

California Environmental Protection Agency



Vapor Recovery Test Procedure

Proposed TP-201.2D

**Determination of
Onboard Refueling Vapor Recovery (ORVR) Compatibility of
Phase II Vapor Recovery Systems of
Dispensing Facilities**

Adopted: [Date of Adoption]

Note: All text is new text proposed for adoption.

Adopt Vapor Recovery Test Procedure to read:

**California Environmental Protection Agency
Air Resources Board**

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Onboard Refueling Vapor Recovery (ORVR) Compatibility of
Phase II Vapor Recovery Systems of
Dispensing Facilities**

1 APPLICABILITY

Definitions common to all certification and test procedures are 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.

The procedure can be used for the determination of ORVR compatibility of Phase II vapor recovery systems of dispensing facilities. This procedure is to be used in conjunction with any of the applicable test procedures cited in CP-201, especially TP-201.2.

This procedure shall be applied to new certifications or modifications to existing certifications only.

2 PRINCIPLE AND SUMMARY OF TEST PROCEDURE

For the purposes of this test procedure, there are two strategies by which Phase II systems can maintain high control efficiencies and achieve ORVR compatibility: 1) inhibiting forced ingestion of air into the underground storage tank (UST), and 2) managing UST pressure. An example of the first approach is shutting off the Phase II system's vacuum assist pump when refueling ORVR vehicles. Examples of the second approach are routing excess vapors to an incinerator or controlling pressure using membrane technology.

Properly functioning balance systems with P/V valves, by their physical nature, passively succeed at the first strategy. Vacuum assist systems, however, must demonstrate compatibility as specified in Section 2.1 or 2.2, depending on the design of the system. Some systems may be subject to both types of demonstration described below, depending upon the means employed by the manufacturer to achieve ORVR compatibility.

2.1 Control Forced Air Ingestion

To demonstrate control of forced ingestion of air into the UST:

Intersperse ten ORVR vehicle refuelings with regular vehicle refuelings using manufacturer completed ORVR vehicles. Measure the dispensed gasoline volume and the air pumped into the UST when refueling ORVR vehicles. The volume of air ingested shall not exceed one-half of the volume of gasoline dispensed. A continuous performance test of at least 90 days and an efficiency test, as specified in TP-201.2, will be required. An exception to this requirement will be considered for modifications to currently certified systems, provided that they do not affect the system as previously certified.

2.2 Control UST Emissions

To demonstrate control of emissions from the UST:

Simulate ORVR refuelings at levels up to and including 100% ORVR and measure the dispensed gasoline volume. Vent and/or processor emissions must be less than 0.42 pounds per thousand gallons (0.42#/E3G). A continuous performance test of at least 90 days and an efficiency test, as specified in TP-201.2, will be required. An exception to this requirement will be considered for modifications to currently certified systems, provided that they do not affect the system as previously certified.

3 BIASES AND INTERFERENCES

This section is reserved for future use.

4 SENSITIVITY, RANGE, AND PRECISION

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5 EQUIPMENT

Use equipment as specified in TP-201.2.

6 CALIBRATION PROCEDURE

As specified in TP-201.2.

7 PRE-TEST PROTOCOL

- 7.1 This test procedure should be conducted during the continuous performance test for the system.
- 7.2 Inspect all the vapor recovery equipment that shall be used in the test. Verify that the equipment is in good working order, is free from tears, slits, leaks or any other defects which would substantially impair the effectiveness of the system, as specified in Section 94006, Title 17 of the California Code of Regulations.
- 7.3 Assemble equipment as required by TP-201.2. If the system has a P/V valve, use a sleeve to quantify the actual emissions at the vent (see TP-201.2, Section 5.1.3).
- 7.4 ARB will specify the vehicle test matrix using the approach specified in TP-201.2A.

8 TEST PROCEDURE

Monitor and record UST pressure and vent and/or processor emissions, 24 hours a day, throughout the test period. If the test period for this procedure is less than 24 hours, continue monitoring and recording until 24 hours has elapsed from the start of the test period for this procedure.

8.1 Testing Control of Forced Ingestion of Air into the UST

This approach is not appropriate for vapor recovery systems with a central vacuum pump serving all dispensers.

Conduct refuelings of ORVR and non-ORVR vehicles according to the following procedures. Although the example given is for alternating ORVR and non-ORVR vehicles, it is not the only test mode allowed. Other sequences, with multiple successive ORVR or non-ORVR vehicles may be used, in order to include combinations which place the highest demand on the system, based on an engineering evaluation of the system design.

