

Air Sampling in Nuclear Facilities During Routine & Emergency Situations

This 4-day course provides a practical understanding of the requirements of air sampling in nuclear power generating stations and other nuclear facilities such as waste processing and fuel fabrication plants. It also presents current methods of addressing these requirements. The course will be organized into three main topics; air sampling regulatory requirements, fundamentals of air sampling, and equipment used for air sampling.

An overview of the requirements of ANSI N13.1-1999 (Sampling and Monitoring Releases of Airborne Radioactive Substances From the Stacks and Ducts of Nuclear Facilities), 40 CFR Part 61 (Radiological National Emission Standards for Hazardous Air Pollutants), and 40 CFR Part 50; Appendix B (Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere) will be provided. The requirements for air sampling during emergencies will also be covered.

The fundamentals of air sampling section will provide design considerations for the extraction of representative samples from stacks and ducts and from the environment and work areas.

The third topic will include a description of the various types of air samplers including the functions available for each type of sampler. Different types of air samplers and filter media will be compared and the suggested applications for each will be discussed. Special purpose air samplers will also be covered. Typical operation, maintenance, and calibration procedures will be described for the various air samplers. The course will conclude with a hands-on demonstration of many of the air samplers described. This course will provide an understanding of regulatory requirements that govern the sampling of radioactive particulate and iodine in a nuclear facility, the design criteria to be considered in sampling these types of isotopes, and the selection of air samplers based on regulatory requirements, functional criteria, and operation/maintenance needs.



Course Instructors

Marc Held is President of HI-Q Environmental Products company. Marc oversees the day-to-day operation of research & development, design, manufacturing, & application of HI-Q's air sampling product line. He has a Bachelor of Science degree in Mechanical Engineering from San Diego State University and over 10 years of experience in the design and application of Air Sampling Equipment, Systems, and Accessories in both the Nuclear and Environmental Industries. HI-Q Environmental Products is a participating Affiliate member of the Health Physics Society (HPS) and a Corporate Sponsor of the National Registry of Radiation Protection Technologists (NRRPT).

Brian Asamoto has 35 years of experience in the nuclear power industry with 31 years in the design of radiation monitoring and sampling systems for commercial nuclear power plants. Mr. Asamoto has specialized in the monitoring of normal and post-accident radioactive effluents from release points in power plants. He also has experience in the start-up and commissioning of major radiation monitoring systems for new plant installations. Mr. Asamoto is a member of the ANSI N13.1 working group and is currently involved in projects for verifying that stack sample locations conform to the requirements of ANSI N13.1-1999.

Brent Blunt has over 30 years experience in the area of air pollution control, environmental compliance, dispersion modeling, aerosol transport and air emissions inventory. He is currently leading a new ANSI committee developing an Ambient Air Sampling Standard. This work involves innovative research in the ambient transport of large particles. He also serves on three other ANSI committees and is developing modeling software for particle transport in sample lines and the selection of a homogeneous sampling site in effluent stacks. Mr. Blunt was a contributing author to the ANSI/HPS N13.1-1999 standard and continues to serve on the working group for that standard. As the environmental team lead for a consortium of companies from the USA, France and Japan, he prepared the environmental compliance portions of the DOE (Department of Energy) sponsored industry studies for the GNEP (Global Nuclear Energy Partnership).

Nagaraj Ramakrishna has been working in the air sampling industry for the past 9 years. Mr. Ramakrishna has been involved in the design, testing, and installation of air sampling systems. He has developed systems to control the operation of both high volume and low volume air sampling systems. Prior to that time, Mr. Ramakrishna was a graduate student at Texas A&M University performing aerosol generation, detection, and sampling experiments for Dr. Andrew McFarland. While at Texas A&M University Mr. Ramakrishna was responsible for conducting scale model testing to verify that stack sampling locations met the requirements of ANSI N13.1-1999. Mr. Ramakrishna is currently responsible for the scale model testing of vent stacks and ducts to verify that the sampling locations conform to the requirements of ANSI N13.1-1999. Mr. Ramakrishna has a Masters of Science in Mechanical Engineering from Texas A&M University.

