POLLUTION BY SEWAGE, CHEMICAL WASTES AND TOXIC MATERIALS: A REVIEW

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Abstract. The issue of sewage disposal has become one of the biggest problems facing the entire world, due to the many health and economic risks that this entails. This type of polluted water includes many dangerous pollutants, whether they are organic or chemical materials (such as soap and industrial detergents), some types of harmful bacteria and microbes, in addition to toxic heavy metals and carbohydrates. Wastewater or sewage water is liquid waste or water whose quality has been negatively affected as a result of human influence. It includes effluents discharged from residential, commercial, industrial and agricultural complexes, and may also contain a wide range of potential pollutants in different concentrations. The large amounts of water produced from mine drainage, mine cooling, hydroextraction, and other mining operations increase the potential for these chemicals to contaminate surface water. In well-regulated mines, hydrologists and geologists make accurate water and soil measurements to rule out any kind of water pollution that could be caused by mining operations. Reducing or eliminating environmental degradation in modern American mining is implemented by federal and state law by restricting operators to meet standards for protecting surface and ground water from pollution. It also refers to the general term, to the liquid waste issued by human complexes and containing a wide range of pollutants resulting from the mixing of liquid waste from various sources.
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Introduction

River water is considered polluted when the composition or condition of its water changes directly or indirectly as a result of human action, and thus its water becomes less suitable for uses in its natural state (Aljamali et al., 2020). Water pollution is also every change in the natural characteristics of water by adding foreign substances that cause it to disturb it or give it an odor, color or taste. Microbes may be a source of pollution (Lazhar et al., 2023; Zeeshan, 2023), making it a source of harassment or harm to the legitimate uses of life. Polluted water contains substances foreign to its natural component, which may be dissolved or suspended solids, dissolved organic or inorganic materials, or microscopic substances such as bacteria, algae or parasites, which leads to a change in its natural, chemical or biological properties, making the water uninhibited. Suitable for drinking or home consumption (Blaser et al., 2021; Jawad et al., 2020a; 2020b), as well as not suitable for use in agriculture or industry.

Discussion

Industrial pollutants

Oil pollutants are considered one of the most widespread and influential sources of water pollution despite their recent history. Oil pollution occurs when oil materials seep into water bodies - especially marine ones - which are not limited to coastal areas only, but extend to the surface of ocean waters and deep water layers. There are many causes of oil pollution of water, to include accidents of oil tankers and its products, and accidents of extracting oil from marine wells, especially during the process of completely separating water from oil, or as a result of oil leakage from wells adjacent to sea shores, or due to damage to pipelines transporting oil from sea wells to beaches. As well as accidents of dumping waste and oil residues in the sea from oil tankers while they are in progress; especially those mixed with water that was used to wash their tanks; as well as those associated with the discharge of ships' ballast water (Al-Musawi et al., 2023; Najm and Hussein, 2023; El-Seedi et al., 2022). Or the sinking of oil tankers laden with oil or their collision with other ships. Oil pollution also occurs when the intentional destruction of land and sea oil wells, as in the first and second Gulf wars, which led to the pollution of the Arabian Gulf waters with oil. Studies have shown that oil pollution in the Gulf is more than 47 times the pollution at the global level per unit area. 77% of pollution comes from marine production and tankers (Al-Musawi et al., 2023; Najm and Hussein, 2023).

Effect of industrial pollutants

Among the damages of oil pollution, we find the following: Oil has a toxic effect on marine organisms when they absorb it. The hydrocarbons that make up the oil collect in the fatty tissues, liver and pancreas of fish, which in turn kills humans after they are cancerous. It also negatively affects invertebrates, plankton, oysters, mammals, sea birds and coral reefs. The impact of negative pollution on beach tourism products extends. The cost of reducing the negative effects of oil, or the compensation paid by shipping companies as a result of pollution, increases (Brandt, 2013; Kellermayer, 2013).

Natural pollution

It is meant the pollution that changes the natural properties of water, making it unsuitable for human use, by changing its temperature or salinity, or increasing the suspended substances in it, whether they are of organic or inorganic origin. The increase in the salinity of the water is usually caused by an increase in the amount of evaporation of the water of the lake or river, especially in dry places without renewing it, and this also leads to it gaining an unpleasant odor or changing its color or taste (Marchant, 2018; Aljamali, 2017; Lewis and Cook, 2014).

