PetroFLAG™

HYDROCARBON TEST KIT FOR SOIL

EPA SW-846 METHOD 9074

P.O. Box 280, CH-7007 Chur

ETI Environmental Technology Ltd.

+41(0)81 253 54 54 - Fax +41(0)81 253 66 22

info@eti-swiss.com – www.eti-swiss.com

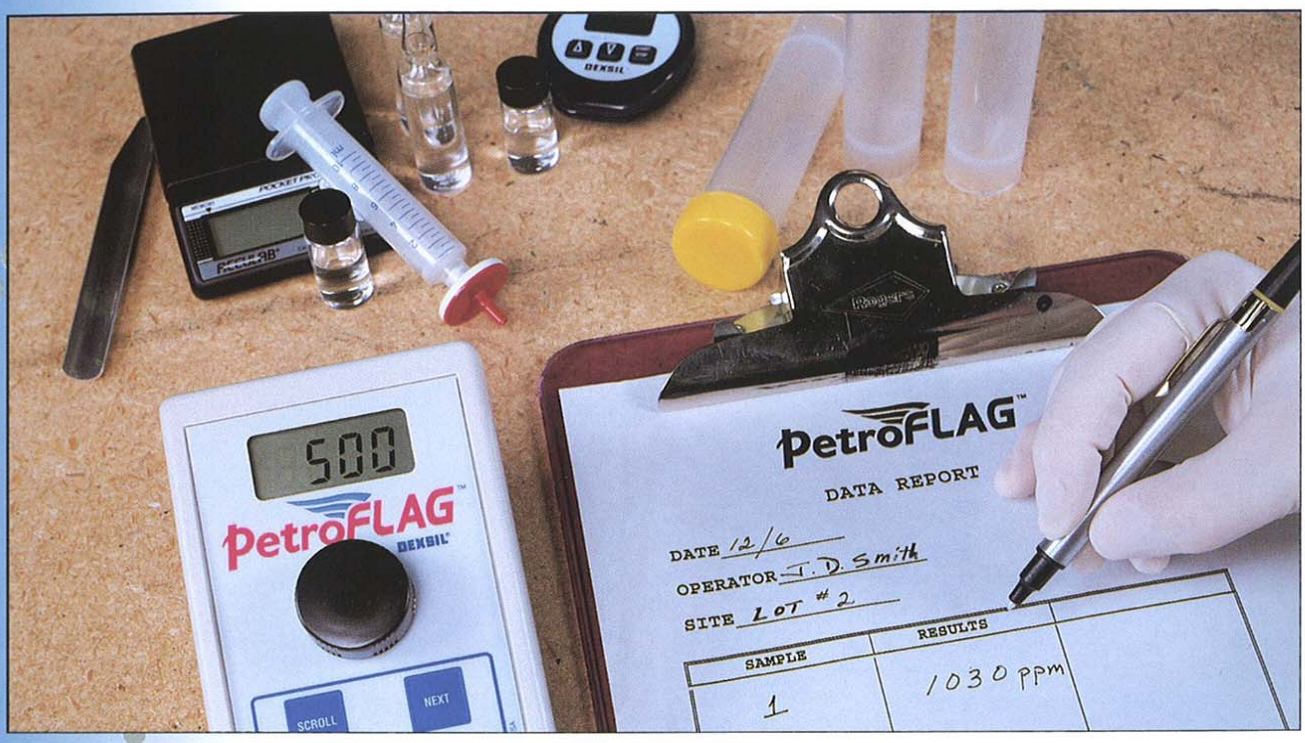
Dexsil's PetroFLAG System

CFCs

USES NO CFCs

PetroFLAG™: Quantifies Total Extractable Hydrocarbons In Soil

Dexsil's PetroFLAG is a revolutionary new field portable test method for determining hydrocarbon concentration in all types of soil. The test is ideal for site assessments, tank removal procedures, oil spill clean-up and for monitoring the progress of remediation activities. In minutes, users can obtain quantitative data on a sample contaminated with any type of petroleum hydrocarbon.



Economically Locate & Define Hydrocarbon Contaminated Soil

Using PetroFLAG, environmental professionals can determine hydrocarbon contamination levels at a fraction of the cost of laboratory analysis. An additional cost benefit comes from the field portability of the kit, tests can be run on-site and provide real-time results to facilitate clean-up activities and assist on-site project management.

