C61 New Jersey Hillbillies

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The objective of this paper is to show the use of environmental forensic techniques to identify and date the releases of hydrocarbon products.

The presentation will impact the forensic science community by identifying useful tools for use in environmental forensic investigations.

The forensic work will include two separate sites from which very unexpected hydrocarbon substances were found in a well. The process of collecting the separate phase hydrocarbon and identifying the product and explaining its release to the environment will be discussed. Unlike the Beverly Hillbillies, these materials are refined products and not crude oil.

Site 1: The site was originally used as an open-air trolley yard, possibly for horse-drawn, then electrically driven. In 1925 it was developed as a state- of-the-art "bus barn" covering the entire ½ city block site. The new development included mechanic's lube pits, a washing station and refueling island, all internal to the site. Underground storage tanks were installed under the sidewalks, external to the building footings, but not in the street proper. The first buses were powered by gasoline. The bus fleet was converted to diesel fuel in the late 1940s and 1950s. Site operations ceased during 1995 and the tanks were closed at the end of that year. The building was demolished.

In 2005, a temporary well was placed on the site near the sidewalk. A clear, light yellow hydrocarbon was obtained from this well. A sample of this hydrocarbon was submitted for gas chromatographic analysis using both a flame ionization detector (GC/FID) and an electron capture detector (GC/ECD). The GC/FID chromatogram is shown in Figure 1. This chromatogram was obtained without use of a diluting solvent. The chromatogram is a straight run gasoline that does not contain any tetraethyl lead antiknock additive. This gasoline appears not to be weathered by water washing, evaporation or biodegradation. Since the use of tetraethyl lead as a gasoline additive was used in the late 1920s then the age of this gasoline release is in the 1925 to 1930 time frame. It is obvious that age-dating of gasolines and other hydrocarbon products is very questionable when the basis for the age determination is a weathering process.

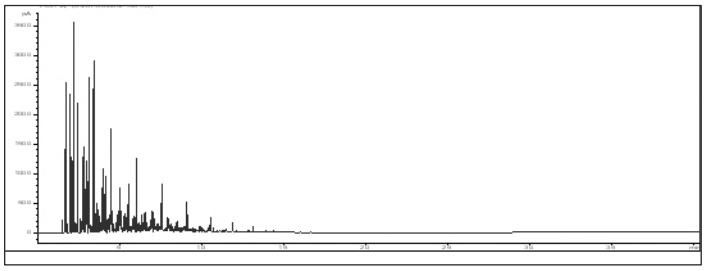

Figure 1

Site 2: This site was an industrial location last used for the recycling of materials with gold and silver. The plant recycled circuit boards by ash- ing the organic material, dissolving the inorganic ash and recycled metals with aqua regia. The process continued until gold and silver bars were pro- duced. No use of a hydrocarbon was apparent in any of the recycling processes.

Again, punching holes into the ground brought an unusual substance to the surface. In only one well, there was a clear, light purple oily substance that clung to the rock in the well and to the glass of the sample vial. This sub- stance appeared to float in the water. GC/FID analysis of this sample pro- duced the chromatogram shown in Figure 2. The substance did not react with concentrated sulfuric acid. The infrared spectrum indicated a saturated hydrocarbon. A GC/mass spectrometry analysis (GC/MS) indicated a series of sharp peaks with the molecular weight of 352. The interpretation of these mass spectra indicated that these compounds were alkyl substituted naphthalenes. A patent search identified the substance as a synthetic motor oil. This material was most likely used as a vacuum pump oil in the recycling processes of the site's former company.

 ** Presenting Author*

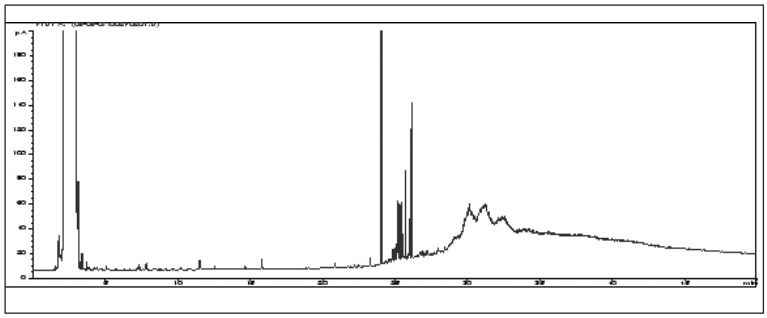

Figure 2

Hydrocarbon, Synthetic Motor Oil, Gasoline

