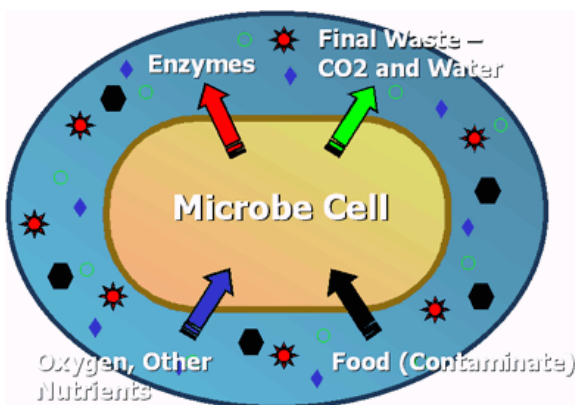


BIOREMEDIATION

The remediation of polluting soils is increasingly moving towards the in situ technique, which allows to reduce the heavy social and economic costs, typical of ex situ reclamation (excavation and disposal) and on site (excavation, treatment and re-planting) which, also entail greater risks for personnel and the environment, including the release of the most volatile pollutants into the atmosphere.

For this reason, Bioremediation is being favored,



which consists in the growth of autochthonous microorganisms (biofarming) and in the addition of new specially selected bacterial strains (inoculation) to attack and break down the pollutants present in less time.

Tecnica di bonifica	Rischio salute durante la bonifica	Rimozione e Sostanze Volatili	Rimozione Idrocarburi Pesanti	Inquinamento Atmosfera (CO2, NOx, PM)	Controllo pH, T, CO2, Umidità	Automazione
Ex Situ	ALTO	SI	SI	SI	N/A	NO
In Situ:						
Soil Vapour Extraction	ALTO	SI	NO	NO	NO	NO
Soil Venting	MEDIO	SI	NO	NO	NO	NO
Soil Washing	ALTO	SI	SI	NO	NO	NO
Bio Venting	MEDIO	SI	SI	NO	NO	NO
Air Sparging	MEDIO	SI	NO	NO	NO	NO
Bio Remediation	BASSO	SI	SI	NO	NO	NO
BioReLife	NULLO	SI	SI	NO	SI	SI

In this perspective, BioReLife allows to optimize the biodegradation process by harmonizing the treatment plant with the selected microorganisms, minimizing their use thanks to the use of additional components that, by conditioning the matrix, facilitate and accelerate metabolism.

BIORELIFE SYSTEM

However, bioremediation has limits because it is not easy to manage the trend of bacterial activity, both in terms of localization and specific vitality of microorganisms, which require frequent human intervention for monitoring

Thanks to the consolidated experience in hydrocarbons, we have developed a new technique, BioReLife, which allows to overcome all the negativities of Bioremediation while retaining its great advantages.

The BioReLife automation eliminates:

- the presence of human resources on the polluted site during the remediation
- the risks associated with contact with pollutants
- stripping activities typical of ex situ and on site techniques

TECHNOLOGY

BioReLife is a fully automated system that can be adapted to the needs and dimensions of the site to be reclaimed, consisting of:

- a set of diffusers, also biodegradable, inserted into the ground up to the desired depth, connected on the surface to the management box
- multi-parametric probes for the evaluation of both the environmental parameters of the matrix and the functional parameters of the treatment, to modulate the operation of the management system
- a plant suitable for the size of the remediation, able to independently manage the bioremediation process, contained in a 10 'container / box
- if required, a system of photovoltaic panels for the total autonomy of the process.

BENEFITS

Compared to known treatments, BioReLife is an innovative system of bioremediation in situ, capable of automatically managing biodegradation processes, adapting the system's response to the activity of native or inoculated bacterial flora, thanks to the monitoring of vital parameters detected by the probes and transmitted to the management system, significantly reducing human / pollutant interaction.

THE PLANT

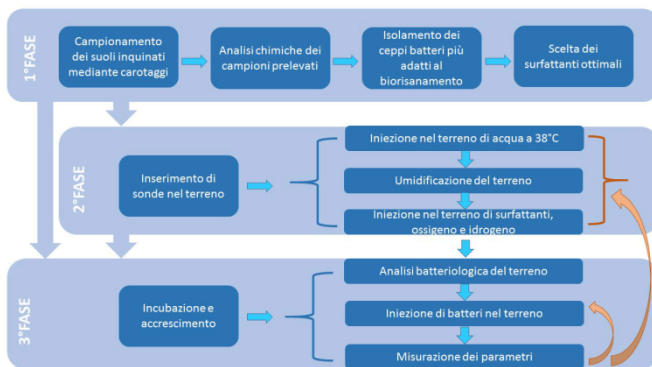
BioReLife is an easily scalable system, able to be applied both to large extensions up to the desired depth, and to fuel dispensers with surface treatment.

The management box includes the tanks for bio liquids, nutrients and other process fluids, the plants for additional treatments, the automated management system subordinated to the parameters detected by the probes.

TREATMENT ANALYSIS

As with all remediation, a cognitive analysis is required regarding both the zoning, the depth and concentration of pollutants, and the definition of the environmental matrix with an indication of the native bacterial flora.

This allows the preparation of a technical -



economic feasibility plan, including the selection with our experts of the most suitable bacterial strains.

OPERATIONAL FLOW CHART

INSTALLATION

After obtaining the necessary authorizations, the control box is installed, the support grid is traced, the diffusers are installed, all the necessary connections are made, the hydraulic test is carried out and finally the usability or, if necessary, the drive-over of the site is restored.

Where necessary, a 12 kW photovoltaic system can replace the connection to the electricity grid.

TIMING AND COSTS

The execution times of the remediation depend on the contamination of the soil in terms of concentration and depth of the contaminants. On average, the duration is between 18 and 36 months.

The costs of Bioremediation are based on:

- the type of pollutant and its concentration



- the environmental parameters that characterize the matrix
 - INSIDE A BOX
- the type of Bioremediation used Biofarming or Inoculum
- of the mode:
 - system purchase + total service
 - plant purchase + partial service
 - plant rental + service

In any case, it can be said that the costs related to the use of BioReLife are lower by approximately:

- 30% -40% compared to other On Site remediation techniques
- 40% -60% compared to Ex Situ remediation, not taking into account the social costs deriving from the environmental impact of transport and the use of waste or landfill conditioning systems