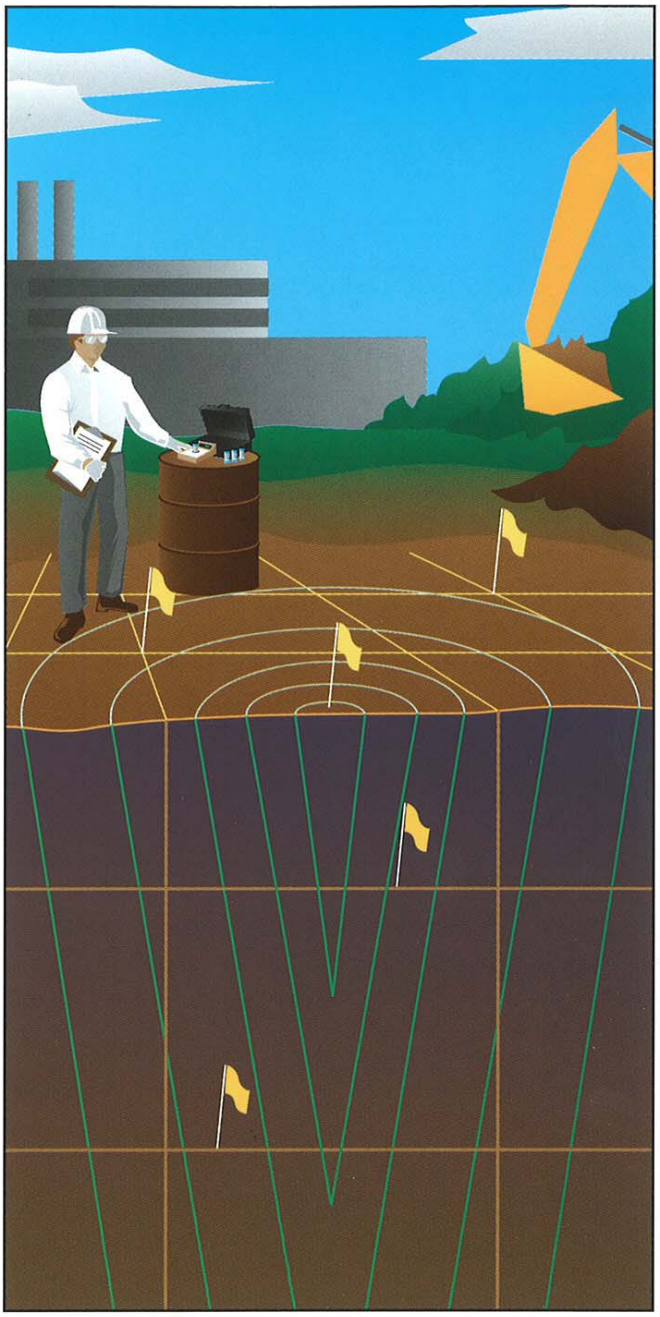
PetroFLAG also provides high throughput capabilities; up to ten tests can be performed concurrently so one user can easily complete 25 samples in an hour. Everything required to run the test, including the chemical reagents, fits in the convenient carrying case. The test procedure uses no chlorofluorocarbons and all spent reagents can be easily disposed of.

PetroFLAG™

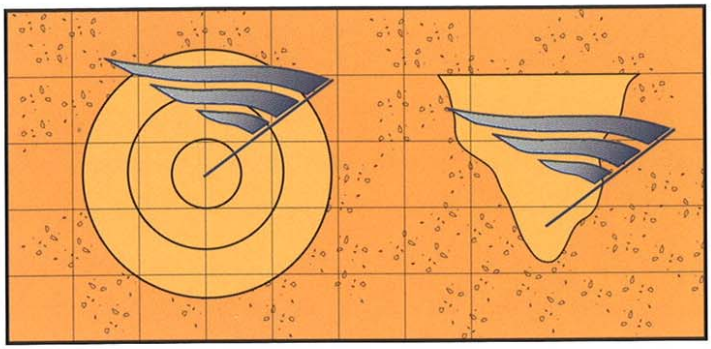
PetroFLAG Supports A Wide Variety Of Sampling Strategies

PetroFLAG is easily used at contamination sites where a variety of sampling strategies are to be employed. It is useful at sites requiring lateral and vertical definition of soil contamination plumes throughout the vadose zone, including sites that are being drilled or excavated for sampling.

