California Environmental Protection Agency

Air Resources Board

Proposed for Adoption

Vapor Recovery Test Procedure

TP-206.1

Determination of Emission Factor for Standing Loss Control Vapor Recovery Systems Using Temperature Attenuation Factor at Gasoline Dispensing Facilities with Aboveground Storage Tanks

Adopted: [insert adoption date]

[Note: All text is proposed for adoption. As permitted by Title 2, California Code of Regulation, section 8, for ease of review underline to indicate adoption has been omitted]

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1. APPLICABILITY

Definitions common to all certification and test procedures are in:

D-200 Definitions for Vapor Recovery Procedures

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

1.1 This test procedure is used to determine the emission factor for Standing Loss Control vapor recovery systems installed at gasoline dispensing facilities (GDF) with aboveground storage tanks (AST) from the daily ratio of fuel surface temperature range to ambient temperature range.

2. PRINCIPLE AND SUMMARY OF TEST PROCEDURE

2.1 The AST shall be equipped with a thermocouple capable of floating on the fuel surface. An additional thermocouple or temperature probe shall be installed outside the tank and in the shade to measure ambient temperature. The system shall be continuously monitored at one minute intervals for a minimum of 30 days. The test period shall include a minimum of seven days when the maximum daily ambient temperature is between 90°F and 105°F. Daily maximum and minimum fuel surface and ambient temperatures shall be used to determine the fuel surface and ambient temperature ranges (difference between daily minimum and maximum). The ratio of these temperature ranges produces the Temperature Attenuation Factor, or A_f. The temperature attenuation factor is then used to calculate the emission factor. The test shall be conducted after proper installation of P/V valves and other components to maintain pressure integrity.

3. RANGE

3.1 The full-scale range of the thermocouples shall be 0.0-150.0°F with a minimum accuracy of ±2.0 °F.

4. INTERFERENCES

4.1 Other Phase I and Phase II certification and test procedures and fuel transfers (Phase I and II) may bias the results of this test. During the performance of other certification and test procedures, fuel surface temperatures will be invalidated for the 24 hour period following the running of these other procedures. Invalidated 24-hour periods will not be considered part of the minimum 30 day test duration.

4.2 All Standing Loss Control vapor recovery components that are part of the system shall be in place and operating properly during the collection of fuel surface and ambient temperature data. If any part of the vapor recovery system is not operating properly, fuel surface temperature data shall be invalidated for each 24-hour period that the system is in non-compliance with the certification and test procedures.

4.3 Thermocouples and temperature probes shall not be placed in direct sunlight as this may bias the results. Ambient temperature probes shall be shaded using a solar radiation shield to minimize the effects of solar and terrestrial radiation and provide accurate measurements.

5. APPARATUS

5.1 Thermocouples, temperature probes and associated wiring

Thermocouples will be fixed on floats attached to stainless steel guide rods that float on top of the fuel surface in each tank to be tested to measure fuel surface temperature (Figure 1). An additional thermocouple or temperature probe will be collocated with the test tank to measure ambient air temperature; this thermocouple or temperature probe shall be equipped with a radiation shield to prevent bias from direct sunlight. Associated wiring shall be used to connect the thermocouples and/or temperature probes to the data logger. All wiring and components used for testing will be intrinsically safe.

5.2 Data Logger

A data logger capable of recording continuous (minimum one-second interval) and storing (minimum one-minute average) temperature data will be attached to the thermocouples and temperature probes. Thermocouple and temperature probe compatibility with the data logger shall be established prior to the beginning of the test.

5.3 Leak Detection Solution

Any liquid solution designed to detect vapor leaks may be used to verify the pressure integrity of system components during this test.

6. PRE-TEST PROCEDURES

6.1 Thermocouples shall be calibrated with the data logger in accordance with the manufacturer's instructions. Calibrations a NIST standard or transfer standard traceable to National Institute of Standards and Technology (NIST) is required.

6.2 After the thermocouples and temperature probes are installed, TP-206.3 shall be conducted to verify the system complies with the static pressure decay test procedures. No fuel surface temperature data will be valid without the system successfully passing the requirements of TP-206.3.

6.3 The tank shall be filled to 50% of the total ullage through the top or side mounted product adaptor using a camlock fitting.

6.4 The test shall be conducted with the facility in normal operating mode, but without any dispensing. This includes all nozzles properly hung up in the dispenser boots and all dispenser cabinet covers in place.

