



Concept of applications and advantages of bioremediation technique

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DESCRIPTION

Bioremediation is a biotechnical method that involves the removal of complicated materials or contaminants through the degradation of environmental pollutants by live microorganisms. It is a method of removing pollutants from the environment, repairing contaminated areas, and preventing pollution. Bioremediation activity is based on microorganisms' natural ability to breakdown organic substances. The natural ability of organisms to adsorb, collect, and degrade prevalent and new contaminants has drawn attention to the use of biological resources in contaminated environment treatment. In comparison to traditional physiochemical treatment approaches, which have significant limitations, bioremediation is sustainable, environmentally friendly, inexpensive, and scalable. The majority of bioremediation is unintentional, using natural organisms. Bioremediation research is largely focused on accelerating the process by inoculating a polluted region with organisms or providing nutrients to boost development. Bioremediation might be employed to lessen the impact of anthropogenic byproducts such as industrialization and agricultural processes. Bioremediation may prove to be less expensive and more sustainable than other cleanup options.

Microorganisms' ability could be improved by providing them with optimal growing conditions or by using genetically modified microorganisms. This technology has been used to eliminate dangerous substances from the environment and detoxify them into benign versions. Microorganisms play an important part in bioremediation; various

members of the microbial group, such as algae, fungi, and bacteria, may solubilize, transport, and deposit metals, as well as detoxify dyes and complex compounds. Because toxic waste materials can exist in vapour, liquid, or solid phases, bioremediation technology varies based on the type of toxic material.

ADVANTAGES

Natural process

Bioremediation, as a natural process, is widely regarded as a waste treatment option for contaminated materials such as soil. Microbes capable of decomposing the pollutant multiply and make harmless byproducts. The treatment residues are often innocuous byproducts such as carbon dioxide, water, and cell biomass.

Complete destruction

Bioremediation is used to completely destroy a wide range of pollutants. Many harmful substances can be converted into non-toxic products. This reduces the possibility of future liability for hazardous material treatment and disposal. Bioremediation can be performed on-site without creating significant disruption to daily activities. This eliminates the need to transfer large amounts of waste off-site, reducing possible dangers to human health and the environment that can develop during transportation.

Economic process

In comparison to other methods of hazardous waste cleanup, bioremediation is less expensive.

Safest and least invasive

This is the safest and least invasive soil and groundwater treatment available when properly done by using specialized bioremediation equipment. Furthermore, this approach eliminates the need for digging and disposal. As a result, it is safer than other remediation procedures.

Highly treatable

Microorganisms are used in bioremediation; they have enzymes and the ability to breakdown heavy pollutants. Bioremediation can treat organic pathogens, arsenic, fluoride, nitrate, volatile organic compounds, metals, and a number of other pollutants like as ammonia and phosphates.

Many environmental factors influence the rate of bioremediation through temperature, nutrients, the presence of oxygen or other electron acceptors in the soil, and the type of microbial population present at a given contamination site. As a result, optimizing these conditions is crucial for the best bioremediation process.