PetroFLAG is well suited for large sites where a grid sampling plan is the strategy of choice. In many cases a grid sampling plan would be ruled out due to the high cost of laboratory analysis. PetroFLAG allows the grid strategy to be used while providing the user with meaningful data for on-site decision making prior to submitting samples for expensive laboratory analysis. The use of PetroFLAG for grid sampling will help to economically locate and define the extent of the contamination, locate and define hot spots and help delineate the zero line. This can prevent unnecessary drilling and sampling and will eliminate re-mobilization costs associated with waiting for laboratory results. Additionally, PetroFLAG is useful for tracking and evaluating the success of soil remediation projects such as bioremediation.



PetroFLAG™



PetroFLAG Test Methodology

PetroFLAG relies on a unique system of extraction solvents, analytical reagents and a hand-held, battery-powered analyzer to read contamination levels directly in parts per million (µg/g).

The test is performed using three simple steps: extraction, filtration and analysis. In the first step a proprietary solvent system that does not contain chlorofluorocarbons effectively extracts hydrocarbons from a variety of soils ranging from course sand to marine sediment and clay. Moisture content has no effect on extraction efficiency. The second step filters out all suspended materials from the extract so that they don't interfere with the test results. Finally, a developing solution is added and the soil extract starts to react and develops a response in proportion to the amount of hydrocarbon contained in the soil sample. Within ten minutes the developing solution equilibrates and a reading can be obtained using the analyzer.

If the type of hydrocarbon is known, then the specific response factor can be selected from the on-board menu to calibrate for the analyte. If the contaminant is unknown a general hydrocarbon screen can be performed by selecting a conservative response factor and using the "screen" mode. This will provide a conservative, general screening result that lets the user know if contamination is present and if so, at what relative concentration.

Fig. 1 PetroFLAG vs. 418.1 on Diesel Bioremediation Site

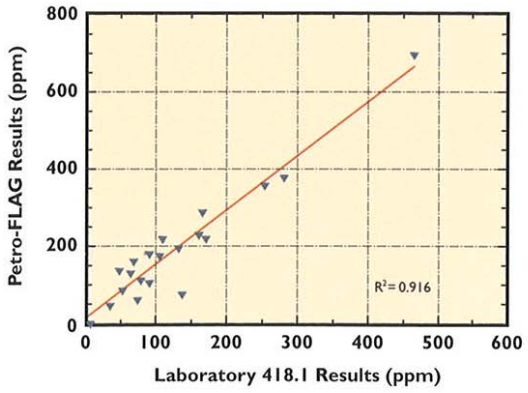


Fig. 2 PetroFLAG vs. 8015B on Diesel Bioremediation Site

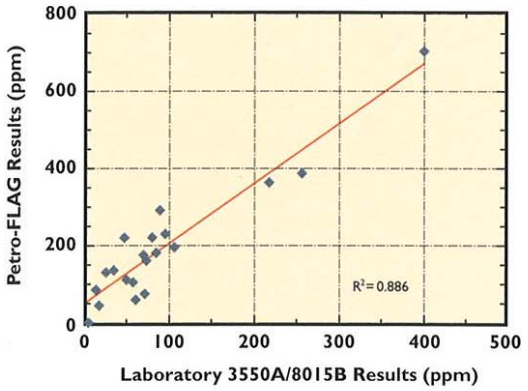
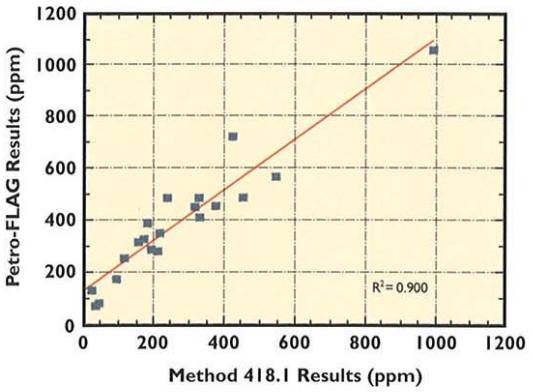


Fig. 3 PetroFLAG vs. 418.1 on Oil and Grease Bioremediation Site



Comparison To Laboratory Test Methods

In recent trials the PetroFLAG kit has provided valuable real-time data that correlates very well with the two most widely used laboratory methods. When split samples were sent for laboratory confirmation using EPA Method 418.1 and EPA Method 8015B, the correlation was in excess of 90% for EPA 418.1 and in excess of 88% for EPA 8015B. These results were obtained at an existing bioremediation site for diesel fuel contamination. (See Fig. 1 and 2)

The comparison with lab methods is equally impressive at sites with oil and grease contamination. Samples from an auto repair site sent to the lab were analyzed using EPA Method 418.1 and PetroFLAG. The results show that on oil and grease sites the PetroFLAG data obtained in real-time is statistically equivalent to the EPA lab method. The follow-up analysis showed a 90% correlation between the PetroFLAG and EPA 418.1 results. (See Fig. 3)

Laboratory studies on spiked soil samples show that the extraction efficiency of the PetroFLAG system is greater than 90% across a broad range of hydrocarbon products. Replicate analysis also indicates that the repeatability is better than 90%.

