California Environmental Protection Agency

Air Resources Board

Vapor Recovery Test Procedure

TP - 201.6

DETERMINATION OF LIQUID REMOVAL OF PHASE II VAPOR RECOVERY SYSTEMS OF DISPENSING FACILITIES

Adopted: April 12, 1996
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1 APPLICABILITY

A set of definitions common to all certification and test procedures is in:

D-200 Definitions for Certification Procedures and Test Procedures for Vapor Recovery Systems

For the purpose of this procedure, the term "ARB" refers to the State of California Air Resources Board, and the term "ARB Executive Officer" refers to the Executive Officer of the ARB or his or her authorized representative or designate.

This procedure is used to quantify the removal of liquid gasoline from the vapor passage of coaxial hoses equipped with a liquid removal device. It is applicable in all cases where a liquid removal system is required in conjunction with a Phase II balance system. This test procedure is explicitly not applicable to vapor assist type systems.

2 PRINCIPLE AND SUMMARY OF TEST PROCEDURE

All gasoline is drained from the dispenser hose's vapor passage and a measured amount of liquid gasoline, usually 150 ml, is then introduced into the vapor passage. After ten gallons of gasoline are dispensed the liquid remaining in the hose is measured and the amount removed determined by subtraction with consideration of liquid which may adhere to the hose wall or be lost by evaporation.

3 BIASES AND INTERFERENCES

Pouring 150 ml of fuel into the vapor passage may cause some nozzles to shut off prematurely. This can be usually overcome by using a smaller volume.

Allowing insufficient time for liquid to drain from the hose can cause errors in

measurement of the volume drained.

4 SENSITIVITY, RANGE, AND PRECISION

Range of measurement of liquid removal is approximately from 0 to 15 ml removed per gallon dispensed; upper range depends on volume of gasoline lost due to evaporation and surface adhesion to the hose wall and on the ability of the nozzle to function without premature shutoff with 150 ml of gasoline in the vapor passage.

5 EQUIPMENT

5.1 Stopwatch

Use a stopwatch accurate to within 0.2 seconds.

5.2 Graduated Cylinder

Use a shatterproof 250 milliliter cylinder which is compatible for use with gasoline.

6 CALIBRATION PROCEDURE

This section is reserved for future specification.

7 PRE-TEST PROTOCOL

7.1 Test, Challenge, and Failure Modes for Certification Testing

The specification of test, challenge, and failure modes such as the number of liquid transfer episodes, volume and volumetric rate of liquid transfer, storage tank volumes, etc. shall be done according to the principles of CP-201 § 5 for the testing and evaluation of vapor recovery equipment. The facility and system shall be prepared to operate according to any specified test, challenge, and failure modes.

7.2 System and Facility Preparation

System equipment and components shall be completely operational and, at newly constructed facilities, any storage tanks involved in the test shall have been initially filled to the appropriate volume a minimum of 24 hours prior to the scheduled test.

7.3 Specific Pre-Test Protocol Items

(1) Use a stopwatch to accurately measure the gasoline dispensing rates at

high, medium, and low nozzle hold-open clip settings with no other refueling activity occurring at the facility. At least one gallon shall be dispensed before timing the dispensing rate. For those nozzles without hold-open latches, use wedges to simulate the three latch positions. Record this data. Alternatively, dispensing rate may be determined simultaneously with liquid removal as provided for in Section 8 below.

(2) Use the graduated cylinder to pour 150 milliliters of gasoline into the vapor passage of the hose.

(3) Completely drain the gasoline from the vapor passage back into the graduated cylinder.

NOTE: The intent of these last two steps is to ensure that the vapor passage surfaces are pre-wetted with liquid gasoline to limit errors due to liquid lost by adhesion to these surfaces in subsequent measurements.

8 TEST PROCEDURE

(1) Use the graduated cylinder to pour 150 milliliters of gasoline into the vapor passage of the hose.

