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Split Compartment Test for Vehicle Tank Meters

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As fall and winter approach more vehicle tank meters (VTMs) will be in use across the U.S. delivering products such as home heating fuels. To ensure that the metering system and its associated equipment are operating accurately, the testing of a VTM must include, in addition to basic accuracy tests, a special test called the split compartment test. This article provides information on how to perform the split compartment test on VTMs.

Because most designs of meters used on VTMs cannot differentiate between product and air or vapor passing through the measuring chamber, it is crucial that a VTM be equipped with an effective means for eliminating air and vapor from the system (as required by NIST Handbook 44 VTM Code, Paragraph S.2.1.). Most VTMs are equipped with a device called an air eliminator, which vents air and vapor away from the meter so that the meter registers fuel and not air or vapor. This helps to ensure that the customer is not paying for air and vapor. While conventional air eliminators are not effective at eliminating air that is entrained in the product, they can effectively eliminate air that enters the VTM system through the tank, a common source (though not the only source) of air in the system.

The split compartment test examines the capability of the system to prevent air and vapor from entering the meter by testing the device under the most demanding circumstance when this might occur; this is, when the fuel supply is exhausted and air floods the intake lines. Such a condition would occur in commercial use when a tank compartment is emptied while a delivery is in progress.

Multi-Compartment Tanks

1. Start the test with an amount of product equal to less than one-half the nominal capacity of the prover in the largest compartment.
2. Begin delivery to the prover, drawing product from the largest compartment. Because of the extended drain times from the largest compartment, drawing from the largest compartment provides a more rigorous test of the system and its capability to prevent the registration of air or vapor.
3. Dispense the product from the tank into the prover at the system's full flow rate.
4. When the supply of product is exhausted, the air eliminator should close the intake to the meter to prevent registration of air, and the register should stop and hold its indications.
5. If the register does not stop and hold the indications, some air or vapor is leaking through the shut-off valve into the meter.
6. Next, the pump is left engaged while the manifold valve to the empty compartment is closed and the valve to a compartment containing a sufficient amount of the same product

to complete the draft is opened. (Note that the mechanism for switching compartments may vary according to the design of the system.)

7. To complete the test, the delivery is continued until the register indicates the nominal capacity of the prover, and the error is recorded.

Single-Compartment Tanks

1. Start the test with an amount of product equal to less than one-half the nominal capacity of the prover in the tank.
2. Follow steps 3 – 5 above.
3. Next, additional product must be added to the tank. This additional product may be supplied from another truck or from a terminal.
4. If no source of additional product supply is available at the operator's location, you must arrange to perform this test (at least) at a distribution site or elsewhere.
5. Sufficient product must be added with the pump disengaged if the system is power operated. This will interrupt the delivery, but this is what will happen in commercial use. In commercial use, the delivery would be discontinued and the single compartment truck would be driven back to the terminal to be refilled.
6. When the tank is refilled, allow sufficient time for the product to settle (particularly if it is susceptible to foaming), but keep in mind the possible effects of temperature and evaporation of the product already in the prover. Keep the rest period to a minimum.
8. To complete the test, the delivery is resumed without resetting the meter and continued until the register indicates the nominal capacity of the prover, and the error is recorded.

Tolerances to Apply

Even a system that is properly designed, installed and maintained may permit a small amount of air and or vapor to pass through the meter; therefore, the more liberal special tolerance applies to the results of the split compartment test. NIST Handbook Section 3.31, Paragraph T.2. Table 1 permits a special test tolerance of ± 0.45 % for meters delivering petroleum products.

Note that the NCWM Specifications and Tolerances Committee is presently considering changes to the requirements for conducting a split compartment test. A "restructuring" of the tolerances applied to the results of the split compartment test is being considered.

As a general rule, the greater the difference between the results obtained for the normal test and the split compartment test of a vehicle tank metering system, the stronger the indication that the air eliminator is not functioning properly and is in need of repair.

It is important that the split compartment test be included as part of a complete test of the VTM system to verify that the air eliminator is functioning properly and to ensure that customers are not being charged for air and vapor.