Air Sampling in Nuclear Facilities During Routine and Emergency Situations

April 4-8, 2016 ◆ Albuquerque, NM

Scope

This 5-day course provides an in-depth understanding of the requirements and methods of air sampling and monitoring in nuclear facilities and it presents current methods and equipment for addressing these requirements. The course is organized into five main topics; (1) basic fundamentals of air sampling and monitoring, (2) air sampling and monitoring regulatory requirements, (3) methods of extracting representative samples from stacks, ducts, the environment, and work areas, (4) equipment used for air sampling and monitoring, and (5) hands-on use of air sampling and monitoring equipment including analysis methods and algorithms, detection levels, interferences, and limitations.

Basic fundamentals of air sampling and monitoring includes basic calculations, interferences, and limitations of air sampling and monitoring systems. Types of air sampling pumps discussed and demonstrated are rotary vane, centrifugal, diaphragm, and ejectors. Air sample flow controllers such as throttling valves, mass flow controllers, critical flow orifices, and pinch valves are demonstrated. Air sampling rate meters such as dP gauges, mass flow meters, and rotameters are demonstrated.

An overview of the requirements of 10 CFR 20 (Standards for Protection Against Radiation), 10 CFR 20 Subpart D (Radiation Dose Limits for Individual Members of the Public), Nureg 1400 (Air Sampling in the Workplace), 10 CFR 835 (Occupational Radiation Protection), 29 CFR 1910 (Occupational Safety and Health Standards), 40 CFR 50 (National Primary and Secondary Ambient Air Quality Standards), 40 CFR 50 Appendix B (Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere), 40 CFR 61 (Radiological National Emission Standards for Hazardous Air Pollutants), and ANSI N13.1-1999 R2011 (Sampling and Monitoring Releases of Airborne Radioactive Substances From the Stacks and Ducts of Nuclear Facilities) is provided.

Methods of extracting representative samples from stacks and ducts and from the environment and work areas is presented. Deposition software developed at Texas A&M University is provided. Sampling rakes and shrouded probes for stacks and ducts are discussed as well as methods of measuring air flow rates through stacks and ducts. Isokinetic sampling limitations are discussed.

The next topic includes a description of the various types of air samplers and air monitors including the capabilities and limitations of each type of sampler/monitor. The types of air samplers and monitors and filter media will be compared and the suggested applications for each will be discussed, along with typical operation, maintenance, and calibration procedures.

The final topic includes hands-on use of many of the air samplers and monitors described. Calibration equipment is provided to demonstrate how the air samplers and monitors are calibrated. Various air sample filters are used in the hands-on demonstration. Air sample filters are counted and airborne concentrations are calculated. Various sample analysis methods and algorithms are demonstrated.

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Day 1 - Basic Fundamentals of Air Sampling and Monitoring

- Calculate concentration using count rate, counting efficiency, and sample volume
- Concentration conversion factors (such as pCi/L to uCi/mL or Bq/M3)
- Radon and Thoron interference in aerosol and gas sampling
- Uranium-238 decay chain
- Thorium-232 decay chain
- Comparison of typical radon/thorn progeny concentrations compared to desired concentration limits for transuranic airborne activity
- Detection limits based on sampling rate and time and detector counting efficiency
- Basic air sampling pumps; rotary vane, centrifugal, diaphragm, and ejectors
- Air sample flow controllers; throttling valves, mass flow controllers, critical flow orifices, and pinch valves
- Air sampling flow rate meters; dP gauges, mass flow meters, orifice flow meters. and rotameters
- Calculate DAC (Derived Air Concentration) and DAC-h
- Calculate the DAC level on a filter from the number of DPM on the sample filter and the sample time and the sampling rate
- Calculate the number of DAC-h on a filter from the number of DPM on the filter and the air sampling rate
- Calculate the DPM on a filter to reach an 8 DAC-h accumulation
- Calculate the mrem/h and mrem from inhaling airborne radioactivity
- Group discussion of basic fundamentals of air sampling and air monitoring
- Summation of day 1 training

