Difference Between Aerobic and Anaerobic Wastewater Treatment

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Key Difference – Aerobic vs Anaerobic Wastewater Treatment

Proper wastewater treatment is an important requirement to prevent waterborne diseases and maintain a healthy environment for organisms. A treatment process which involves microbes or living organisms is named as biological wastewater treatment. There are two types of biological waste water treatments namely aerobic wastewater treatment and anaerobic waste water treatment. Aerobic wastewater treatment is carried out by aerobic microorganisms. Aerobic microorganisms require oxygen; hence, oxygen is supplied for aerobic wastewater treatment tanks. Anaerobic wastewater treatment is carried out by anaerobic microorganisms. Thus, anaerobic wastewater treatment process occurs without an oxygen supply. The key difference between aerobic and anaerobic wastewater treatment is that **in aerobic wastewater treatment, treatment tanks are constantly supplied with oxygen while, in anaerobic wastewater treatment, gaseous oxygen is prevented from entering into the system.**

How is Wastewater Treatment Carried Out?

Wastewater treatment process occurs via several major steps such as preliminary treatment, primary treatment, secondary or biological treatment, tertiary treatment and anaerobic digestion. Biological wastewater treatment is the key step in the wastewater treatment process, and it is carried out by organisms such as microorganisms, nematodes, small organisms, etc. The organic matter present in the wastewater is broken down by these organisms. Biological treatment comes after the primary treatment for further removal of organic matter in the wastewater. As mentioned above, there are two types of biological treatments named aerobic wastewater treatment and anaerobic waste water treatment.

What is Aerobic Wastewater Treatment?

Aerobic wastewater treatment process is governed by aerobic organisms which need oxygen for the breaking process. Aerobic wastewater treatment tanks are

constantly supplied with oxygen. It is been done by circulating air through the tanks. For effective functioning of aerobic organisms, sufficient amounts of oxygen should be present in the aerobic tanks at all times. Therefore aeration is properly maintained throughout aerobic treatment.

There are two main types of aerobic wastewater treatments: attached culture systems or fixed film reactors and suspended culture systems. In attached culture system, biomass is grown on solid surfaces or media and wastewater is passed over the microbial surfaces. Trickling filter and rotating biological contactor are two attached culture systems. In suspended culture systems, biomass is mixed with wastewater. Activated sludge system and oxidation ditch are two popular suspended culture systems.

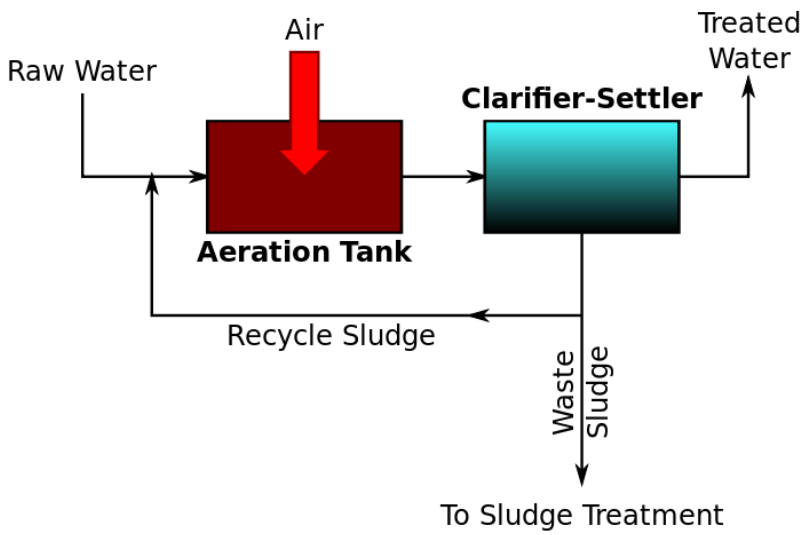

Figure 01: Activated Sludge Method

What is Anaerobic Wastewater Treatment?

Anaerobic wastewater treatment is a biological treatment process where organisms, especially bacteria, break down organic material in the wastewater in an oxygen absent environment. Anaerobic digestion is a well-known anaerobic wastewater treatment process. The degradation of organic material is done anaerobically. For the effective anaerobic digestion of organic materials, the entry of air into anaerobic tanks is prevented. During anaerobic digestion, methane and carbon dioxide are produced. Methane is a biogas. Hence, anaerobic digestion process can be used to produce biogas which can be utilized as electricity.

Anaerobic wastewater treatment process occurs via four major steps named hydrolysis, acidogenesis, acetogenesis, and methanogenesis. All these steps are governed by anaerobic microorganisms, especially bacteria and archaea.

Figure 02: Anaerobic Wastewater Treatment

What are the similarities between Aerobic and Anaerobic Wastewater Treatment?

- Aerobic and anaerobic wastewater treatment processes are biological wastewater treatment processes which involve living organisms.
- Complex organic materials are broken down during both processes.
- Both processes mainly govern by bacteria.

What is the difference between Aerobic and Anaerobic Wastewater Treatment?

Multiple Sclerosis vs Motor Neuron Disease	
Aerobic wastewater treatment is a biological wastewater treatment process which uses an oxygen rich environment.	Anaerobic wastewater treatment is a process where anaerobic organisms break down organic material in an oxygen absent environment.

Bacteria	
Bacteria involved the aerobic wastewater treatment are aerobes.	Bacteria involved the anaerobic wastewater treatment are anaerobes.
Air Circulation	
Air is circulated in aerobic wastewater treatment tanks.	Air is not circulated in anaerobic wastewater treatment tanks.
Production of Biogas	
Aerobic wastewater treatment does not produce methane and carbon dioxide.	Anaerobic wastewater treatment produces methane and carbon dioxide.
Energy Efficiency	
Aerobic wastewater treatment requires energy. Hence, they are less energy efficient.	Anaerobic wastewater treatment is an energy efficient process.
Examples	
Activated sludge method, trickling filter, rotating biological reactors, and oxidation ditch are examples of aerobic wastewater treatment.	Anaerobic lagoons, septic tanks, and anaerobic digesters are examples of anaerobic wastewater treatment.

Summary – Aerobic vs Anaerobic Wastewater Treatment

Wastewater treatment is an essential process which should be properly maintained to safe guard human health. Waste water treatment has four major steps, and biological wastewater treatment process plays a key role in the overall process. Biological treatment has two ways named aerobic wastewater treatment and anaerobic wastewater treatment. Aerobic wastewater treatment process needs oxygen while anaerobic treatment process does not need oxygen. Aerobic wastewater treatment process is carried out by aerobic organisms while anaerobic wastewater treatment is carried out by the anaerobic organisms. This is the difference between aerobic and anaerobic waste water treatment.

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