

# Overview of Instruments for Onsite Analysis

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# Why Onsite Analysis?

- Real-time decision making for evaluating the extent of contamination
- Help reduce offsite laboratory costs
- Evaluate contaminate concentrations during removal actions
- Screening soil cores to identify sample intervals
- Sample holding time limitations (remote sites)
- Reduce sample packing and shipping costs

# Tools Available

- Hand-held Gas Chromatography – Frog-4000
- Field portable X-ray fluorescence (FP-XRF) – Niton, Olympus, and more
- Colorimetric – AQR Color-Tec, Cheiron
- Immunoassay – MODERNWATER,
- Near Infrared (NIR) - microPHAZIR™

# Hand-held Gas Chromatography - Frog-4000™

- Hand held gas chromatograph (GC) capable of providing quantitative results for some VOC analytes including PCE, TCE, BTEX, VC, chlorinated alkenes
- Contains a preconcentrator, micro GC column, and a 10.6 eV lamp photo ionization detector (PID)
- Water or soil/water samples are placed in the sparger
- A wand is attached to the unit for air samples
- EPA Small Business Innovation Research program recipient

# Hand-held Gas Chromatography - Frog-4000™

- INSERT Frog 4000 photo

# Frog-4000™

## Advantages

- Able to analyze multi-media
- Provides quantitative results within 10 minutes
- Small and easily shipped and carried around sites
- Many samples can be analyzed each day; results can be used to make real-time site decisions

# Frog-4000™

## Considerations

- Best if operated by a chemist and at a minimum someone familiar with chromatographic techniques
- Requires calibration standards, which require care in handling and disposal
- Cannot analyze all chemicals included in EPA Method 8260
- Regulators may require split samples be analyzed by offsite lab
- High cost to purchase; limited rental options
- Not many people have heard of the instrument

# FP-XRF

- Field Portable X-ray Fluorescence (FP-XRF)
- Detection limits vary; need to contact manufacture for instrument specific
- EPA guidance: *Field Portable X-Ray Fluorescence Spectrometry for the Determination of Elemental Concentrations in Soil and Sediment*
- FP-XRFs are capable to provide quantitative results for 16 RCRA metals and 10 non-RCRA metals (EPA 2007)



FP-XRF



# FP-XRF

## Advantages

- Can be used by most field staff with minimal training
- Available for rental from many companies
- Low cost per sample; many samples can be analyzed in a day
- Has been used in the environmental industry for a long time

# FP-XRF

## Considerations

- Samples will likely require preparation in the field including sieving and drying
- Sample moisture, soil matrix, chemical matrix, and air temperature can effect results
- Off-site split samples may be required to confirm field results
- Expensive to purchase the equipment

# Colorimetric - AQR Color-Tec<sup>®</sup>

- AQR Color-Tec<sup>®</sup> field screening test-kit for total chlorinated halocarbons
- Water and water/soil samples are collected in VOAs for analysis
- Testing works by oxidizing chlorinated compounds and a degradation compound (hydrogen chloride) reacts with the colorimetric tube
- Colorimetric response converted to a range of expected equivalent concentration of total chlorinated halocarbons, if sample was analyzed by GC/MS