- 8.1.1 Bring an ORVR vehicle into position for refueling. The type of ORVR system shall be specified from a matrix representative of the on-road ORVR population to ensure that the ORVR systems tested reflect the current vehicle fleet. Purge canisters before each use.
- 8.1.2 Refuel the vehicle with a minimum volume of 7.5 gallons of gasoline. The refueling rate shall be 4 to 10 gallons per minute, with an initial target rate of 7.5

gallons per minute. Other rates may be used as indicated by engineering evaluation.

- 8.1.2.1 At Test Point 2 of TP-201.2, measure and record the volume of air/HC mixture pumped into the UST during refueling.
- 8.1.2.2 Using the dispenser display, measure and record the volume of gasoline pumped into the vehicle tank during refueling.
- 8.1.3 Bring a non-ORVR vehicle into position for refueling.
- 8.1.4 Refuel the vehicle with a minimum volume of 7.5 gallons of gasoline. The refueling rate shall be 4 to 10 gallons per minute, with an initial target rate of 7.5 gallons per minute. Other rates may be used as indicated by engineering evaluation.
- 8.1.5 Repeat this series of procedures, starting with Section 8.1.1, until at least ten ORVR vehicle refuelings have occurred.

8.2 Testing Control of Emissions from the UST

This approach shall be used for vapor recovery systems with a central vacuum processor serving many dispensers or for other vapor recovery systems which control the UST pressure in such a manner as to prevent emissions from the UST in compliance with performance standards and performance specifications.

The applicant shall submit a test program proposal to represent various levels of ORVR penetration, including a worst-case scenario designed to maximize potential emissions.

Conduct refuelings of ORVR vehicles according to the following procedures. Initially, simultaneous testing shall occur with one ORVR refueling at each dispenser.

- 8.2.1 Bring an ORVR vehicle into position for refueling. The type of ORVR system shall be specified from a matrix representative of the on-road ORVR population to ensure that the ORVR systems tested reflect the current vehicle fleet. Provisions shall be taken to adequately purge ORVR canisters before each use.

Conduct refuelings of ORVR and non-ORVR vehicles according to the following procedures, alternating ORVR and non-ORVR vehicles in order to include combinations which place the highest demand on the system, based on an engineering evaluation of the system design.

- 8.2.2 Refuel the vehicle with a minimum volume of 7.5 gallons of gasoline. The

refueling rate shall be 4 to 10 gallons per minute, with an initial target rate of 7.5 gallons per minute. Other rates may be used as indicated by engineering evaluation.

- 8.2.2.1 Measure and record the volume of gasoline pumped into the vehicle tank during refueling.
- 8.2.3 Repeat this series of procedures, starting with Section 8.2.1, until at least twenty ORVR vehicle refuelings have occurred.
- 8.3 It may not be possible to simulate the worst-case load on a processor, such as a burner or membrane processor, using only manufacturer completed vehicles. Therefore, in some cases, air shall be introduced into the system in quantities which simulate the air ingested in a very busy station where most of the vehicles are ORVR. The calculations in Section 11.2 shall be interpreted as allowing this type of test.

9 QUALITY ASSURANCE / QUALITY CONTROL (QA/QC)

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10 RECORDING DATA

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11 CALCULATING RESULTS

Note: In addition to other required calculations, vapor recovery system test results shall be calculated in units of pounds of hydrocarbon emitted per thousand gallons of fuel transferred for any results which are expressible in such units.

See TP-201.2 for additional guidance on calculations.

11.1 Calculating Forced Ingestion of Air into the UST

For the ORVR refuelings, calculate the total volume of air pumped into the UST divided by the total volume of gasoline pumped into the vehicle tanks. If the volume of air (in the air and HC mixture) pumped into the UST exceeds one-half of the volume of gasoline pumped into the vehicle tanks, ***the system has failed TP-201.2D***. If the volume of air (in the air and HC mixture) pumped into the UST is equal to or less than one-half of the volume of gasoline pumped into the vehicle tanks, ***the system has passed TP-201.2D***.

11.2 Calculating Emissions from the UST

For all of the ORVR refuelings, calculate the total mass of hydrocarbon emitted from the UST divided by the total volume of gasoline dispensed. If the cumulative vent and/or processor emissions divided by the gallons dispensed for this refueling series exceeds 0.42 pounds of hydrocarbon emitted per thousand gallons of gasoline dispensed, ***the system has failed TP-201.2D***. If the cumulative vent and/or processor emissions divided by the gallons dispensed for this refueling series is equal to or less than 0.42 pounds of hydrocarbon emitted per thousand gallons of gasoline dispensed, ***the system has passed TP-201.2D***.

12 REPORTING RESULTS

Note: In addition to other required results, vapor recovery system test results shall be reported in units of pounds of hydrocarbon emitted per thousand gallons of fuel transferred for any results which are expressible in such units.

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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 and demonstrations 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 use.

15 EXAMPLE FIGURES AND FORMS

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