Module: 4.4.8
LPG and Anhydrous Ammonia Liquid Metering Systems

Overview and Scope

This module sets standards for basic inspection and testing of Liquefied Petroleum Gas and Anhydrous Ammonia Metering Systems. The module is geared toward specific concepts related to device technology, operations, and specific inspection requirements and test procedures for these devices.

Prerequisites

4.1 Safety Considerations; 4.2 NIST Handbook 44 - Introduction to Device Control; 4.4 Dynamic Measuring Systems - General

Learning Objectives

1 Technologies Used in Liquefied Petroleum Gas (LPG) and Anhydrous Ammonia Liquid Metering Devices

A weights and measures professional should understand the technologies used in a typical LPG or Anhydrous Ammonia Metering System. To demonstrate this the inspector can:

1.1 Define common terms for LPG or Anhydrous Ammonia metering systems.

1.2 Describe the important physical and chemical characteristics of LPG liquid and Anhyrous Amonia, and identify important physical and chemical hazards involved in handling these products.

1.3 Describe the major components of a LPG or Anhydrous Ammonia measuring system from the storage tank(s) to the discharge nozzle.

1.4 Recognize typical measurement technologies used in LPG or Anhydrous Ammonia systems, such as positive displacement meters.

1.5 Recognize typical registration technologies used in LPG or Anhydrous Ammonia systems, such as mechanical registers and electronic registers.

1.6 Identify the metrological components of a measuring system (measuring element, pulser or signal generator, register, operator controls and printer).

1.7 Describe built in safety components in a LPG or Anhydrous Ammonia measuring system.

1.8 Restate that these systems may be made up of measuring elements/modules and indicator elements/modules.

1.9 Recognize that system performance will vary with the rate of flow (linearity), product composition and flow properties, influences such as temperature, supply voltage, etc, and disturbances such as product vaporization, EMI/RFI, etc.

2 System Markings and Operations

A weights and measures professional should understand the various marking requirements applicable to a LPG or Anhydrous Ammonia measuring system and demonstrate ability to operate a measuring system. To demonstrate this the inspector can:

2.1 Recognize and interpret required identification markings on a LPG or Anhydrous Ammonia measuring element.

2.2 Recognize and interpret required markings on the controls, indications and features of a LPG or Anhydrous Ammonia measuring system.

2.3 Operate the following functions/operations on a measuring system.

2.3.1 Zero reset.

2.3.2 Activation controls to start flow.

2.3.3 Flow control valves (in line, at nozzle or outlet).

2.3.4 Activation/deactivation of automatic temperature compensator for mechanical systems, or alternatively, use of system controls to obtain both net and gross volume indications for electronic systems.

2.4 Recognize and interpret the measurement information displayed on a mechanical register.

2.5 Recognize and interpret the measurement information displayed on an electronic register.

3 Technical Requirements

A weights and measures professional should understand the various technical requirements applicable to a LPG or Anhydrous Ammonia measuring system. To demonstrate this the inspector can:

3.1 Apply the rules regarding the following measuring system features/indications and identify where to find the rule in HB44.

3.1.1 Marking Requirements.

3.1.2 Value of minimum increment of volume and price indications.

3.1.3 Return to proper zero indication on reset.

3.1.4 Maximum and minimum flow rates for the system.

3.1.5 Flow control and check valves.

3.1.6 Discharge lines and valves.

3.1.7 Maximum and minimum indications of delivery.

3.1.8 Agreement of indications within a system, both mechanical and electronic.

3.1.9 Mathematical agreement on computing devices - mechanical or electronic.

3.1.10 Unit price display and changes to unit price.

3.1.11 Vapor elimination devices.

3.1.12 Categories of sealing, appropriate seals and audit trails.

4 User Requirements

A weights and measures professional should understand the various user requirements applicable to a LPG or Anhydrous Ammonia measuring system. To demonstrate this the inspector can:

4.1 Assess whether device is installed correctly.

4.2 Assess suitability of the piping, discharge hose and nozzle.

4.3 Assess whether the device is being used correctly.

4.4 Assess whether the device is being properly maintained.

5 Basic Test Procedures

A weights and measures professional should be able to apply the appropriate performance tests to a LPG or Anhydrous Ammonia measuring system and evaluate compliance with the applicable tolerances and performance standards. To demonstrate this the inspector can:

5.1 Determine the appropriate Accuracy Class for the LPG or Anhydrous Ammonia measuring system.

5.2 Determine minimum test drafts required for testing a given LPG or Anhydrous Ammonia measuring system.

5.3 Select appropriate test measures to conduct tests, use them correctly, and care for them when not in use. Use includes making connections of all hoses to the system under test correctly to ensure tests are conducted accurately.

5.4 Explain the difference between normal and special tests, or other performance tests.

5.5 Select appropriate test drafts for normal tests of a given measuring system, perform the appropriate normal tests, and evaluate the test results for compliance with applicable tolerances.

5.6 Select appropriate test drafts for special tests for a given measuring system, perform the appropriate special tests, and evaluate the test results for compliance with applicable tolerances.

5.7 Select appropriate test drafts and flow rates for a Repeatability Test for a given measuring system, perform the test, and evaluate the test results for compliance with applicable tolerances and agreement requirements.

5.8 Conduct appropriate performance tests to evaluate that regulated devices within the system are working correctly and are functioning within tolerance (check valves, prepay purchases, zero reset, mathematical agreement, etc).

Contributors:

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