Direct Push Technology

Cone Penetrometer Testing (CPT) Capabilities

SCE's CPT technology is a minimally intrusive, high capacity hydraulic ram mounted on a mid-size truck designed to push small diameter probes directly into unconsolidated materials without drilling a borehole.

- CPT is capable of differentiating soil types, measuring in-situ soil density, or collecting samples at 3 times the rate of a typical drilling rig, at a similar daily rate.
- CPT is capable of penetrating 300—900 feet per day—much higher productivity than drilling
- No cutting or drilling fluids are generated; grouting performed upon retrieval.
- Rapid site characterization includes real time contaminant plume delineation
- Data is stored digitally and easily integrated into software applications such as GIS.

Geotechnical Applications

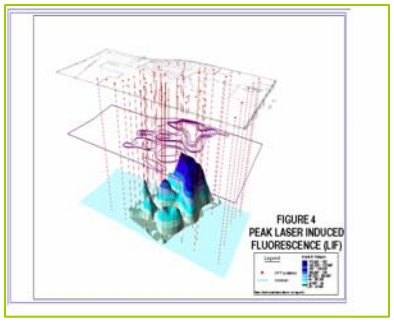
- Continuous soil density/soil stratigraphy
- Accurate top of rock measurements at 3 times the rate of a drill rig
- Real time soil classification
- In-situ formation pore-pressure readings
- Water table mapping with resistivity measurements
- Standard Penetration Test (SPT)
- Overburden volume calculations with GPS
- Sinkhole delineation
- Bearing Capacity

Vital Statistics

Weight:	15,000 lbs
Reaction Weight:	4 tons
Down Force:	20 tons
Penetration Speed:	4-15 fpm
Penetration Depth:	150-200 ft

Environmental Applications

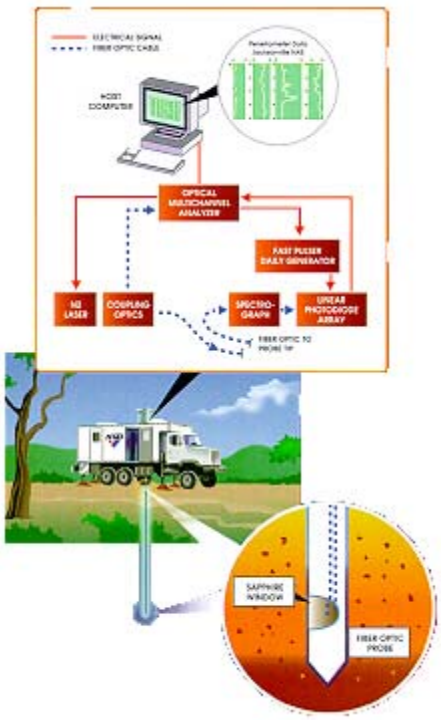
- Rapid Site Characterizations using the EPA TRIAD approach
- Continuous soil samples
- BAT Groundwater sampling
  - -Zero headspace samples
  - -Permeability testing
- In-situ permeability testing
- Soil gas monitoring
- Laser Induced Fluorescence (LIF) technology for plume mapping and PAH and BTEX, phenols and fuels



- Temporary wells / sparge points
- Accurate Plume Mapping

Please Call SCE @ 570-383-4151 to request a price quote or additional information on the CPT Technologies

Rapid Site Characterization – SCE can deploy its Cone Penetrometer Testing Rig (CPT) to platform with a state-of-the-art sensor technology and a suite of cone penetrometer (CPT) tools to perform rapid site characterization across the United States. Using fiber-optic technology with LIF, or laser-induced fluorescence, provides rapid real-time in situ delineation of subsurface petroleum hydrocarbon contamination down to depths of 150 feet. New laser sources (xenon chloride [XeCl] excimer and microchip quadrupled neodymium/yttrium aluminum garnet [Nd/YAG]) extend the contaminants detected to span the range of petroleum hydrocarbon products. This technology consists of a sensor-tipped penetrometer probe hydraulically advanced with a self-contained data-collection and analysis system, housed in our CPT truck. Additional probes incorporate video imaging technology and soil moisture measurements while the latest in CPT sampling devices allows collection of soil, water, or gas samples for analytical confirmation or other measurements. Two-inch, one-inch, and one-half-inch direct push wells can be installed using the CPT platform. Using a combination of sensors and tools, our CPT yields significant savings in both time and cost over conventional screening methods.