Chemical pollution

The chemical pollution of water is one of the most important and most dangerous problems facing modern man, as water has a toxic effect because of it - that is, humans - due to the presence of dangerous chemicals in it, such as compounds of lead, mercury, cadmium, arsenic, and pesticides, which can be divided into a soluble type, and another type capable of accumulating and collecting in the living organisms that live in the water, which represents a great danger to them, as well as to the reach of fish due to its contamination. Sanitation refers to a portion of effluent water contaminated with feces or urine, but is often used to refer to all types of effluents (Panigrahy and Reddy, 2015;

Wang et al., 2015; Ray, 2012; Pirotta and Garland, 2006). Wastewater includes domestic and industrial effluents disposed of using pipes, sewers, or any similar structure, and sometimes in a technical pit, after which it is emptied using special trucks that suck the sewage water and drain it away. The sewage system is all infrastructure, including pipes, pumps, filters, and channels. , etc. used to transport wastewater from its source to the collection point or treatment plants.

Wastewater properties

Physical properties

One of the most important physical properties of wastewater is its solids content, which consists of floating materials, sediments, suspended materials and dissolved materials. The rest of the physical properties are smell, temperature, color and degree of turbidity.

Total solid

Scientifically, the total solids in wastewater are defined as all the substances that remain upon evaporation at a temperature of 103 to 105 ºC. As for materials that have a high vapor pressure, they will be lost in the evaporation process at this temperature and therefore are not considered solid materials. Sedimentable solids are defined as the substances that settle to the bottom of a conical container (called an ammhoff cone) within a time of 60 minutes. Sedimentable solids in mL/L are an approximate measure of the amount of sludge that will be separated by the first settling. The total solids or remaining after evaporation can also be divided into substances that cannot be filtered (suspended) or substances that can be filtered by passing a known volume of liquid through a filter (filter). Solid materials can be further divided according to their volatility at 550 ºC. The organic part oxidizes at this temperature and turns into a gas, while the inorganic part remains as ash (Ray, 2012). Thus, we can use the term “volatile suspended matter” and “fixed suspended matter” on both the organic and inorganic content. Organic (mineral) suspended matter, respectively. Volatile solids analysis is always performed on the sludge to measure its biological stability.

Odors

Odors are usually emitted from gases generated from the decomposition of organic matter or from additives to waste water. Industrial wastewater may contain odorous compounds or compounds that emit an odor during the treatment process.

Temperature

Temperature is one of the most important indicators affecting the treatment process because of its impact on chemical reactions and their speed, as well as affecting aquatic organisms, and the suitability of water for beneficial uses. For example, an increase in temperature may lead to a difference in the species of fish present in the aquatic environment receiving wastewater. Therefore, many industrial establishments pay great attention to the temperature of the surface water that is used in the cooling process. In addition to the above, oxygen is less soluble in warm water than in cold water. Therefore, when the water temperature rises in the summer months, the rate of biochemical reactions increases, accompanied by a decrease in the amount of oxygen

present in surface waters, which may lead to a sharp depletion of the concentration of dissolved oxygen in the water. These dangerous effects may increase when the amount of hot water that is drained onto water bodies increases, noting that when any sudden change in temperature occurs, it may result in a high death rate in aquatic organisms, and the abnormal rise in temperature may lead to an increase in the growth of some unwanted aquatic plants and fungi (Panigrahy and Reddy, 2015; Jess, 2014; Pirotta and Garland, 2006).

Color

The color of industrial wastewater varies according to the type of industry, so it is important to know the properties and methods of color measurement. Traditional treatment methods cannot remove the color because most of the coloring materials are in the dissolved state, but some secondary treatment units such as active sludge and sand filters can remove a certain percentage of some types of coloring materials, and sometimes the removal of pigments needs chemical oxidation processes.

