Designation: D7607 – 11

StandardTest Method for Analysis of Oxygen in Gaseous Fuels (Electrochemical Sensor Method)[1]

This standard is issued under the fixed designation D7607; 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.

1. Scope

1.1 This test method is for the determination of oxygen (O_2) in gaseous fuels and fuel type gases. It is applicable to the measurement of oxygen in natural gas and other gaseous fuels. This method can be used to measure oxygen in helium, hydrogen, nitrogen, argon, carbon dioxide, mixed gases, process gases, and ambient air. The applicable range is 0.1 ppm(v) to 25% by volume.

1.2 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

1.3 *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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D4150 Terminology Relating to Gaseous Fuels

D5503 Practice for Natural Gas Sample-Handling and Conditioning Systems for Pipeline Instrumentation

3. Terminology

3.1 For general terminology see Terminology D4150.

3.2 *Definitions:*

3.2.1 *electrochemical sensor*—A chemical sensor that quantitatively measures an analyte by the electrical output produced by the sensor.

3.2.2 *span calibration*—The adjustment of the transmitter electronics to the sensor's signal output for a given oxygen standard.

3.2.3 *zero calibration*—The adjustment of the transmitter electronics to the sensor's signal output for a sample gas containing less than 0.1ppm(v) oxygen.

4. Summary of Test Method

4.1 Measurement of oxygen is accomplished by comparing the electrical signal produced by an unknown sample with that of a known standard using an oxygen specific electrochemical sensor. A gaseous sample at constant flow and temperature is passed over the electrochemical cell. Oxygen diffuses into the sensor and reacts chemically at the sensing electrode to produce an electrical current output proportional to the oxygen concentration in the gas phase. Experience has shown that the types of sensors supplied with equipment used in this standard typically have a linear response over the ranges of application which remains stable during the sensor's useful life. The analyzer consists of a sensor, a sample flow system, and the electronics to accurately determine the sensor signal.

5. Significance and Use

5.1 This test method is primarily used to monitor the concentration of oxygen in gases to verify gas quality for operational needs and contractual obligations. Oxygen content is a major factor influencing internal corrosion, fuel quality, gas quality, and user and operator safety.

6. Interferences

6.1 Interfering gases such as oxides of sulfur, oxides of nitrogen, and hydrogen sulfide can produce false readings and reduce the expected life of the sensor. Scrubbers are used to remove these compounds. Special sensors suitable for gas containing high fractions of carbon dioxide are available from manufacturers.

7. Apparatus

7.1 *Sensor*—The sealed sensor is contained in a housing constructed of stainless steel or other non-permeable material. The sensor contains a cathode and an anode in an electrolyte solution. A fluorocarbon membrane allows the oxygen from the

[1] This test method is under the jurisdiction of ASTM Committee D03 on Gaseous Fuels and is the direct responsibility of Subcommittee D03.12 on On-Line/At-Line Analysis of Gaseous Fuels.

Current edition approved June 1, 2011. Published July 2011. DOI: 10.1520/D7607-11.

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