C30 Use of Water Partitioning of Petroleum Hydrocarbon Free Product to Determine Material Comparability

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The goals of this presentation are to demonstrate the use of partitioning to determine potential contribution of petroleum hydrocarbon free product to the groundwater and demonstrate the differences between samples of free product.

In many instances where a specific type of petroleum hydrocarbon fraction has been spilled, it becomes necessary to identify whether a single spill event occurred or the free product is the result of multiple or continuous spill. The overall flame ionization detector (FID) chromatographic pattern of all the free product samples appear virtually identical and is not helpful in determining if all the samples are the same. The chromatographic pattern is dominated by the peaks associated with the alkanes, and minor constituents frequently cannot be observed. By extracting the free product with water advantage is taken of the fact that the alkanes are insoluble in water, and most other components, including the aromatic compounds, are more soluble than the alkanes. Upon examining the water phase, considerable information can be obtained.

In a specific study to which the partitioning technique was applied, eleven monitoring wells on a site contained jet fuel as a free product. Of the eleven samples, nine appeared identical chromatographically. Underneath the free product layer, the groundwater contained several chlorinated solvents and MTBE, neither of which is normally associated with jet fuel. In addition, the analysis of the groundwater exhibited the presence of aromatic compounds. The partitioning technique was applied to determine if the chlorinated solvents, MTBE, and aromatic compounds were derived from the free product.

Each free product sample was mixed with an equal volume of laboratory water in a closed container, and the bottles were vigorously shaken for 24 hours at room temperature. The phases were allowed to separate. The aqueous phase was then subject to analysis by GC/MS, using EPA Method 8260. In addition, the free product samples themselves were diluted and analyzed by the same method.

Based on the results, it was possible to demonstrate that:

a. The free product consisted of several distinct formulations of jet fuel, not the result of a single spill.
b. The chlorinated solvents were unrelated to the petroleum hydrocarbons free product layer.
c. The MTBE in the groundwater was derived from the free product, even though jet fuel is not normally formulated with MTBE.
d. The aromatic hydrocarbons in the groundwater were derived from the free product layer.
e. Qualitatively, the petroleum hydrocarbon free product layer was present at certain locations for a greater length of time than at the others.

The technique is powerful in determining the presence of soluble components and various additives in the free product layer. In this fashion, identification or matching of samples of free product is feasible.

Aqueous Partitioning, Petroleum Hydrocarbons, Free Product

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