Day 2 – Standards

Overview of the requirements of:

- 10 CFR 20 (Standards for Protection Against Radiation)
- 10 CFR 20 Subpart D (Radiation Dose Limits for Individual Members of the Public)
- Nureg 1400 (Air Sampling in the Workplace)
- 10 CFR 835 (Occupational Radiation Protection)
- 29 CFR 1910 (Occupational Safety and Health Standards)
- 40 CFR 50 (National Primary and Secondary Ambient Air Quality Standards)
- 40 CFR 50 Appendix B (Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere)
- 40 CFR 61 (Radiological National Emission Standards for Hazardous Air Pollutants)
- ANSI N13.1-1999 R2011 (Sampling and Monitoring Releases of Airborne Radioactive Substances From the Stacks and Ducts of Nuclear Facilities)
- Group discussion of regulations pertaining to air sampling
- Summation of day 2 training

Day 3 - Methods of extracting representative samples from stacks and ducts and from the environment and work areas

- Deposition software developed at Texas A&M University
- Demonstration of Deposition software
- Sampling rakes and shrouded probes for stacks and ducts
- Methods of measuring air flow rates through stacks and ducts
- Isokinetic sampling limitations
- Group discussion of extracting representative samples, depo software, rakes and shrouded probes, methods of measuring air flow rates, and Isokinetic sample
- Summation of day 3 training

Day 4 - Types of air samplers and air monitors

- Capabilities and limitations of each type of sampler/monitor
- Power versus air sampling rate for various types of air sampler pumps
- Types of filter media are compared and the suggested applications for each are discussed
- Typical operation, maintenance, and calibration procedures
- Group discussion of air samplers and air monitors and filter media
- Summation of day 4 training

Day 5 - Hands-on use of air samplers and monitors

- Calibration equipment is provided to demonstrate how the air samplers and monitors are calibrated
- Various air sample filters are used in the hands-on demonstration
- Air sample filters are counted and airborne concentrations are calculated
- Various sample analysis methods and algorithms are demonstrated
- Group discussion of air samplers, air monitors, and filter media
- Summation of the training

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Instructor

James Tom Voss is President of Voss Associates, a consulting firm providing services to the radiation detection/protection industry. He was a former chemical engineer in the US Army, radiation technician in commercial nuclear power plants, startup engineer in both nuclear and fossil power plants, and Chair of the Laboratory Accreditation Assessment Committee for the HPS. He participated in the initial startups of 2 PWR nuclear power plants, 1 BWR nuclear power plant, and 2 fossil power plants. His current full-time employment is in the radiation instrumentation calibration and repair team at Los Alamos National Laboratory. He is a procedure writer and OJT developer/trainer. He is certified by the American Board of Health Physics and registered by the National Registry of Radiation Protection Technologists. He has 22 years of experience in commercial nuclear power reactors and 24 years of experience in DOE. He is the current President of the Power Reactor Section of the HPS. He serves on many ANSI standards development committees and is a delegate to the IEC where he participates in the development of international standards.

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A TMS Training Course Developed Exclusively for your Organization Makes Sense...

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Our instructors are top experts in their field with many years of practical experience. Many are or have been presidents or officers of professional societies and are authors of numerous recognized publications and text books.

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Accommodations

This course will be held at the Albuquerque Marriott Pyramid North.

A block of rooms has been reserved at reduced rates for course participants. Please make your reservation directly with the hotel by calling 505-821-3333 – please specify that you are attending the Technical Management Services' short course to receive the group rate.

The reserved block of rooms will be released 3 weeks prior to the course (at which time rooms will be offered on an availability basis only).

How to Register

1. Register online: www.tmscourses.com
2. Call TMS at (860) 738-2440
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4. Mail the attached form:
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Continuing Education Credits

The AAHP has awarded 40 credits for this course.
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