Module: 8.5
Vehicle-Tank Meters (Registered Service Agents)

Overview and Scope

This module outlines the learning objectives registered servicepersons must understand and apply to successfully perform their duties in placing in service, repairing, and calibrating Vehicle-Tank Meters (VTM). The module focuses on specific concepts related to device technology, operations, specific inspection requirements, and test procedures for these devices found in NIST Handbook 44 General Code and Vehicle Tank Meters, NIST Examination Procedure Outline 23, and NTEP Certificates of Conformance.

Prerequisites

Module 8.1 - NIST Handbook 44 and NIST Handbook 130 – Basic (Registered Servicepersons)

Learning Objectives

1 Technologies, Terminology and Basic NIST Handbook 44 Requirements

A registered serviceperson should understand the technologies used in a typical vehicle tank meter (VTM). The serviceperson should understand terminology and NIST Handbook 44 General Code and Fundamental Considerations. To demonstrate this the serviceperson 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 disturbances such as entrapped vapor or air, EMI/RFI, etc.

1.10 Recognize and apply NIST Handbook 44, General Code requirements.

1.11 Recognize and apply NIST Handbook 44, Fundamental Considerations.

2 System Markings and Operations

A registered serviceperson should understand the various marking requirements applicable to a measuring system and demonstrate the ability to operate a measuring system. To demonstrate this the registered serviceperson 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 Recognize 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.

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.

2.6 Demonstrate ability to estimate the actual flow rate of a system using the system indications.

3 Technical Requirements

A registered serviceperson should understand the various technical requirements applicable to a VTM. To demonstrate this the serviceperson can:

3.1 Apply the rules regarding the following measuring system features/indications and identify where to find the rule in Handbook 44.

3.1.1 Marking Requirements.

3.1.2 Size 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 wet hose systems.

3.1.6 Discharge lines and valves.

3.1.7 Maximum and minimum indications of delivery or price.

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

3.1.9 Vapor elimination devices for pump-discharge systems.

3.1.10 Categories of sealing, appropriate seals and audit trails.

3.1.11 Recorded representations and receipts.

4 User Requirements

A registered serviceperson should understand the user requirements applicable to a vehicle-tank meter system. To demonstrate this the serviceperson can:

4.1 Apply NIST Handbook 44, UR.1. Installation Requirements.
4.2 Apply NIST Handbook 44, UR.2. Use Requirements.
4.3 Apply NIST Handbook 44, UR.3. Maintenance Requirements.

5 Basic Test Procedures

A registered serviceperson should be able to use Handbook 44, NIST Examination Procedure Outline (EPO) 23 and NTEP Certificates of Conformance to conduct the appropriate performance tests and evaluate compliance of VTMs with applicable tolerances and performance standards. To demonstrate this the serviceperson can:

5.1 Determine the appropriate accuracy class for the VTM.
5.2 Determine minimum test drafts required for testing a VTM system.
5.3 Select appropriate test measures or provers to conduct tests, use them correctly, and care for them when not in use.
5.4 Explain the difference between normal, special, and other performance tests.
5.5 Select appropriate test drafts for normal tests of a 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 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 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 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 (anti-drain valves, product depletion, zero reset, etc.).
5.10 Apply the information found in an NTEP Certificate of Conformance.
5.11 Recognize and apply procedures in NIST EPO 23 including safety notes and reminders.

Contributors:

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