1. Regulatory Requirements for Air Sampling

- a. Introduction to the Regulatory Requirements for Air Sampling
- b. Rad/NESHAP (40 CFR 61) – National Emission Standards for Hazardous Air Pollutants: Radionuclides
 - i. Subpart H
 1. Existing Sources
 2. New Sources
 - ii. Subpart I
- c. Regulatory Guide 1.21 – Measuring, Evaluating, and Reporting Radioactive Material in Liquid and Gaseous Effluents and Solid Waste
 - i. Sampling Requirements for Noble Gases
 - ii. Sampling Requirements for Particulates
 - iii. Sampling Requirements for Iodine
- d. Regulatory Guide 1.97 – Criteria for Accident Monitoring Instrumentation for Nuclear Power Plants
 - i. Sampling Requirements for Noble Gases
 - ii. Sampling Requirements for Particulates
 - iii. Sampling Requirements for Iodine
- e. Regulations Limiting Inhalation Exposure in the Workplace and to the Public

2. Methods of Compliance with the Regulatory Requirements

- a. Introduction
- b. Compliance with Rad/NESHAP (40 CFR 61) Requirements
 - i. Continuous Sampling/Monitoring
 - ii. Periodic Sampling/Monitoring
 - iii. Diffuse and Fugitive Sources
- c. Compliance with Regulatory Guide 1.21
 - i. Sampling Requirements for Noble Gases
 - ii. Sampling Requirements for Particulates
 - iii. Sampling Requirements for Iodine
- d. Compliance with Regulatory Guide 1.97
 - i. Post-accident Sampling Methods for Noble Gases
 - ii. Post-accident Sampling Methods for Particulates
 - iii. Post-accident Sampling Methods for Iodine
- e. Compliance with the Regulations Limiting Inhalation Exposure in the Workplace and to the Public
- f. Reference Standards for Compliance with the Regulatory Requirements
 - i. ANSI N13.1-1969 – Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities
 1. Application of ANSI N13.1-1969 CFR 61 Air Sampling
 2. Application of ANSI N13.1 – 1969 to Regulatory Guide 1.21 Air Sampling
 3. Application of ANSI N13.1-1969 to Regulatory Guide 1.97 Air Sampling
 - ii. ANSI N13.1-1999 – Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities
 1. Application of ANSI N13.1-1999 to 40 CFR 61 Air Sampling

2. Application of ANSI N13.1-1999 to Regulatory Guide 1.21 Air Sampling
3. Application of ANSI N13.1-1999 to Regulatory Guide 1.97 Air Sampling
- iii. 40CFR60, Appendix A, Method 1 – Sample and Velocity Traverses for Stationary Sources

3. Air Sampling Systems

- a. Introduction to Air Sampling Systems
- b. Design Considerations for Air Sampling Systems for Regulatory Guide 40 CFR 61 Compliance
- c. Design Considerations for Air Sampling Systems for Regulatory Guide 1.21 Compliance
- d. Typical ANSI N13.1-1999 Air Sampling System Design

4. Air Sampling Equipment

- a. Air Samplers
 - i. High Volume Air Samplers
 1. Fixed High Volume Air Samplers
 2. Portable High Volume Air Samplers
 - ii. Medium Volume Air Samplers
 1. Fixed Medium Volume Air Samplers
 2. Portable Medium Volume Air Samplers
 - iii. Low Volume Air Samplers
 1. Fixed Low Volume Air Samplers
 2. Portable Low Volume Air Samplers
 - iv. Very Low Volume Air Samplers
 1. Fixed Very Low Volume Air Samplers
 2. Portable Very Low Volume Air Samplers
 - v. Battery Powered Air Samplers
 - vi. Special Purpose Air Samplers
- b. Filter Holders
 - i. Combination Cartridge & Paper Holders, Open Faced
 - ii. Paper Only Filter Holders, Open Faced
 - iii. In-Line Combination Cartridge & Paper Holders
 - iv. In-Line Paper Only Filter Holders
- c. Filter Collection Media
 - i. Filter Paper (47mm, 2", 4", 8" x 10")
 - ii. TEDA Impregnated Carbon Cartridges
 - iii. Silver Gel Collection Columns

5. Air Flow Calibrators and Calibration Adapters

- a. Analog Low & High Volume Calibrators
- b. Digital Low & High Volume Calibrators
- c. Digital Standard Temperatures & Pressure Calibrators

6. Air Sampling Accessories

7. Calibration and Maintenance of Air Sampling Equipment and Accessories

8. Hands on Demonstration of Air Sampling Equipment Operation and Calibration

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