Wastewater Story

Components And Sources Of Sewage

We have seen wastewater being generated from our kitchens and bathrooms, during the washing and cleaning at our homes. The rain water that runs down after washing off the rooftops, roads etc. is dirty and carries harmful pollutants.

Wastewater is generated during various activities in homes, industries, hospitals, offices, and laundry services etc. This waste water is called sewage.

Sewage is the wastewater containing solid and liquid wastes and pollutants. It is produced by humans from homes, industries, hospitals, offices and other places that use water for their various processes.

We know that sewage is wastewater. What are its components? These are listed in the table

Did you know that Delhi alone generates 2871 million litres of sewage per day?

Components of sewage impurities and their characteristics	
Organic components	Human faeces, animal wastes, oil, urea (urine), pesticides, herbicides, fruits, and vegetable wastes etc.
Inorganic components	Nitrates, phosphates, metals
Nutrients	Phosphorus and nitrogen
Bacteria	The organisms which cause cholera and typhoid
Protozoans	The organisms which cause dysentery and diarrhoea

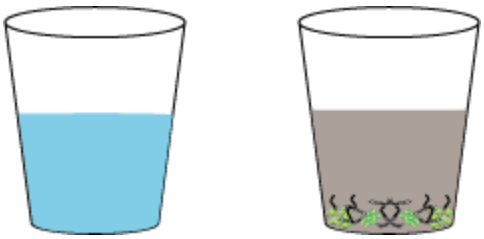
Sewage contains harmful components and therefore utmost care should be taken to avoid consuming water contaminated with sewage.

How do we know if the water is clean or is mixed with sewage?

Let us see how Rahul differentiated between clean water and sewage water

He fills a glass of sewage water from the sewage near his house. He also fills a glass with clean water and places it next to the glass containing sewage water.

Rahul finds that sewage water is dark in colour with impurities and other small organisms.



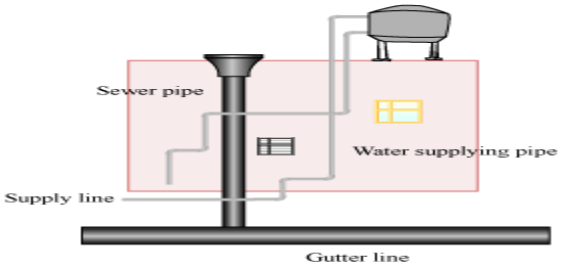
He also observed that sewage water smelt bad. This bad smell of sewage water is caused by the presence of various impurities in sewage.

When Rahul's sister Anuradha, observed a drop of sewage water under the microscope, she found many small germs. There were no germs observed in the clean water sample.

Thus, sewage is harmful as it contains many impurities and germs. Therefore, we should avoid contact with sewage.

Sewage Treatment Processes

Before we study the processes of sewage water treatment, let us find out how sewage water is transported to a treatment plant.



If you look carefully at the pipes supplying water to your house and those that carry away sewage water from your house, you will notice two distinct networks of pipes.

Narrow pipes supply clean usable water to your house.

Commonly used water supplying pipes

Larger pipes carry away the wastewater from your house to the line of sewer. Typically, these pipes are black-coloured iron pipes that are larger in size than the pipes that supply water. They are usually about 5 inches in diameter. These pipes are known as **sewer pipes.**

Commonly used sewer pipes

While walking along the sides of the road, you can see several large-sized open or covered canals that carry dirty water. These are known as **sewerage canals or the sewer line**. Along the footpath, you will observe circular vents which are generally closed. These are called **manholes**. They are the points at which two

sewer pipes meet or when there is a change in direction of the sewer pipe. These are the entry points which are used by people for clearing blockages, repairs, or for general inspection purposes.

These smaller canals carry sewage into the larger canals that eventually carry them to the treatment plants. Sewage contains harmful contaminants that pollute the environment and therefore, should be treated before they are released into the environment.

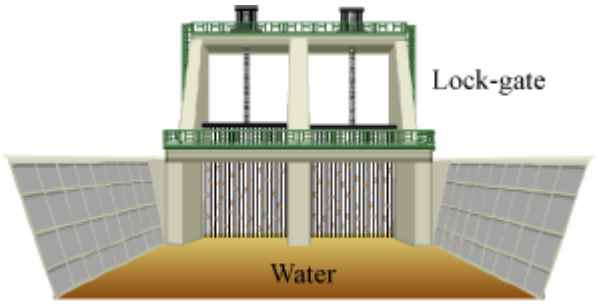
The process of removing the contaminants from sewage water is done through various stages. This entire process is known as the sewage water treatment process.

Let us understand the different processes involved in the treatment of sewage water, in order to reduce the contaminants that make sewage harmful.

In waste water treatment plants, the wastewater is treated through **physical, chemical, and biological processes to remove the physical, chemical and biological contaminants.**

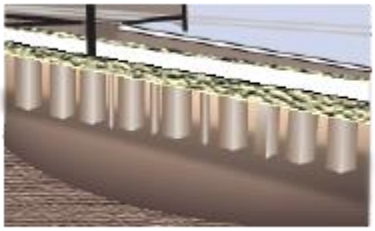
Following are the various processes involved in the treatment of wastewater in a treatment plant

Bar screen



The purpose of this section of the water treatment plant is to remove large-sized objects from the wastewater such as rags, sticks, cans, plastic packets, napkins, papers, etc by allowing the sewage to pass through a bar screen.

