Strategies for microbial bioremediation of environmental pollutants from industrial wastewater: A sustainable approach

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Introduction

Bioremediation helps purify water sources, create healthier soils, and improve air quality around the world [1]. However, unlike excavation-based remediation processes, which can be destructive, bioremediation is less interventional and can facilitate the remediation of environmental impacts without damaging sensitive ecosystems. Environmental remediation technologies such as bioremediation can provide long-term solutions to improve the quality of air, water, and land affected by traditional industrial activities [2]. Read on to explore the benefits of bioremediation and decide if it's right for your site. The EPA says bioremediation uses either aerobic or anaerobic microorganisms to reduce environmental impacts on air, water, and soil [3]. Microorganisms do this by breaking down the chemicals in question into non-toxic substances over time and using them as a source of energy. In essence, bioremediation is a means of eliminating harmful environmental effects. This benefits individual human health and the environmental system as a whole [4]. Bioremediation helps purify water sources, create healthier soils, and improve air quality around the world. However, unlike excavation-based remediation processes, which can be destructive, bioremediation is less interventional and can facilitate the remediation of environmental impacts without damaging sensitive ecosystems [5]. If you're in charge of an area that needs clean up, you know that having an impact on the environment doesn't come cheap. Luckily, bioremediation is a very cheap technology.

Description

The cost of treating hazardous waste in landfills with bioremediation is typically significantly lower than the cost of using conventional treatment methods [1]. Bioremediation technology is easily scalable to treat areas ranging from small landfills to large water treatment plants. For example, wastewater treatment plants are the world's largest bioremediation companies, collecting and treating approximately 34 billion gallons of wastewater each day in the United States alone [3]. The sheer size of this company proves how flexible bioremediation really is. Microbial bioremediation is an eco-friendly natural cleaning process enhanced by special equipment [5]. This wastewater treatment method removes contaminants from soil and groundwater produced by industrial processes. Bioremediation, which uses microorganisms to break down contaminants, is an economical way to reduce pollution and keep groundwater clean. This process enhances the natural biological effectiveness of removing contaminants from used water [2]. Industrial processes such as mining, agriculture, and manufacturing produce various by-products. Some of the resulting inorganic and organic residues are harmless, while others are toxic and pollute the environment. Toxic residues are especially harmful to groundwater and soil [4]. The earth has existing environmental remediation systems, but the natural soil and groundwater remediation process takes time. Bioremediation technology regenerates contaminated water and soil so that it can be safely returned to the environment after human use in industrial practices.

Conclusion

While some waste treatments processes use remediation equipment to remove and dispose of contaminants, bioremediation processes use organisms to remove or neutralize contaminants in contaminated areas. Biological microorganisms are microscopic bacterial organisms that occur naturally in the environment. These microbes exist naturally to degrade, recycle, and correct imbalanced groundwater and soil chemistry. Bioremediation is the scientific process of remediating contaminated groundwater and soil using natural organic matter and its beneficial properties. According to the Environmental Protection Agency (EPA), bioremediation processes are water and soil treatment technologies that use natural organisms to attack toxic substances and transform them into safer substances. Heavily contaminated areas can often be rendered non-

toxic using appropriate bioremediation methods and specialized equipment. Bioremediation stimulates natural microorganisms to turn pollutants into energy sources and food consumption a source. Certain microbes digest and eliminate toxic chemicals and pathogens by eating them and converting their composition into harmless gases such as methane and carbon dioxide. Depending on the state of the contaminated water and soil, the appropriate microbes already exist to naturally remove the contaminants, but human intervention may amplify the microbial action and accelerate the natural remedial process.

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Conflict of Interest

The author declares there is no conflict of interest in publishing this article.

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