Module 4.4.4

Vehicle-Tank Meter Systems

Overview and Scope

This module sets standards for basic inspection and testing of Vehicle Tank Meter Systems (VTM). 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 Vehicle Tank Metering Devices

A weights and measures professional should understand the technologies used in a typical Vehicle Tank Meter System (VTM). To demonstrate this understanding the professional can:

1.1 Define common VTM terms.

1.2 Describe the different types of VTM systems (gravity-discharge vs pump-discharge, multiple vs single compartment, etc).

1.3 Describe the major components of a VTM from the storage tank(s) to the discharge nozzle.

1.4 Recognize typical measurement technologies used in VTM systems, such as positive displacement meters.

1.5 Recognize typical registration technologies used in VTM 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 VTM.

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 properties, influences such as temperature, supply voltage, etc, and distrubances such as entrapped vapor or air, EMI/RFI, etc.

2 System Markings and Operations

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

2.1 Recognize and interpret required identification markings on a VTM system or element.

2.2 Recognize and interpret required markings on the controls, indications and features of a VTM.

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).

2.4 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 VTM. To demonstrate this understanding the professional 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 for either gravity-discharge or pump-discharge systems.

3.1.6 Discharge lines and valves for either gravity-discharge or pump-discharge systems.

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 for pump-discharge systems.

3.1.12 Automatic vacuum breaker for gravity-discharge systems.

3.1.13 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 VTM system. To demonstrate this understanding the professional can:

4.1 Assess whether device is installed correctly.

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

4.3 Assess whether a device is being used correctly.

4.4 Assess whether the device is being properly maintained (electrical issues, leaks, etc.).

5 Basic Test Procedures

A weights and measures professional should be able to apply the appropriate performance tests to a VTM system and evaluate compliance with the applicable tolerances and performance standards. To demonstrate this understanding the professional can:

5.1 Determine the appropriate Accuracy Class for the VTM.

5.2 Determine minimum test drafts required for testing a given VTM system.

5.3 Select appropriate test measures to conduct tests, use them correctly, and care for them when not in use.

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

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

5.9 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).

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