Turbidity

Turbidity is a measure of the passage of light through water and is used as a test to measure the quality of the discharged water relative to suspended foams. In general, there is no relationship between the degree of turbidity and the concentration of suspended matter in untreated water, but the degree of turbidity depends on the quantity, type, color and fineness of suspended matter (Albrich et al., 2004; Nakajima et al., 2002; Brown and Doolittle, 1997).

Chemical properties

Organic materials

Organic matter consists of a mixture of carbon, hydrogen, oxygen and sometimes nitrogen, in addition to some other important elements such as sulfur, phosphorous and iron. Industrial wastewater may contain small amounts of synthetic organic molecules whose chemical composition varies greatly, such as surfactants (industrial detergents), major organic pollutants, volatile organic compounds and agricultural pesticides. The presence of these compounds has led to many complications for industrial wastewater treatment processes because most of these compounds do not biodegrade or decompose very slowly.

Oils, fats and greases

Fats are considered one of the most stable organic substances, as they are not easily degraded by bacteria. Kerosene and lubricating oils reach the sewage through workshops and garages, where they float on the surface of the sewage water and a small part of it remains in the form of sludge that collects with the sludge. Mineral oils cause maintenance problems as a result of covering surfaces. If grease is not removed before the water is discharged to the external environment, it may adversely affect biological life in surface waters, causing a layer of invisible floating material (Nakajima et al., 2002; Kolář et al., 2001; Brown and Doolittle, 1997).

Industrial detergents

Industrial detergents are surfactants, which are large organic molecules and have poor solubility. Air bubbles during the biological treatment process causing persistent foam beyond the curing process.

Phenol

Phenol and other organic compounds are important components in water, which can cause problems with the taste of drinking water, especially when the water is sterilized with chlorine. Phenol is produced from industrial processes, as it makes its way to surface waters when industrial wastewater is disposed of. Phenol can be removed by oxidation during biological treatment up to concentrations of 500 mg/L.

Volatile organic compounds

Are organic compounds that have a boiling point of less than 100°C and/or a vapor pressure of less than 1 mmHg at a temperature of 25°C. The flow of these compounds into sewers or treatment plants may adversely affect the health of workers in sewage networks and treatment plants.

Pesticides and agrochemicals

The organic compounds found in pesticides and plants as well as agricultural chemicals are toxic to most living organisms and can be considered an important and effective pollutant in wastewater.

Toxic inorganic compounds

Due to the toxicity produced by these substances, some cations are of importance in the treatment and disposal of wastewater. Many of these compounds have been classified as priority pollutants. Lead, iron, silver and chromium, in addition to boron, are toxic substances that have varying degrees of toxicity to microorganisms, so they must be taken into account when designing biological treatment plants. Many treatment plants suffer due to the presence of these cations in the water, as they cause the killing of microorganisms and thus stop the treatment. Potassium and ammonium cations are considered toxic at 4000 mg/L. Cyanide and chromate, which are considered toxic ions, also appear in industrial wastewater from metal plating and must be removed from the beginning by primary treatment in the factory rather than mixing it with sewage. Fluoride, a toxic element, is commonly found in waste water from the electronics industries. Industrial wastewater can also contain toxic organic materials.

Heavy metals

Small concentrations of many metals such as nickel, manganese, lead, chromium, cadmium, zinc, copper and iron, in addition to mercury, are important components of industrial wastewater. The presence of such minerals in high quantities will affect the use of water due to its toxicity. Therefore, it is always preferred to measure and control the concentration of these substances in water.

The environmental impact of medicines and personal care products

A large-scale study is currently being conducted on the environmental impact of medicines and personal care products. Medicines and personal care products contain

substances that are used by individuals for personal health or cosmetic reasons, and some products are used in agribusiness, to promote the growth or ensure the health of livestock. Each year, more than twenty million tons of pharmaceuticals and personal care products are produced. The presence of medicines and personal care products has been discovered in bodies of water all over the world. The effects of these chemicals on humans and the environment are not yet known, but there is no scientific evidence yet to prove their effect on human health. More research is needed to assess the risks of toxicity, frequency of use, and bioaccumulation of these substances. Pharmaceuticals and personal care products include Environmental Persistent Pharmaceutical Pollutants (EPPs), which are one type of POPs. They cannot be removed from contaminated water by conventional methods. The European Union has declared that it is one of their biggest tasks to consider the possibility of water and soil pollution due to pharmaceutical and drug residues.

