



## Module 4.4.1

### Retail Motor Fuel Dispensers

#### Overview and Scope

This module sets standards for basic inspection and testing of Retail Motor Fuel Dispensers. 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 Retail Motor Fuel Devices

A weights and measures inspector should understand the technologies used in a typical Retail Motor Fuel Device (RMFD). To demonstrate this understanding the inspector can:

- 1.1 Define common RMFD terms such as motor fuel, motor fuel device, retail device, etc.
- 1.2 Describe the different types of RMFD systems (dispensers vs pumps, above ground vs below ground storage, blenders, vs single product systems, etc).
- 1.3 Describe the major components of a RMFD.
- 1.4 Recognize typical measurement technologies used in RMFD systems, such as positive displacement meters.
- 1.5 Recognize typical registration technologies used in these 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 the function and types of vapor recovery systems.
- 1.8 Describe built in safety components in a RMFD.
- 1.9 Restate that these systems may be made up of measuring elements/modules and indicator elements/modules.
- 1.10 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.

## 2 System Markings and Operations

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

- 2.1 Recognize and interpret required identification markings on a RMFD system or element.
- 2.2 Recognize and interpret required markings on the controls, indications and features of a RMFD.
- 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 (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 inspector should understand the various technical requirements applicable to a RMFD. To demonstrate this understanding 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 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 with both above ground and below ground storage.
  - 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.
  - 3.1.10 Mathematical agreement on computing devices - electronic.
  - 3.1.11 Unit price display and changes to unit price.
  - 3.1.12 Vapor elimination devices for dispensers and pumps.
  - 3.1.13 Categories of Sealing, appropriate seals and audit trails.

## 4 User Requirements

A weights and measures inspector should understand the various user requirements applicable to a RMFD system. To demonstrate this understanding the inspector can:

- 4.1 Assess whether device is installed correctly.
- 4.2 Assess suitability of the 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 inspector should be able to apply the appropriate performance tests to a RMFD system and evaluate compliance with the applicable tolerances and performance standards. To demonstrate this understanding the inspector can:

- 5.1 Determine the appropriate Accuracy Class for the RMFD.
- 5.2 Determine minimum test drafts required for testing a given RMFD system.
- 5.3 Select appropriate test measures to conduct tests, use them correctly, and care for them when not in use.
- 5.4 Understand the difference between normal and special tests.
- 5.5 Describe the different test procedures used for single-product or for blend-product dispensers.
- 5.6 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.
- 5.7 Select appropriate test drafts and flow rates for a (Normal) 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 for special tests for a given measuring system, perform the appropriate special tests, and evaluate the test results for compliance with applicable tolerances.
- 5.9 Conduct appropriate performance tests to evaluate that required devices within the system are working correctly and are functioning within tolerance (air elimination, check valves, prepay purchases, zero reset, mathematical agreement, etc).

### **Contributors:**

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