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Bioremediation of Soils Contaminated with Saline Rich Water and Petroleum Hydrocarbons

With the production of oil comes the possibility of accidental spills resulting from ruptured delivery lines or blowouts. The damage to surrounding environments can be devastating and require extensive remediation efforts and time to restore the affected land. The problems generated from such a discharge can include oil contamination and/or salt damage to vegetation and wildlife. Remediation efforts to correct such problems have had limited success. However, probiotic technology (the use of complex organic materials) has been applied to affected areas that initiate microbial degradation of petroleum products and neutralize harmful salt conditions. Salt damage has inhibited the growth of vegetation and degradation of oil contaminants because of high osmotic conditions in the area influenced by the spill. Therefore, salt is often the true culprit responsible for damage to the impacted soil.

Probiotic compounds such as fulvic and humic acids are capable of buffering salts and other reactive metals in the soil that inhibit growth. The buffering actions are predicated on the relationships between the soil particles and the organic compounds. In order to “tie-up” the salts and other metals, a complex organic molecule is required. This organic molecule will bind with the soil particle, but can only do so if there is a metal present between it and the soil fragment surface. Cation exchange capacity is increased in the soil with the addition of the organic complexes, enabling the increased release of valuable nutrients for vegetative and microbial use. The nutrients released from the soil and/or organic materials may be exchanged for harmful salts and/or metals. The salts appear to remain inert or are buffered, and eventually may leach out of the soil. The salts may also be involved in other less harmful chemical processes that occur naturally in the soil. With the salts buffered in the affected oil spill areas, vegetation and microbial forms can function normally. However, other environmental factors (i.e. moisture, temperature, oxygen, etc.) must also be sufficiently present for effective remediation.

Our approach to remediating and restoring contaminated soils to a healthy productive condition is to begin rebuilding the biological health of the soil. This can be accomplished through the application of products rich in beneficial microorganisms, bio-stimulants, organic acids, biologically produced enzymes and chelating agents. By restoring the population and proper ratio of beneficial micro and macro-organisms, even the most contaminated soil can be revitalized to a healthy, productive environment; one suitable even for farming crops.

Chemically induced changes to soil through the use of lime and salt-based fertilizers are only temporary changes. Changes in soil chemistry and fertility resulting from the biological activity within the soil are longer lasting and generally require a disruption in environmental conditions to cause a significant change once established.