

Wastewater treatment: The importance of it

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Author's Note

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Abstract

It was not until well into the 19th century that sewerage was implemented in the U.S. Around this time, new stresses and demands were introduced to urban environments that required cities to develop sewage systems. According to Historian Joel A. Tarr, “the adoption of two new technologies piped-in water and the water closet combined with higher urban densities to cause the breakdown of the cesspool-privy vault system of waste removal and to generate excessive nuisances and health hazards” (Tarr. 233).

Introduction

The municipal sewer system technology advanced before water treatment technology in the late 19th and early 20th centuries. At this time, most cities drew their water from streams and lakes – the same streams and lakes that were receiving untreated wastewater from those and other cities. This correlated to a “large increase in mortality and morbidity from typhoid fever and other infectious waterborne diseases.

Argument

Historically, wastewater treatment is the prevention of disease. Even in relatively recent times (1800s, early 1900s, and earlier) water-borne diseases were problematic. Prior to wastewater treatment, water-borne diseases were prevalent. Downriver of large towns and cities, the water was dirty and dangerously polluted. With proper wastewater treatment, diseases like cholera, cryptosporidium, and E. coli are kept in check with treatment process.

These diseases still exist, but are primarily found where sanitation is poor. "The World Health Organization (WHO) estimates that more than 25,000 people throughout the world die every day from waterborne diseases. Additional purposes include 1) reduction of organic loading, which depletes BOD in a receiving body of water, potentially killing fish and other biota, and 2) reduction of nitrogen/phosphorus/sediment pollution, which cause algal blooms downstream, also impacting the stream's/river's health.

In short, be thankful for your local wastewater treatment plant... and every one upstream.

Objectives and Evolution of Wastewater Treatment

We cannot allow wastewater to be disposed of in a manner dangerous to human health and lesser life forms or damaging to the natural environment. Our planet has the remarkable ability to heal itself, but there is a limit to what it can do, and we must make it our goal to always stay within safe bounds. Basic wastewater treatment facilities reduce organic and suspended solids to limit Pollution to the environment. This process will remove dissolved matter and toxic substances. However, we as a society we must do our part to properly dispose of our waste.

Treatment technology includes physical, biological, and chemical methods. Residual substances removed or created by treatment processes must be dealt with and reused or disposed of in a safe way. The purified water is discharged to surface water or ground water. Residuals, called sludge's or bio solids, may be reused by carefully controlled composting or land application. Sometimes they are incinerated.

Since early in history, people have dumped sewage into waterways, relying on natural purification by dilution and by natural bacterial breakdown. Population increases resulted in greater volume of domestic and industrial wastewater, requiring that we give nature a helping hand. Some so-called advancements in cities such as Boston involved collecting sewage in tanks and releasing it to the ocean only on the outgoing tide. Sludge was barged out to sea so as to not cause complaint.

Until the early 1970s, in the United States, treatment mostly consisted of removal of suspended and floating material, treatment of biodegradable organics, and elimination of pathogenic organisms by disinfection. Standards were not uniformly applied throughout the country. In the early 1970s until about 1980, aesthetic and environmental concerns were considered. Treatment was at a higher level, and nutrients such as nitrogen and phosphorus were removed in many localities.

Since 1980, focus on health concerns related to toxics has driven the development of new treatment technology. Water-quality standards were established by states and the federal government and had to be met as treatment objectives. Not just direct human health but aquatic-life.

Wastewater treatment types

Rural areas rely on the use of septic systems, a large tank, known as the septic tank, settles out and stores solids, which are partially decomposed by naturally occurring anaerobic bacteria. The solids have to be pumped out and hauled by tank truck to be disposed of separately. They often go to municipal wastewater treatment plants, or are reused as fertilizer in closely regulated land-application programs. Liquid wastes are dispersed through perforated pipes into soil fields around the septic tank.

Wastewater odor

Odors' emanating from wastewater treatment plants has always been a problem controlling within the industry. The unpleasant smell can make people sick to their stomachs if the problem isn't controlled quickly. At times bad odor can be contributed to unwanted bacteria within the waste treatment system which can cause bad smell and taste to the water. Odors can be controlled by using a series of different techniques one such technique is the use of charcoal filters.

The cause of bad odors are such things as inorganic compounds, ammonia and Hydrogen sulfides are considered to be the main causes of odor when the sewage comes from mainly households. Odors can be controlled by using a series of different Techniques used by the wastewater treatment industry. The causes of bad odors are such things as inorganics, ammonia, and hydrogen sulfide may be the main causes of odor when the sewage comes from mainly households.

