disadvantage is that these methods cannot have a wastewater treatment plant pretreatment with them, such as flow evacuation our water. The second drawback is that these methods of anaerobic wastewater treatment methods for using the suspended solids are very high. In this method should be a maximum wastewater suspended solids, BOD is 10 to 20 percent. Suspended solids anaerobic reactors because more time will not stop, so there is no possibility of analysis and be an important part of them sent sludge to waste sludge beds. The new anaerobic system in which gas and liquid are separated which is difficult to separate suspended solids and gas bubbles. The anaerobic treatment should be the quality of oxygen in the reactor with different properties and from the time simple and complex organic materials into the reactor and the reactor was informed of the maximum load and this time must be clear in terms of day, month and season. Also should be aware of incorporation of industrial sewage effluent entering the reactor and specially should be informed of the presence of toxic substances in industrial effluent and drainage sufficient nutrients into whether or not the reactor.

4.2.1. UASB reactors

The work this type of reactor is based on the formation of granules. Granular sludge is a biological process in which many different factors are involved. Under the right conditions, methane gas, which is the end product of anaerobic treatment of methane, is produced by bacteria. In such circumstances, any factors that disrupt the production of methane gas as a nuisance is in the process of wastewater treatment. One of sulfate ions can be found in abundance in many industrial wastewaters. Sulfate reduction can produce sulfide, which in turn inhibits the activity of the methane bacteria (15).

4.2.2. Anaerobic filter

A fixed bed process and is able to produce high levels of biomass within the reactor. Therefore, due to the low speed barrier in this process type mixing and clogging problems likely to arise in such systems is high.

4.2.3. Fluidized bed reactors

In fluidized bed reactors higher concentrations of biomass can be achieved. The solid particles in the reactor have to work on larger specific surface area. In fact, these systems have the best stability and efficiency. The high concentration of biomass consists of solid particles in the fluid bed leads to be decomposed organic material in a short time and so on lower growth rate of Anaerobic bacteria problem. Bed expansion is that the accumulation of biomass helps reduce problems such as bed blocking in conventional fixed bed systems. From parameters in the commissioning stage of anaerobic bio filter parameters such as temperature, pH, quality and quantity of fertilization, HRT, flow, alkali compounds can be noted (16).

5. CONCLUSION

Major industries such as oil refineries and petrochemical plants need water for production and ultimately as waste water will be removed. Therefore, a significant amount of waste is created in those industries most robust and toxic organic compounds and heavy metal ions, especially resulting from industrial applications. From past few years till now, mankind was thinking about reducing the organic matter of wastes, therefore secondary or biological treatment came into existence. But gradually aerobic treatment methods became more wide spread. In the second half of the twentieth century it became clear that even the evacuation treated wastewater biological methods may cause destruction of the environment and wastewater effluent. Providing health conditions for people to live, keeping the environment clean, restore sewage, natural fertilizer and energy production, are among issue that require wastewater treatment to become more and more important. In this article we have tried to accomplish the objectives, concepts and methods of wastewater treatment processes.

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