

Aging Diesel Spills

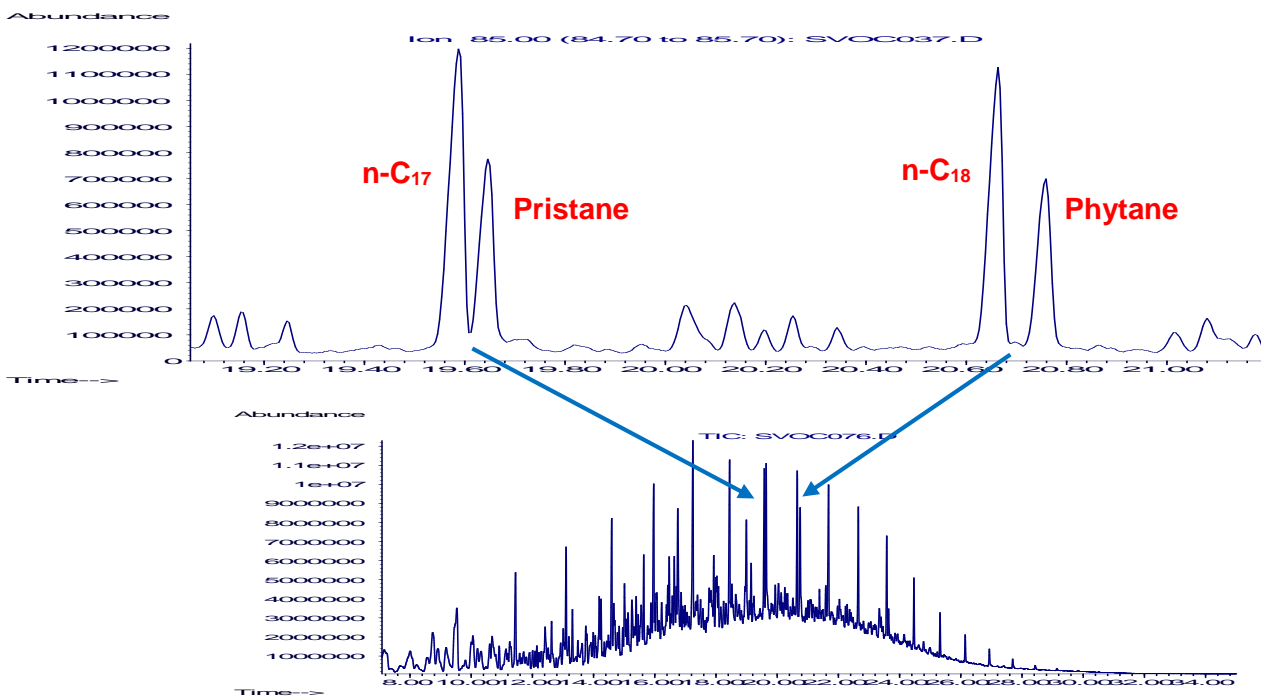
Middle distillates such as diesels are degraded mainly by evaporation, leaching and microbial action. The degradation of diesel can be very dependent on its environment. For example, these processes will only have a minor influence on diesel stored in a storage tank where there is no leaching or evaporation and the proportions of water, oxygen, nutrients and free oil would inhibit microbial action. This will result in the product remaining largely preserved, potentially, for many years. However, a spill on the surface of an organic rich environment would experience rapid microbial degradation as well as enhanced leaching and evaporation. These processes will result in the oil degrading rapidly which in some cases could be within a few months. In order to age the diesel with a high degree of certainty the following should be:

- Diesel concentration should be greater than 100 mg/kg
- The spill should be at least 1m below ground level
- Samples should be collected from the unsaturated zone underneath a paved area
- The analyses should include information on single components such as nC₁₇ and pristane

One of the most useful techniques involves the ratio of n-C₁₇ : pristane.

n-C₁₇ : pristane

The isoprenoid C₁₉ - pristane is ubiquitous in most oil and sediment extracts and is derived from chlorophyll. As it degrades very slowly compared to n-C₁₇, age estimates can be made by using the ratio which decreases in a linear manner with time. Based on the results of a large scale study carried out by Christensen and Larson (1993) over a period of 20 years which produced a linear relationship of the n-C₁₇ : pristane ratios, an equation to estimate the age of a diesel spill was derived by Kaplan et al (1996). This equation gives a good correlation of age which can only be applied to diesel and has an experimental error of ±2 years. A high ratio (>1.8) is normally indicative of a recent/fresh spill whereas a ratio of <0.5 is indicative of an old/historic spill. If the sample is totally biodegraded (ie a ratio of <0.2) ageing is not normally possible.



References:

Christensen, L.B., Larsen, T.A., *Method for the Age of Diesel Oil Spills in the Soil*, Groundwater Monitoring Review, Fall, pp. 1993, 142-149. Isaac R. Kaplan et al. *Patterns of Chemical Changes During Environmental Alteration of Hydrocarbon Fuels*, Groundwater Monitoring Review, Fall, pp. 1996, 113-124.