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Continuing Education Course #016  
Environmental Contamination  
The Membrane Interface Probe (MIP)

1. Dynamic sampling is a useful tool when assessing environmental contamination because:
  - a. It offers the ability to screen contaminant levels in soil and groundwater semi-quantitatively, while still in the field.
  - b. It allows the work plan to be revised while still in the field, if unanticipated conditions are encountered.
  - c. It can help avoid the costs incurred in analyzing unnecessary samples.
  - d. All of the above
2. The EPA's Triad approach:
  - a. is intended to limit a remediation project to a maximum of three site visits.
  - b. outlines the use of a dynamic sampling plan to expedite thorough characterization of a contaminated site.
  - c. compares three common remedial strategies—soil vapor extraction, in-situ bioremediation, and natural attenuation.
3. A Conceptual Site Model (CSM)
  - a. is a three-dimensional image used to accurately site monitoring wells.
  - b. is a decision tree to assist in selecting the optimum remedial technology.
  - c. is another term for the finalized remedial design.
  - d. is a plan that includes a decision pathway or flowchart that dictates adjustments to the sampling plan and CSM as real-time data comes in.
4. Real-time measurement systems (RTMS):
  - a. Provide the geologist or engineer with data almost instantly, and in sufficient quantity to provide a level of sampling density that assures data quality.
  - b. Enable decisions regarding the sampling effort to be implemented onsite
  - c. Provide a means of building a thorough picture of subsurface contamination and subsequently providing the information necessary to design an effective remediation system.
  - d. All of the above.
5. MIP is an abbreviation for:
  - a. Metal Identification Probe
  - b. Membrane Interface Probe
  - c. Metamorphic Individuation Plot
  - d. Minimum Isolation Process
6. Which of these statements about the MIP is not true?
  - a. The MIP provides a real-time vertical log of volatile organic contamination with depth.
  - b. The MIP probe contains an electrical conductivity sensor
  - c. The MIP provides insight into potential contaminant migration pathways with lithologic information that can be

interpreted from the soil conductivity data.

- d. The MIP is a primary tool for the assessment of heavy metal contamination.

7. The key component of the probe:

- a. is a metal screen which enhances the speed at which volatile compounds condense.
- b. is a semi-permeable membrane that acts as an interface between subsurface contaminants and gas phase detectors arrayed at the surface.
- c. is a polymer film preventing direct contact between the detectors and the vapor sample.
- d. None of the above.

8. The heated block attached to the probe

- a. prevents cross-contamination by semi-volatiles in maintenance lubricants
- b. maintains the optimum temperature for aerobic decomposition of volatile organic compounds.
- c. maintains a sterile sampling environment.
- d. accelerates diffusion of volatile compounds across the membrane.

9. The “stringpot” is:

- a. a trunk line threaded through the direct-push rods.
- b. a heated block attached to the probe.
- c. a depth-measuring potentiometer.
- d. a lubricant-storage reservoir.

10. The detector configuration used by most MIP service providers is:

- a. a photoionization device (PID) and flame ionization device (FID),
- b. a flame ionization device (FID) and an electron capture device (ECD).
- c. an electron capture device (ECD).
- d. a photoionization device (PID), a flame ionization device (FID), and an electron capture device (ECD).

11. BTEX stands for:

- a. butane, toluene, ethanol, and xylene.
- b. benzene, toluene, ethylbenzene, and xylene.
- c. butane, tert-butyl ethylene, ethane, and xylitol.
- d. benzene, trichloroethane, ethylene, and xanthene.

12. True or false: For chlorinated compounds, the ECD detector gives lower detection limits than the PID detector.

- a. True
- b. False.

13. Which of these detectors is non-destructive:

- a. PID
- b. FID
- c. ECD

14. Which detector uses ultraviolet radiation to ionize molecules in the MIP carrier gas stream?

- a. PID
- b. FID
- c. ECD

15. Which detector uses hydrogen/air flame to produce ions and electrons?

- a. PID
- b. FID
- c. ECD

16. Which detector produces ions and electrons by passing the carrier gas over a beta-emitter, causing ionization and electron production?

- a. PID
- b. FID
- c. ECD

17. This detector is most sensitive for volatile aliphatic hydrocarbons and high carbon compounds such as methane and propane, and less sensitive as a detector for chlorinated solvents. However, when chlorinated compounds are present in such high levels that the more sensitive detector responses are maximized, this lower sensitivity can be used to advantage.

- a. PID
- b. FID
- c. ECD

18. True or False. A response in the field by the ECD detector is a clear indication of the presence of a chlorinated compound.

- a. True.
- b. False.

19. The MIP output is:

- a. independent of the temperature of the probe.
- b. a compilation listing quantitative measurements of chlorinated and non-chlorinated compounds.
- c. a log of the detector responses, the temperature of the heated probe, the speed of penetration, and the electrical conductivity (EC) by depth.
- d. None of the above.

20. The MIP output shows electrical conductivity in units of:

- a. millisiemens/meter.
- b. millivolts/meter.
- c. microvolts.
- d. microsiemens.

21. The MIP output shows individual detector responses in units of:

- a. millisiemens/meter.
- b. millivolts/meter.
- c. microvolts.
- d. microsiemens.

22. True or false. The PID/FID/ECD array is the only configuration of detectors that can be used with the membrane interface probe.

- a. True.
- b. False.

23. True or false. The array of detectors most commonly used with the membrane interface probe can be configured to yield quantitative data in the field.

- a. True.
- b. False.

24. The response test is:

- a. a test of the working MIP system performed by advancing the probe to a standard depth below-surface and comparing the measurements to those obtained during the previous response test.
- b. a test of the working MIP system performed by comparing randomly selected measurements to laboratory-

generated data.

- c. a test of the working MIP system performed by comparing two consecutive measurements taken at the same depth below-surface.
- d. a test of the working MIP system performed by placing the probe in an aqueous phase solution with a known contaminant at a known concentration.

25. The response test is performed:

- a. at the beginning of each field effort.
- b. before each log and at the end of the day.
- c. before each log and at the beginning of each day.
- d. at random intervals, as directed by the field supervisor.

26. The trip time:

- a. is the time required for the contaminant to penetrate the semi-permeable membrane and travel through the fixed-length trunk line to the gas phase detectors at the surface.
- b. is the time required to advance the probe to the desired depth.
- c. is the time required to get the field crew in place to begin work.
- d. is none of the above.

27. Leaks or plugs in the membrane or elsewhere in the system can be determined:

- a. by monitoring the MIP log.
- b. by measuring the penetration rate.
- c. by monitoring the system's pressure gauges and comparing supply to return flows.
- d. by visual inspection.

28. True or false. It is generally assumed conductivity decreases as the grain size decreases or as moisture content increases.

- a. True.
- b. False.

29. True or false. The MIP system is only useful in saturated zones.

- a. True.
- b. False.

30. The MIP technology is equally well-suited for volatile, semi-volatile, and non-volatile contaminants.

- a. True.
- b. False.

31. Carryover, the retention of contaminant in the membrane and trunkline, can result in

- a. a false positive at subsequent depth readings.
- b. or an elevated gas phase detector baseline.
- c. both of the above.

32. True or false. Comparing contaminant response and background electrical conductivity before and after an injection can determine its radius of influence.

- a. True.
- b. False.

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