(2) Using the high hold-open clip setting, dispense 10.0 ±0.10 gallons into the vehicle gas tank with no other refueling activity occurring at the facility, measuring the dispensing time with the stopwatch if the dispensing rate was not previously established. Record the exact volume (and dispensing time if measured). If premature nozzle shutoff occurs after pouring 150 ml of gasoline into the vapor passage, then reduce the amount of gasoline poured into the vapor passage progressively in 25 ml increments to identify the largest volume which does not have this effect. Repeat all steps above and this step, adding the amount of gasoline thus established instead of 150 ml, and dispensing a proportionally lesser amount of fuel (i.e. (10.0 x liquidVolume/150ml)±0.10 gallons).

(3) Carefully drain any gasoline present in the vapor passage of the hose into the graduated cylinder. Record this quantity. If compliance is demonstrated at a high flow rate, testing at lower flow rates is not required unless specified by the ARB Executive Order applicable to the specific type of vapor recovery system or an applicable regulation.

(4) If necessary, repeat appropriate steps with the hold-open clip in both the medium and low positions. Record this data. If performance meets specified requirements of the ARB Executive Order applicable to the specific type of vapor recovery system or an applicable regulation at any of the three flow rates (high, medium or low hold-open clip settings), then compliance of the system shall be considered to be demonstrated. In the absence of other quantitative requirements the requirements of CP-201, section 4.2.6.1 shall

apply if a system is determined by the Executive Officer of the ARB to be subject to performance specifications for liquid removal devices.

(5) Use the graduated cylinder to pour the same amount of gasoline into the vapor passage of the hose. Dispense no gasoline.

(6) Completely drain the gasoline from the vapor passage back into the graduated cylinder. Subtract this quantity from the volume added. This value represents the volume of gasoline lost due to evaporation in transfer to and from the graduated cylinder and adhesion of liquid to vapor passage surfaces in previous measurements.

9 QUALITY ASSURANCE / QUALITY CONTROL (QA/QC)

This section is reserved for future specification.

10 RECORDING DATA

Record data on a form similar to the one shown in Figure 1.

11 CALCULATING RESULTS

The volume of liquid gasoline removed from the hose vapor passage per gallon of gasoline dispensed is calculated as follows:

$$VR = \frac{(VI - VW) - VF}{G}$$

where:

VR	=	Gasoline removed per gallon dispensed, milliliters/gallon
VI	=	Total initial volume poured into hose vapor passage, milliliters
VW	=	The liquid lost due to wall adhesion and evaporation, milliliters
VF	=	The volume of gasoline remaining in the hose vapor passage after dispensing, milliliters
G	=	The total gallons dispensed, gallons

12 REPORTING RESULTS

This section is reserved for future specification.

13 ALTERNATIVE TEST PROCEDURES

Test procedures, other than specified above, shall only be used if prior written approval is obtained from the ARB Executive Officer. In order to secure the ARB Executive Officer's approval of an alternative test procedure, the applicant is responsible for demonstrating to the ARB Executive Officer's satisfaction that the alternative test procedure is equivalent to this test procedure.

(1) Such approval shall be granted on a case-by-case basis only. Because of the evolving nature of technology and procedures for vapor recovery systems, such approval shall not be granted in subsequent cases without a new request for approval and a new demonstration of equivalency.

(2) Documentation of any such approvals, demonstrations, and approvals shall be maintained in the ARB Executive Officer's files and shall be made available upon request.

14 REFERENCES

This section is reserved for future specification.

15 FIGURES

Figure 1. Field Data Form

Figure 1. Field Data Form

Facility Name & Address_____
Inspector_____ Date_____
Vapor Recovery System Type_____
Applicable Air Resources Board Executive Order # _____

Pump Number	Gasoline Grade	(VI) Liquid Gasoline Added, ml	(G) Gallons Dispensed	(T) Time to Dispense, Seconds	60(G)/(T) Dispensing Rate, GPM	(VF) Liquid Gasoline Remaining, ml	(VW) Liquid Gasoline Lost With No Dispensing	(VI+VW-VF)/G Removal Rate, ml/gallon