# Colorimetric - AQR Color-Tec®

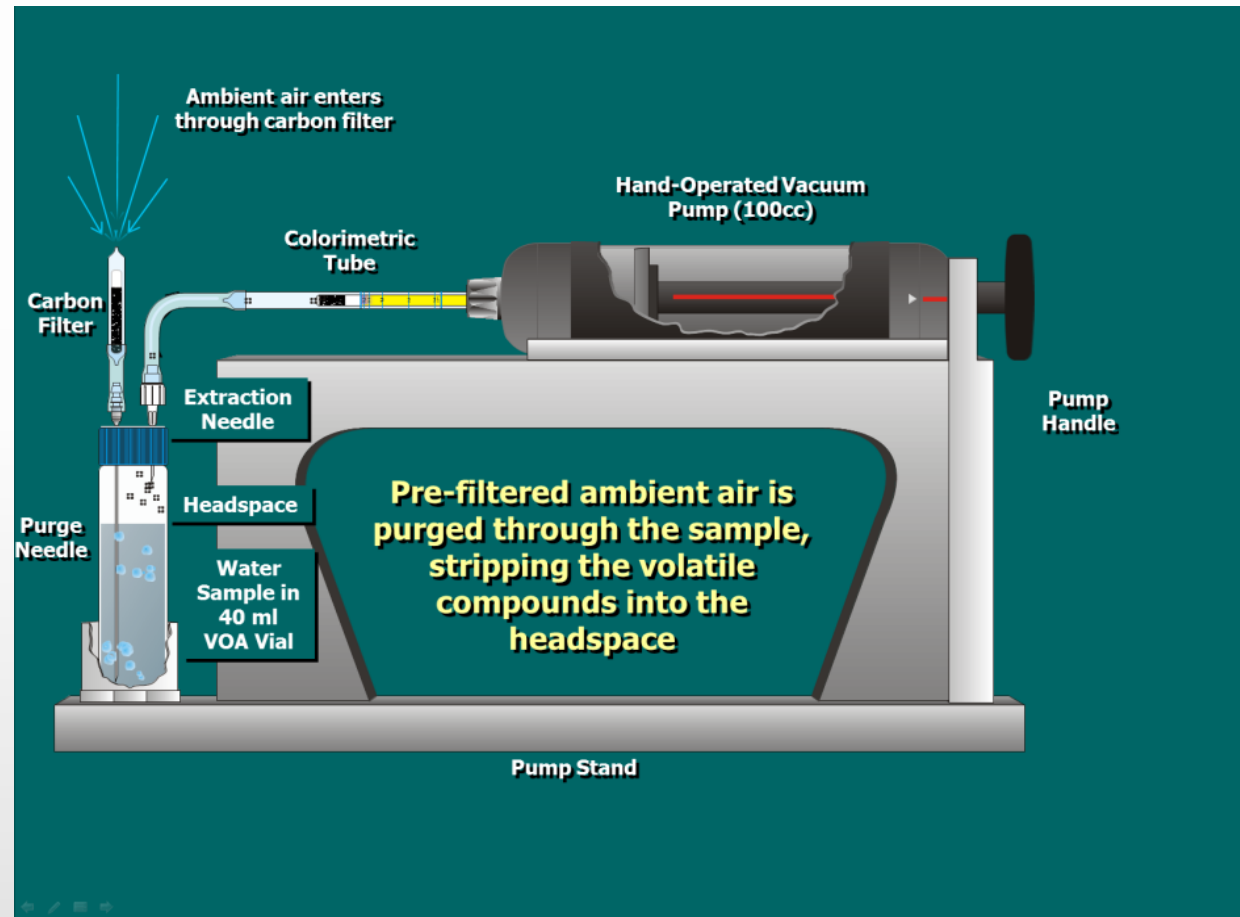


Image Source: [www.aqrcolortec.com](http://www.aqrcolortec.com)

# Colorimetric - AQR Color-Tec<sup>®</sup>

## Advantages

- Low cost to rent equipment and purchase sample packs
- Low detection levels (3 µg/L and 3 µg/kg)
- Simple to learn and implement in the field

## Considerations

- Provides qualitative results of total chlorinated compounds and not individual chemicals
- Cost is not advantages until greater than 20 samples are analyzed; also available to rent

# Colorimetric - Cheiron Resources

- Shaker test, sprays, crystals, and swabs that detect the presence of some petroleum hydrocarbons and some chlorinated compounds (TCE, TCA, and PCE) in soil
- Can be used to identify hot spots, sample intervals, and delineate impacted soil
- Can be used to determine if oil is present in water

# Colorimetric - Cheiron Resources

## Advantages

- Easy to use and test is completed within minutes
- Test can be applied in many fashions
- Can be used to help determine the presence of petroleum hydrocarbons and some chlorinated compounds

## Considerations

- Some compounds like Esters can interfere with the test
- Cannot be used by color blind people
- Cannot detect concentrations less than 500 ppm



# Immunoassay

- RaPID Assay<sup>®</sup> BTEX/TPH – MODERNWATER
  - Requires extraction for soil samples; total analysis time is approximately 1 hr
  - Results are quantitative to qualitative, depending upon knowledge regarding sources of TPH
  - Low level of detections possible (between 1 and >100 PPM)
- RaPID Assay<sup>®</sup> PCP
  - Similar to BTEX/TPH testing, but for Pentachlorophenol (PCP) and other organochlorines
  - EPA SW-846 4010a describes screening for PCP using immunoassay test kits
- Many immunoassay test kits for pesticide testing

# Immunoassay

## Advantages

- Capable of analyzing many samples 'at once'; good for bigger sites
- Can provide better data when compared to shaker test kits
- Can analyze for a variety of environmental analytes

## Considerations

- May require some minor laboratory equipment and people familiar with using the equipment
- Some test require more labor
- Some test need to be analyzed in batches due to method blanks
- Equipment rental costs

# NIR microPHAZIR AS Asbestos Analyzer

- Hand-held analyzer that can detect the presence of :
  - Chrysotile
  - Crocidolite,
  - Anthophyllite
  - Tremolite
  - Actinolite
  - Amosite
- Screening materials during demolition/renovation

# NIR microPHAZIR AS Asbestos Analyzer

## Advantages

- Can confirm the presence of asbestos in building material
- Easy to use

## Considerations

- Detection limit is  $>1\%$  and only the manufacture has tested the products detection limit and the study was not released
- Requires offsite analysis to confirm materials do not contain asbestos

# References

- EPA. 2007. Field Portable X-RAY Fluorescence Spectrometry for the Determination of Elemental Concentrations in Soil and Sediment. February.