PetroFLAG Diesel Results on Spiked Laboratory Standards

Actual Conc. (ppm)	Trial A (ppm)	Trial B (ppm)	Trial C (ppm)	Mean (ppm)	Std. Dev. (ppm)
106	107	114	114	112	3.82
255	239	254	245	246	7.58
516	504	507	516	509	6.43

PetroFLAG Number 6 Fuel Oil Results on Spiked Laboratory Standards

Actual Conc. (ppm)	Trial A (ppm)	Trial B (ppm)	Trial C (ppm)	Mean (ppm)	Std. Dev. (ppm)
100	105	117	117	112	6.55
251	222	234	234	230	6.55
500	438	449	449	446	6.55

PetroFLAG™

Each PetroFLAG Analyzer Comes With:

HAND-HELD, DIGITAL ANALYZER

PORTABLE ELECTRONIC BALANCE

DIGITAL COUNTDOWN TIMER

TWO CALIBRATION STANDARDS

REAGENTS FOR TEN TESTS

CARRYING CASE

ADDITIONAL REAGENTS CAN BE ORDERED IN MULTIPLES OF TEN TESTS

TO PLACE AN ORDER
CALL 1-800-4-DEXSIL
WWW.DEXSIL.COM

P.O. Box 280, CH-7007 Chur

ETI Environmental Technology Ltd.

+41(0)81 253 54 54 - Fax +41(0)81 253 66 22

info@eti-swiss.com – www.eti-swiss.com

Printed on Recycled Paper

REV. 0 4/99

On-Site Test Kits for Soil

Total Petroleum Hydrocarbons • Total Moisture

TPH In Soil

Relying on laboratory methods to determine hydrocarbon contamination in soil is both time consuming and expensive. Laboratory methods such as EPA Method 8015 are very expensive with turnaround times of one to two weeks. Most samples analyzed by this method limit the results to Gasoline Range Organics (GRO) or Diesel Range Organics (DRO). When limiting the analysis to these two ranges, heavier fractions of hydrocarbons such as fuel oil, motor oil, hydraulic oil, gear oil, transformer oil and greases are "not seen" in the analysis and the soil samples may be incorrectly reported as clean (false negative) if these heavier hydrocarbons are present. Method 418.1 was the only broad spectrum "Total Petroleum Hydrocarbon" field test for soil. Although this test is quite accurate for dry soils, the extraction efficiencies for wet soil can be as low as 10%. This inability to solvate wet soil samples can lead to false negative results. Method 418.1 also uses a chlorinated solvent (Freon) as its extraction solvent. Freon is environmentally unsafe, and its disposal costs are quite high. The analyst now has another choice, an environmentally safe, inexpensive, field portable test, PetroFLAG.

Moisture in Soil

Nationwide, the increasing importance of water conservation cannot be ignored. The currently available methods used for monitoring soil moisture levels to ensure the efficient use of irrigation water in production agriculture fail to provide data that is precise or specific enough to adequately accomplish the task. Single location moisture sensors, moisture tension devices and weather data do not measure water content directly and fail to account for changes in soil types, topography and slope exposure and the effect each has on a soil's water supplying characteristics. A method of monitoring soil moisture that is accurate, practical and portable would contribute greatly to water conservation measures.

PetroFLAG® SYSTEM

An On-site Test for TPH in Soil

USEPA SW-846 Draft Method 9074

The PetroFLAG system is a field portable method for the determination of total petroleum hydrocarbons in soil. It is both safe and easy to use. PetroFLAG does not distinguish between aromatic and aliphatic hydrocarbons, but quantifies all fuels, oils, and greases as total hydrocarbons. Analysis of a 10 gram soil sample is performed using three simple steps: extraction, filtration, and analysis.

The PetroFLAG instrument is easily and quickly calibrated using an extract reagent as the zero and a supplied 1000 ppm hydrocarbon standard. The menu driven display prompts the user through the calibration steps. One set of calibration standards accompanies each box of ten tests. Additional calibration standards can be ordered separately.