As the penetrometer probe is pushed into the ground, sensors in its tip detect petroleum hydrocarbons in real time from their fluorescent response to excitation by ultraviolet light passing to the soil through a sapphire window in the tip of the probe. This fluorescent signal is collected by the probe and carried back up the penetrometer rod to the spectrograph, which disperses the signal. The resulting energy is distributed as a function of wavelength and measured using a linear photodiode array. This information is then computer recorded and compared to a standard curve to provide a measurement of the fluorescent response. The measured response is directly related to the concentration of petroleum products in the soil. To ensure consistent performance, at the beginning and end of each push/pull cycle, the system is calibrated using a laboratory standard.

The penetrometer tip is also equipped with sensors to determine the physical characteristics of the soil as the probe penetrates the ground. Strain gages in the tip provide data about compression and sleeve friction. This information is passed up through the center of the penetrometer rod, computer recorded, and then used in a classification scheme to identify the types of soil encountered by the probe. An alternate laser source extends the range of petroleum hydrocarbon contaminant products for more effective detection of light fuels such as kerosene, jet fuels, and gasoline. Additional sensors which can be used with the CPT system include a video imaging probe and soil moisture probes. Video imaging of soils during a CPT push provides insight into soil dynamics and allows grain size analysis. Soil moisture properties can be measured in the vadose zone using a time domain reflectrometry probe, or in the saturated zone using a piezocone. The piezocone also measures pore pressure dissipation by a static test. Together, video imaging and soil moisture measurement data provide better estimation of soil transport properties, which is especially important in a risk-based corrective action approach. Other chemical sensor systems are currently under development that will extend the measurement capability of the system to metals, chlorinated solvents, and other volatile and semivolatile organic compounds.

Regulatory Acceptance

Federal, state, and local regulators in collaboration with the Navy have participated in a comprehensive program of technology demonstration, validation, and data review, with the goal of expedited regulatory acceptance and approval of the CPT-LIF technology. The process involved comparisons of data collected by the CPT-LIF with laboratory measurements performed on soil samples collected by traditional hollow-stem auger techniques. The successes of this approach are detailed in the following paragraphs.

CPT-LIF is certified as a site characterization technology for real-time in situ subsurface field screening for petroleum, oil, and lubricant (POL) contaminants. The California EPA Department of Toxic Substances Control undertook a thorough technological evaluation of the CPT-LIF, including witnessing two demonstrations and review of applicable research, technical literature, and data from previous field studies.

The U.S. EPA's Consortium for Site Characterization Technology participated in high profile demonstrations conducted at the Hydrocarbon National Test Site, Naval Construction Battalion Center, Port Hueneme, California, May 1995; and the Steam Plant Tank Farm, Sandia National Laboratories, Albuquerque, New Mexico, November 1995, two geologically and climatologically distinct sites. An Innovative Technology Evaluation Report (ITER) was issued by the U.S. EPA's National Exposure Research Laboratory, Las Vegas, Nevada, verifying its performance and concluding that the SCAPS "...provided real-time screening of the physical characteristics of soil and chemical characteristics of petroleum hydrocarbon contamination at both demonstration sites. ...Better than 90 percent agreement with discrete soil samples and analytical results... The technology is capable of rapidly and reliably mapping the relative magnitude of the vertical and horizontal extent of subsurface fluorescent petroleum hydrocarbon contaminant plumes in soil and groundwater."

A CPT-LIF multi-state evaluation report was prepared by the Interstate Technology and Regulatory Cooperation Work Group of the Western Governor's Association. A task group of seven member states (California, Idaho, Louisiana, Nebraska, New Jersey, New Mexico, and Utah) have accepted CPT-LIF and endorsed its use in their respective states. Additionally, the seven-state task group recommended all 26 Western Governor's Association member states pursue acceptance of the CPT-LIF technology based on the task group review. Ongoing efforts are aimed at extending regulatory acceptance to each state of the United States...and beyond!