Designation: D3370 – 25

Standard Practices for Sampling Water from Flowing Process Streams[1]

This standard is issued under the fixed designation D3370; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 These practices cover the equipment and methods for sampling water from flowing process streams such as process streams at power stations for chemical, physical, microbiological, and radiological analyses. It does not cover specialized equipment required for and unique to a specific test or method of analysis. The following are included:

1.2 For information on specialized sampling equipment, tests or methods of analysis, reference should be made to Volumes 11.01 and 11.02 of the *Annual Book of ASTM Standards*, relating to water.

1.3 The values stated in SI units are to be regarded as standard. The values given in parentheses are mathematical conversions to inch-pound units that are provided for information only and are not considered standard.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.* For specific hazards statements, see 8.3 and 13.4.

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

A106/A106M Specification for Seamless Carbon Steel Pipe for High-Temperature Service

A179/A179M Specification for Seamless Cold-Drawn Low-Carbon Steel Heat-Exchanger and Condenser Tubes

A269 Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service

A335/A335M Specification for Seamless Ferritic Alloy-Steel Pipe for High-Temperature Service

D1066 Practice for Sampling Steam

D1129 Terminology Relating to Water

D1193 Specification for Reagent Water

D3648 Practices for the Measurement of Radioactivity

D3694 Practices for Preparation of Sample Containers and for Preservation of Organic Constituents

D3856 Guide for Management Systems in Laboratories Engaged in Analysis of Water (Withdrawn 2024)[3]

D4453 Practice for Handling of High Purity Water Samples

D4840 Guide for Sample Chain-of-Custody Procedures

D4841 Practice for Estimation of Holding Time for Water Samples Containing Organic and Inorganic Constituents

D5540 Practice for Flow Control and Temperature Control for On-Line Water Sampling and Analysis

2.2 *Other Standards and Codes:*

ASME Performance Test Code (PTC) 19.11 Steam and Water Sampling, Conditioning, and Analysis in the Power Cycle[4]

10 CFR 20 Standards for Protection Against Radiation[5]

[1] These practices are under the jurisdiction of ASTM Committee D19 on Water and are the direct responsibility of Subcommittee D19.03 on Sampling Water and Water-Formed Deposits, Analysis of Water for Power Generation and Process Use, On-Line Water Analysis, and Surveillance of Water

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at www.astm.org/contact. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] The last approved version of this historical standard is referenced on www.astm.org.

[4] Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Two Park Ave., New York, NY 10016-5990, http://www.asme.org.

[5] Available from U.S. Government Publishing Office (GPO), 732 N. Capitol St., NW, Washington, DC 20401, http://www.gpo.gov.

40 CFR 171–177 Subchapter C, "Hazardous Materials Regulations," of Chapter 1, "Research and Special Programs Administration, Department of Transportation"[5]

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms used in this standard, refer to Terminology D1129.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *back-pressure regulator, n*—a device designed to maintain a constant pressure upstream of itself (variable or fixed back pressure regulators are available) to maintain constant flow in analyzers in on-line sampling.

3.2.1.1 *Discussion*—Contemporary designs of back-pressure regulators provide excellent sensitivity to pressure variations. They require less space, have fewer maintenance problems, and reduce sample-contamination potential.

3.2.2 *composite sample, n*—a series of grab samples integrated into a single sample or a sample collected at specific time intervals and integrated into a single sample.

3.2.2.1 *Discussion*—The goal of a composite sample is to characterize a process-weighted average in proportion to process parameters.

3.2.3 *grab sample, n*—a single sample from a process stream (flowing) or from a source of confined-geometry (stagnant) withdrawn at a specific time.

3.2.3.1 *Discussion*—The goal of withdrawing a grab sample is to obtain a small portion of the process stream or confined geometry source in order to characterize the entire system.

3.2.4 *isokinetic sampling, n*—a condition wherein the sample entering the port (tip) of the sampling nozzle has the same velocity vector (velocity and direction) as the stream being sampled.

3.2.4.1 *Discussion*—Isokinetic sampling ensures a representative sample of dissolved chemicals, solids, particles, chemicals absorbed on solid particles, and in the case of saturated and wet steam, water droplets are extracted from a process stream.

3.2.5 *pressure reducer, n*—a device designed to reduce pressure, and therefore control flow, of sample to a pressure level where regulation is easily achieved.

3.2.5.1 *Discussion*—This device shall be located downstream of the cooled sample where cooling is required.

3.2.6 *sample cooler, n*—a small heat exchanger designed to provide primary or secondary cooling, or both, of sampling streams of water or steam.

3.2.7 *sampling, n*—the extraction of a representative portion of the steam or water flowing in the boiler drum lead or pipeline by means of a sampling nozzle and the delivery of this portion in a representative manner for analysis.

3.2.8 *variable rod in tube orifice, n*—for high pressure samples, a type of pressure reducer that uses a retractable tapered rod inside a reamed tube to provide a variable orifice for pressure reduction. The rods are parallel with the sample flow. This design eliminates wear of the orifice and provides variable pressure-reduction and flow.

3.2.9 *sample lag time, n*—the time between the sample entering the sampling nozzle to when it reaches the sample panel.

3.2.10 *magnetic trap, n*—a device used to separate and isolate magnetic particulates from the sample stream.

3.2.10.1 *Discussion*—Magnetic particulates, if present, can result in plugging of sample lines and damage to analyzers. Typically these devices are located after primary cooling or directly in front of on-line analytics.

4. Summary of Practices

4.1 These practices describe the apparatus, design concepts, and procedures to be used in extracting and transporting samples of liquid water. Sampling nozzle selection and application, line sizing, condensing requirements and optimization of flow rates are all described. These practices include three procedures for sample collection.

4.1.1 The first is for the collection of a grab sample of water at a specific site representing conditions only at the time of sampling. Grab sampling is the only procedure suitable for bacteriological analysis and some radiological test procedures.

4.1.2 The second practice is for collection of a composite sample at a specific site, portions of which are collected at varied time intervals. Alternatively, the composite may consist of portions collected at various sites or a combination of both site and time variables.

4.1.3 The third practice provides a continuously flowing sample from one or more sampling sites, suitable for on-line analyzers or for collecting grab samples from a continuously flowing sample stream.

5. Significance and Use

5.1 The goal of sampling is to obtain for analysis a portion of the main body of water that is representative. The most critical factors necessary to achieve this are points of sampling, and materials selection, system design, time of sampling, frequency of sampling, and proper procedures to maintain the integrity of the sample prior to analysis.

5.2 Homogeneity of the process to be sampled is frequently lacking, necessitating multiple-point sampling. If it is impractical to utilize a most-representative sampling point, it may be necessary to determine and understand interrelationships so that results obtained at a minimum number of points may be used to characterize the system.

5.3 Samples collected from a single point in a system are always recognized as being non-representative to some degree. For this reason, total representativeness of samples cannot be a prerequisite to the selection of a sampling point. The degree of representativeness of the sample shall be assessed and the assessment made a part of the permanent record. This will prevent an artificial degree of accuracy from being assigned to the data derived from tests on the sample.