Safe disposal of waste

Depending on the sources and ingredients, there are different ways that people can dispose of medications, cosmetic and personal care products, in acceptable ways. The most environmentally safe way to dispose of these materials is to take advantage of drug collection and take-back programs, which collect drugs in a central location, for peaceful disposal. Several local public health departments in the United States have begun implementing these programs. In addition, the US Drug Enforcement Administration periodically promotes local take-back programs, as well as the National Drug Take-back Initiative. Recovery programs are currently funded, by state or local health departments or voluntary programmes, by pharmacies or health care providers. In recent years the suggestion that pharmaceutical companies be responsible for their products "from cradle to grave" has gained considerable success. This philosophy suggests that manufacturers should fund proper disposal methods for their pharmaceutical products. Take-back programs should exist in all communities, and if more information about this placement is needed, city officials should be contacted. In the absence of such programs locally, the US Environmental Protection Agency and the Office of National Drug.

Control Policy suggest that consumers: Take out prescription drugs from their original packaging., Mixing medicines with cat litter or used coffee grounds., Put the mixture in a container that has a lid, for later disposal, such as a sealable bag. Cover everything that indicates the personal identity of the owner of the original contraceptive packs, using a black pen. Put these cans in a bag with the mixture, close it well, and then put it in the trash. It is hoped that these steps will keep the chemicals separated from the open environment, especially water bodies, long enough for them to decompose naturally. When these substances find their way into the water, they can be difficult to handle. Water treatment facilities use various processes in order to reduce or completely eliminate these pollutants. This is done using impregnation, where suspended solids are removed by the use of sedimentation. The other method used is biodegradation, and through this method, microorganisms, such as bacteria and fungi, feed on these pollutants or decompose them, which leads to their removal from the polluted media.

Environmental pollution from metals

Minerals can have adverse effects on surrounding surface and groundwater if protective measures are not taken and the result can be abnormally high concentrations of certain chemicals such as arsenic, sulfuric acid and mercury over a large area of the surface or underground. Runoff of rock debris although it is not toxic but also destroys surrounding vegetation and dumping runoff into surface water or into forests is the worst option here. Underground disposal is considered a better option (if the soil is pumped to a great depth). Simply storing the land and refilling the mine after it has been depleted is better if there is no need to deforestation to store the debris and there is a possibility of massive contamination of the area around the mines due to the various chemicals used in the mining process as well as harmful compounds that may come out of the ground with the ore. The large amounts of water produced from mine drainage, mine cooling, hydroextraction, and other mining operations increase the potential for these chemicals to contaminate surface water. In well-regulated mines, hydrologists and geologists make accurate water and soil measurements to rule out any kind of water pollution that could be caused by mining operations. Reducing or eliminating environmental degradation in modern American mining is implemented by federal and state law by restricting operators to meet standards for protecting surface and ground water from pollution. This is best done through the use of non-toxic extraction processes such as biofiltration, and if the project site becomes contaminated nonetheless, mitigation techniques such as acid mine drainage need to be performed. The five main technologies used to monitor and control water flow at mine sites are diversion systems, containment basins, groundwater pumping systems, subsurface drainage systems and subsurface dams, and in the case of mine acid discharge the polluted water is generally pumped to a pollutant neutralization treatment facility. A 2006 review of environmental impact data found that "water-quality predictions made after consideration of mitigation impacts significantly underestimated actual impacts on groundwater and surface water."

Conclusion

The dissolution of metals and heavy metals and their transport by runoff and groundwater is another example of environmental problems related to mining such as the Britannia Beach Mine, a former copper mine near Vancouver, British Columbia, Tar Creek, an abandoned mining area in Beecher, Oklahoma which is now the US Environmental Protection Agency and the site of The overall environmental response is also suffering from heavy metal contamination and mine water has seeped into the mine, which contains dissolved heavy metals such as lead and cadmium in the local groundwater, polluting it. Long-term storage of debris and dust can create additional problems as they can easily explode and be blown away by the wind.

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Conflict of interest

The authors declare that there is no conflict of interest involve in this research study.

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