The PetroFLAG system is not analyte specific, but measures all hydrocarbons in the sample as the target analyte chosen by the user. Programmed into the instrument are 15 response factors for petroleum hydrocarbons. Five response factors, 11 through 15, are specifically designated for crude oil analysis. By choosing the correct response factor for the target analyte, the calibration curve is adjusted for that specific analyte making for a more precise measurement.

The PetroFLAG system is completely field portable. Everything needed to perform ten soil tests can be conveniently carried to the job site in a briefcase size carrying case. PetroFLAG has been assigned a USEPA SW-846 Draft Method 9074.

PetroFLAG Analyzer

The PetroFLAG meter is a light-weight, rugged, hand-held unit powered by a 9-volt battery. 4,000 tests can be run on a single alkaline battery. The meter is menu driven for ease of use and utilizes an EEPROM memory system. Fifteen response factors are built into the analyzer depending on the analyte of interest. Response factors correlate to fuels ranging from weathered gasoline to heavy crude oil. The results are displayed in ppm on a LCD. The lower limit of detection for most hydrocarbons is 20 ppm, except for weathered gasoline which has a LLD of 1000 ppm. Using the standard 10 gram sample, the analyzer has the ability to quantify all hydrocarbons up to 2000 ppm. Quantifying hydrocarbons above 2000 ppm requires an additional step using PetroFLAG's High Range Reagents; or the analyst can reduce the sample size and multiply the results by the appropriate factor.

The PetroFlag Analyzer comes complete with timer, electronic balance, one set of calibration standards, ten tests and carrying case.

Analytes	**Petroleum Hydrocarbons**
Matrix	**Soil**
Detection Method	**Turbidimetric Development**
Action Levels	**(MDL) 15 - 2000 ppm (analyte dependent)**
MDL	**15 ppm**
MQL	**45 ppm**
Interferences	**Natural Hydrocarbons**
Overall Accuracy	**10% +/-MDL**
Analysis Time	**Throughput 1-10 samples in 15 mins.**

	Catalog#
PetroFLAG Analyzer/Carrying Case	**PF-MTR-01**

PetroFLAG® REAGENTS

PetroFLAG for Soil Reagents

PetroFLAG reagents come packaged in ten tests per box. Also included in each box is one set of calibration solutions; a "zero" and 1000 ppm standard. The box is designed to fit directly into a space provided in the field carrying case for convenient replenishment of used reagents. All reagents are premeasured and sealed in glass ampules for quality control assurance. The PetroFLAG reagents consist of patented formulations that are safe and easily disposed of as normal laboratory waste.

Analytes	Petroleum Hydrocarbons
Matrix	Soil
Detection Method	Turbidimetric Development
Action Levels	(MDL) 15 -2000 ppm (analyte dependent)
MDL	15 ppm
MQL	45 ppm
Interferences	Natural Hydrocarbons
Overall Accuracy	10% +/-MDL
Analysis Time	Throughput 1-10 samples in 15 mins.

	Catalog #
PetroFLAG Reagents	
10 SOIL TESTS	**PF-SRP-10**
40 SOIL TESTS (One Case)	**PF-SRP-CS**
(EACH 10 TESTS COMES WITH ONE SET OF CALIBRATION STANDARDS)	
12 CALIBRATION REAGENTS	**PF-CAL-12**
48 CALIBRATION REAGENTS	**PF-CAL-CS**

PetroFLAG High Range Reagents

When quantification of hydrocarbons above 2000 ppm is required, PetroFLAG High Range Reagents should be considered. Designed to detect hydrocarbon contamination in the percent range using a one gram or 10 gram sample, the analyst can now extend the range of PetroFLAG to 20% (200,000 ppm). The high range reagents are an extension of the standard PetroFLAG reagents. The new procedure consists of a soil extraction using the High Range Extraction Solvent, then a 10:1 dilution into the standard PetroFLAG solvent, followed by the usual analysis. The linear range for response factor 5 would be 150 ppm to 20,000 ppm using a 10 gram sample and 15,000 ppm to 200,000 ppm for a 1 gram sample. All reagents are chlorine free and can be disposed of in normal laboratory waste.

Analytes	Petroleum Hydrocarbons
Matrix	Soil
Detection Method	Turbidimetric Development
Action Levels	150 ppm to 20,000 ppm
MDL	150 ppm
MQL	450 ppm
Interferences	Natural Hydrocarbons
Overall Accuracy	10% +/-MDL
Analysis Time	Throughput 1-10 samples in 15 mins.

	Catalog #
***PetroFLAG High Range Reagents**	**PF-HRD-10**
10 Tests	
*For use with regular reagents	