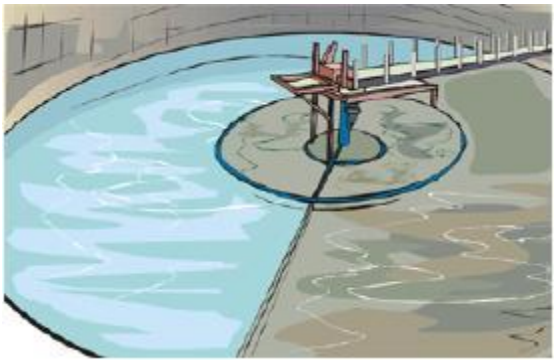
Grit and sand removal



After the wastewater is treated through the bar screen, it goes into the grit and sand removal tank. In this tank, the flow of the water is slowed down to allow sand, pebbles, and grit to settle down at the bottom of the tank.

Clarification

After the wastewater passes through the grit and sand removal tank, it is allowed to settle down in a large tank, with a slope toward the middle. Solid materials like faeces settle at the bottom and are removed with the help of a scraper. The deposited waste material thus collected is called **sludge**. The contaminants that float over the surface of the water are removed by a skimmer. The water that is treated in this process is called **clarified water** and the process is called **clarification.**



Sludge in the tank is allowed to decompose with the help of **anaerobic bacteria** (bacteria which can survive in the absence of oxygen) to produce biogas, that can be used for the generation of electricity.

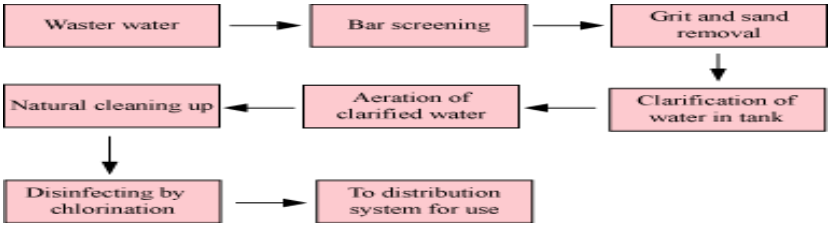
Aeration

Aeration is the process that follows the process of clarification. Air is pumped into the water so that the aerobic bacteria (bacteria which need oxygen to survive), can grow in it. These bacteria consume human wastes, food wastes, soaps and other pollutants that remain in the clarified water.

This pumping of air into the clarified water goes on for several hours. Eventually, the microbes start to settle down at the bottom of the tank as activated sludge. The process of removal of water starts from the top of the tank. The activated sludge that settles down at the bottom of the tank is about 97% water. This water is removed by machines or sand-drying beds. Dry sludge can be used as manure. The water treated through this process contains low organic material. It is therefore discharged into the sea or river or into the ground for natural purification.

Before releasing the water treated in this manner, chlorination is necessary in order to make it germ-free. Chlorine tablets are thus added to it. This process is known as ***chlorination***. Chlorine acts as a disinfectant. It is harmless to humans and other animals.

The entire working of a wastewater treatment plant is summarised in the following illustration.



Reducing Waste Generation

Human activities generate a huge amount of wastes. However, the amount and type of waste materials generated can be easily controlled.

You must have experienced the foul smell emanating from the open sewer pipes in your locality. This situation gets worsened in the rainy season when the sewer pipes start to overflow. As a result, waste materials get scattered over the area. Flies and mosquitoes find a fertile breeding ground over the wastes thus deposited and are responsible for causing several diseases.

Hence, it is of utmost importance to reduce the amount of waste material produced everyday.

The activities that we can undertake to reduce the production of waste materials and pollutants can be grouped into two broad categories

Activities at home to reduce waste generation

- Fats and oils block sewer pipes, thereby reducing the filteration of water. Thus, you should always throw oils and fats in the dustbins.
- You should not throw chemicals such as motor oils, medicines, insecticides, solvents, and paints in water because these chemicals kill the microbes that help in cleaning the water.
- Tea leaves, soft toys, cotton sanitary towels, solid food remains etc. should not be thrown in the sewer pipes or drains because they block these pipes. They also block the flow of oxygen, thereby causing a disturbance in the degradation of waste materials. Thus, you should always throw these materials in the dustbins.

Activities at public places to reduce waste generation

- Large numbers of people visit public places such as bus stops, airports, railway stations, hospitals etc. everyday. It should be the responsibility of every individual to keep these places clean.
- Every citizen must try to keep public toilets neat and clean. People should not excrete in the open places as it poses a serious health hazard.

Improper sanitation increases the generation of waste materials and pollutants. It contaminates the water, thereby causing a variety of water-borne diseases.

Did you know that human excreta are hazardous pollutants?

Proper sanitation facilities are therefore very important. Inadequate sanitation can cause serious problems of pollution and may pose several health hazards.

Water and soil are polluted by human excreta. Water pollution gives rise to several water-borne diseases such as **hepatitis, dysentery, cholera, typhoid, polio, meningitis** etc.

A large number of people in our country do not have access to proper toilet facilities. As a result, they defecate in the open fields, on river beds, on railway tracks, and in the water bodies, thereby polluting the environment. This situation can be avoided if the government takes steps toward providing proper sanitation facilities for everyone.

Low cost and on-site sewage disposal systems such as **septic tanks, chemical toilets, composting pit,** etc. are very suitable for isolated buildings or a small cluster of houses. The excreta collected in these toilets can be used for generating biogas. **Vermin processing toilet** is a type of toilet in which human excreta is treated through earthworms. Earthworms convert human excreta into **vermin cake** that is a good variety of natural manure.