CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
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Project Number
S0803

Project Title
Bioremediation of Petroleum Hydrocarbon Contaminated Soils

Abstract

Objectives/Goals
The goal of this project is to discover the nature of Bioremediation. Bioremediation is any process that uses microorganisms or their enzymes to return the environment altered by contaminants to its original condition. I wanted to see if natural attenuation or an enhanced treatment of the soil would be more effective in eliminating the contaminants.

Methods/Materials
I isolated three biocells: the first was a control with only natural soil, the second had soil with contaminants and was allowed to naturally degrade, and the third also had contaminants, but was given an enhanced treatment with the addition of nutrients, water, and oxygen. I measured the rate weekly at which the contaminants were consumed, by the microbes, in each cell.

Results
CELL 1, a blank cell, contained only soil. It had no contaminants, so therefore no treatment was necessary. There was no abnormal coloration or smell coming from CELL 1 because it was just like ordinary dirt with no additives. The TPH level was 100 mg/kg, which is considered to be non hazardous.
CELL 2 contained just as many contaminants as CELL 3; however, it did not receive any treatment. I wanted to see if it would naturally attenuate without any additional help of tilling or moisturizing. The TPH level started at 1900 mg/kg and at the end of fifteen weeks, it lowered to 1086 mg/kg#a reduction of 57%#a result of natural bioremediation. At the end, there was still a lot of contaminant left.
In CELL 3, the TPH level was 1750 mg/kg, which was a bit lower than the level in CELL 2; however, the rate at which bacteria consumed the contaminants was much faster. In just 15 weeks, the TPH went from 1750 mg/kg to 173 mg/kg #a reduction of 91%#a much greater difference than found in CELL 2.

Conclusions/Discussion
The aeration and addition of moisture to the treatment of the bioremediation process was found to be very effective and successful: in CELL 3, the TPH decreased by 1577 mg/kg in just fifteen weeks, about three months, compared to CELL 2#s, where the TPH level was only reduced by 814 mg/kg.
This will be an economical and faster process to treat POL spills. My results reinforced the idea that bioremediation is a very effective way to safely remove toxic contaminants from soil.

Summary Statement
My project is about testing the effectiveness of the process of bioremediation in the environment.

Help Received
My father acquired the Hanby Test Kit used in the method. Walgreens Pharmacy printed out my title banner. Several environmental engineers answered my questions regarding soil and contaminants.