One solution to odor control is the air stripping process or technique in which dissolved molecules are transferred from water into a flowing air system. Air stripping is primarily used for removal of volatile organic substances in affected waters. This benefits of removing bad odors are, is that the water will smell better and taste better also, removing bad odors will make the water easier to treat in the treatment process (Ball).

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Hydrogen sulfides are considered to be the main causes of odor when the sewages come from mainly households. By choosing the proper treatment technique bad odors can be eradicated from waters and the waters can be made to smell and taste better (Decottignies).

Hydrogen Sulfide is another common odor that can develop in Wastewater Treatment process. Another method of controlling this odor is the use of a bio-filter system that is packed with peat. (peat is a type of gravel used in wastewater treatment); the bio-filter process is very effective in removing hydrogen sulfide odors (Omri).

Microbial diversity quite possibly will increase within the treatment progress of the wastewater treatment process and when that occurs that's an indication that the microbes within the wastewater are quite possibly becoming stabilize from the treatment process because of removal odor pollutants (Xie).

In the treatment process of water and wastewater there has been some distinction made of what type of things causes odor in these two different bodies of water. In Drinking water most odors are caused by chemicals such as industrial as well as household. And in wastewater most odors are caused by bacteria's and different types of organic and inorganic compounds. So therefore finding the odor cause will dictate the approach to treatment to the problem (Suffet and Rosenfeld).

To control odors in wastewater treatment, consist of advanced sampling and analyzing techniques to identify what type of odors are in existence in the wastewater and how they are being formed or cause in the water or the released into the atmosphere. Once this information has been determined then it is possible to create an odor program to prevent odors from reoccurring in the wastewater treatment system (Gonzales, Castillo, Hugo A, and Mary Ann Burns).

There are different processes that can be used to control odor in the wastewater treatment process. Here are at least two types of control technology: 1. vapor-phase process can be used to tame odors in the air and gas; 2. and liquid-phase process can be used to tame odors in liquid wastewater itself (Harshman and Barnette).

History of wastewater treatment

Treatment of wastewater is a relatively modern practice. While sewers to remove foul-smelling water were common in ancient Rome, it was not until the 19th century that large cities began to understand that they had to reduce the amount of pollutants in the used water they were discharging to the environment. Despite large supplies of fresh water and the natural ability of water to cleanse itself over time, populations had become so concentrated by 1850 that outbreaks of life-threatening diseases were traced to bacteria in the polluted water.

Since that time, the practice of wastewater collection and treatment has been developed and perfected, using some of the most technically sound biological, physical, chemical, and mechanical techniques available. As a result, public health and water quality are protected better today than ever before.

The modern sewer system is an engineering marvel. Homes, businesses, industries, and institutions throughout the modern world are connected to a network of below-ground pipes which transport wastewater to treatment plants before it is released to the environment. Wastewater is the flow of used water from a community. As the name implies, it is mostly water; a very small portion is waste material.

At a typical wastewater plant, several million gallons of wastewater flow through each day -- 50 to 100 gallons for every person using the system. The amount of wastewater handled by the treatment plant varies with the time of day and with the season of the year. In some areas, particularly communities without separate sewer systems for wastewater and runoff from rainfall, flow during particularly heavy rains or snowmelts can be much higher than normal.

What happens in a wastewater treatment plant is essentially the same as what occurs naturally in a lake or stream? The function of a wastewater treatment plant is to speed up the process by which water cleanses (purifies) itself.

A treatment plant uses a series of treatment stages to clean up the water so that it may be safely released into a lake, river, or stream. Treatment usually consists of two major steps, primary and secondary, along with a process to dispose of solids (sludge) removed during the two steps.

Primary treatment

In primary treatment, sand, grit, and the larger solids in the wastewater are separated from the liquid. Screens, settling tanks, and skimming devices are most commonly used for the separation. Primary treatment removes 45 to 50 percent of the pollutants.

Secondary treatment

After primary treatment, wastewater still contains solid materials either floating on the surface, dissolved in the water, or both. Under natural conditions, these substances would provide food for such organisms as fungi, algae, and bacteria that live in a stream or lake.

Most public wastewater treatment plants now provide a second stage of treatment known as secondary treatment to remove more of the pollutants--up to 85 or 90 percent altogether.

Secondary treatment is largely a biological process. Air is supplied to stimulate the growth of bacteria and other organisms to consume most of the waste materials. The wastewater is then separated from the organisms and solids, disinfected to kill any remaining harmful bacteria, and released to a nearby lake, river, or stream.

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