



FUGRO

UVOST®-CPT-CONE

The UVOST® (Ultra Violet Optical Screening Tool) is used in combination with CPT (Cone Penetration Testing) as an in situ tool for screening of hydrocarbon derived contamination in soil and groundwater.

APPLICATION & DESCRIPTION

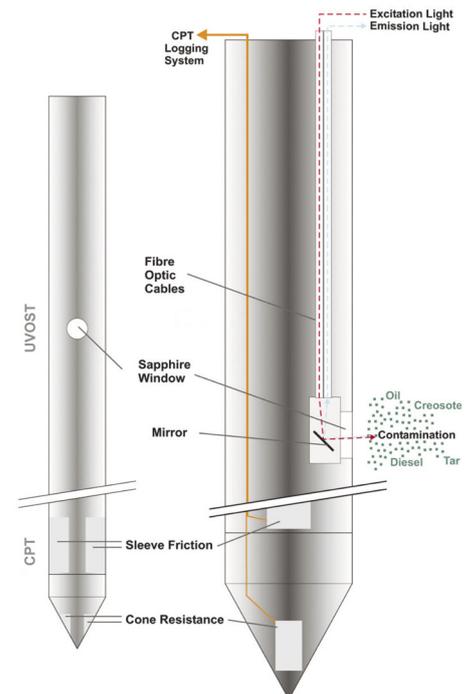
Risk assessments and remedial desk studies require detailed knowledge of the subsurface structure as well as the contaminant geometry and spread in both source and plume areas. In situ investigation techniques are therefore substantial for the vertical and horizontal delineation and characterization of contaminated sites.

For the purpose of environmental data collection a CPT cone (Cone Penetration Testing) is basically used as an adapter to screening sensors. By interpreting tip resistance and friction ratio, CPT data give detailed lithological information of the subsurface soil. This direct sensing cone is

able to detect a large amount of contaminants which are present in the subsurface. The UVOST® (Ultra-Violet Optical Screening Tool) is used as an in situ tool for screening of hydrocarbon derived contamination in soil and groundwater.

LIF (LASER INDUCED FLUORESCENCE)

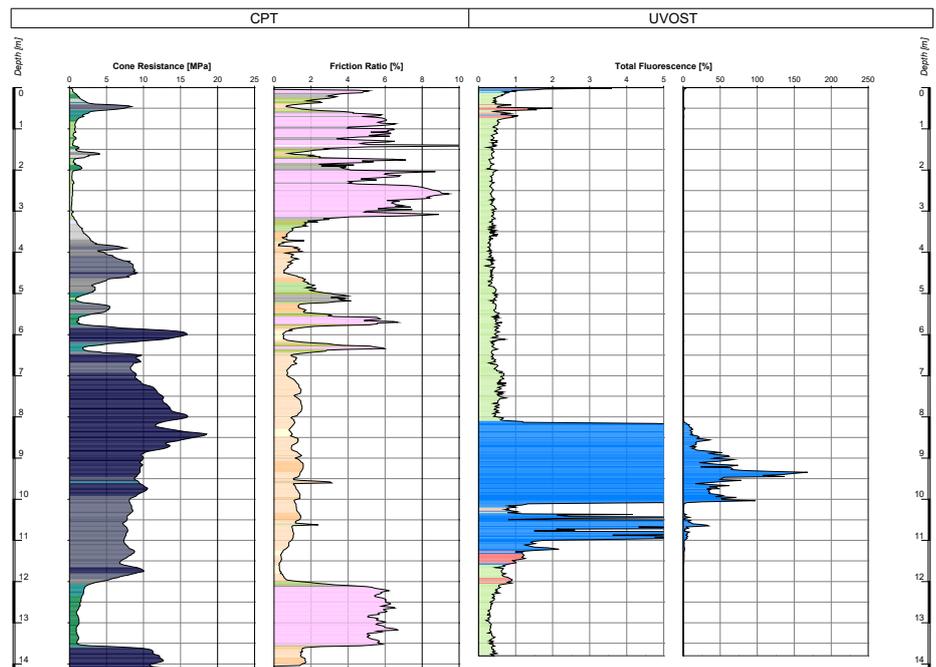
PAH (Polycyclic Aromatic Hydrocarbons) fluoresce if they are excited by light of a specific wavelength. This excitation leads to light emission in a certain wavelength range which is called "Fluorescence". UVOST® is based on LIF (Laser Induced Fluorescence) which means excitation with laser light (UVOST® uses 308 nm).



UVOST®-CPT layout.

As PAH occur in all types of oil UVOST® is able to detect every contamination caused by oil derived hydrocarbons, i.e. jet fuel, diesel, petrol, mineral oil, tar, creosote etc. Every shot of the laser causes light emission of a certain wavelength range. The total fluorescence intensity UVOST® actually measures is the sum of four specific emission wavelengths: 350 nm, 400 nm, 450 nm and 500 nm. This means every wavelength "window" or "channel" has a certain fluorescence intensity depending on what type of oil component is excited. In other words each fluorescence signal contains a spectrum of four wavelengths. Now every oil type has its own characteristic wavelength pattern or "waveform". The difference between lighter hydrocarbon mixtures like petrol, kerosene or diesel, where the lower wavelengths predominate, and the heavier hydrocarbons, where the higher wavelengths predominate, can be clearly seen.

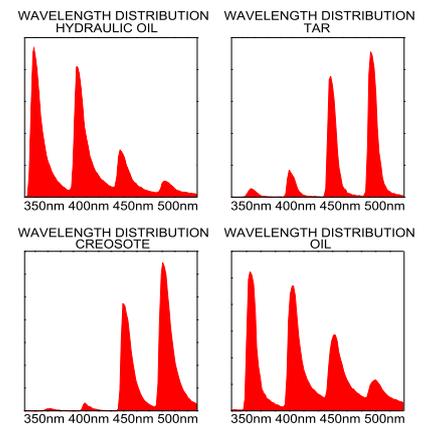
This so called wavelength shift can be also shown in a profile related to the total fluorescence at a given test location (see UVOST® profile). Shift to higher wavelengths is marked red, shift to lower wavelengths is shown blue. This allows an interpretation of whether there are different contaminant types or the contamination is rather homogeneous. Even low concentrations or compounds with reduced fluorescence properties which cause signals in the lower detection range can thus be clearly identified. UVOST®-CPT can provide a maximum of information in one push if needed: tip resistance, sleeve friction, friction ratio, electric conductivity, porewater pressure and fluorescence profile including



Resulting logs of an UVOST®-CPT investigation.

wavelength shift. Waveforms can be printed out in the field to identify oil or fuel types. UVOST® is ideal for NAPL detection and identification, moreover UVOST® fluorescence response can be even calibrated against TPH. No memory effects are involved due to the optical sensor, and NAPL thicknesses can be measured accurately. UVOST® response is nevertheless restricted to oil derived hydrocarbons. CHC, PCB, BTEX and other monoaromatic compounds cannot be detected, unless they occur in a hydrocarbon matrix.

UVOST® is a registered trademark of Dakota Technologies, Inc., in the U.S. and other countries.



Typical fluorescence waveforms of different hydrocarbons.



UVOST®-CPT during field operation.