6.5 When other certification and test procedures are run to evaluate the vapor recovery system, fuel surface temperature data shall be invalidated for the 24-hour period immediately after these tests.

6.6 No deliveries or dispensing shall be allowed during the minimum 30-day testing duration. If a delivery occurs the test will be terminated for a minimum 30 days.

6.7 Reid Vapor Pressure (RVP) of the fuel used to test the tank shall be measured at least 24 hours prior to the 30 day test period.

7. TESTING

7.1 Install thermocouple and float apparatus in the center of the tank opening and attach wiring to data logger. Install additional thermocouple or temperature probe with radiation shield within 10 linear feet of the tank and attach wiring to the data logger.

7.2 Turn on data logger and check in-put from each of the thermocouples and/or temperature probes to ensure they are functioning properly and recording data by conducting the steps listed in section 7.7.

7.3 Record start date and time.

7.4 Daily fuel surface and ambient temperature measurement data shall be recorded continuously a minimum 22 out of 24 hours beginning and ending at midnight during the same time period to maintain data set completeness.

7.5 Collect fuel surface and ambient temperature data for a minimum of 30 days during the summer months (June 1 through September 30) by completing Form 1.

7.6 On a weekly basis or an alternative period specified by the Executive Officer, download the data onto a computer for data reduction, validation, and analysis.

7.7 Once every 7 days or an alternative period specified by the Executive Officer, conduct a precision check of the thermocouple and temperature probes using the following procedure:

7.7.1 Remove the thermocouple and/or temperature probes.

7.7.2 Using a NIST traceable thermometer (mercury or electronic), collocate with the test equipment and record the temperatures on the Quality Assurance/Quality Control (QA/QC) form (Figure 2).

7.7.3 If the test thermocouples and/or temperature probes are within $\pm$ 2.0°F of the NIST traceable standard thermometer, return the test equipment, conduct TP-206.3 (Static Pressure Test), and continue monitoring the fuel surface and ambient temperatures. If the test equipment is not within $\pm$ 2.0°F of the standard, re-calibrate or replace the test equipment, conduct TP-206.3, and continue monitoring temperature. Temperature data shall be evaluated for validity from the last precision check if the test equipment does not meet the QA/QC criteria.

7.7.4 Invalidated data shall not be considered part of the minimum 30-day test duration.

8. POST-TEST PROCEDURES

8.1 Verify data completeness. A valid data set shall include:

8.1.1 A minimum of 30 days of 24-hour fuel surface and ambient temperature data that meet the conditions of section 7.3 of these test procedures.

8.1.2 A minimum of 30 days of valid data obtained during the summer months (June 1 to September 30) or period outside the summer months approved by the Executive Officer as provided by section 3.3.1 of CP-206.

8.1.3 At least seven days where the daily maximum ambient temperature shall be between 90°F and 100°F in order for data to be considered valid.

8.2 Remove temperature probe from the tank and replace with appropriate dust caps.

9. CALCULATIONS

9.1 Determine the daily fuel surface temperature range (difference between daily minimum and maximum temperatures) for each of the 30 consecutive days as follows:

Equation 9-1

$$T_f^{Range} = T_f^{Max} - T_f^{Min}$$

where:

T_f^{Range} = The daily fuel surface temperature range

T_f^{Max} = The daily maximum fuel surface temperature

T_f^{Min} = The daily minimum fuel surface temperature

9.2 Determine the average ambient temperature range (difference between daily minimum and maximum temperatures) for each of the 30 consecutive days as follows:

Equation 9-2

$$T_a^{Range} = T_a^{Max} - T_a^{Min}$$

where:

T_a^{Range} = The daily ambient temperature range

T_a^{Max} = The daily maximum ambient temperature

T_a^{Min} = The sum of the daily minimum fuel surface temperatures

9.3 Determine the attenuation factor as follows:

Equation 9-3

$$A_f = \frac{(\sum_1^n T_f^{Range} / n)}{(\sum_1^n T_a^{Range} / n)}$$

where:

A_f = Temperature Attenuation Factor

$\sum_1^n T_f^{Range}$ = sum of daily fuel surface temperature range

$\sum_1^n T_a^{Range}$ = sum of daily ambient temperature range

n = number of data sets (days)

10. REPORTING

10.1 The temperature Attenuation Factor can be applied to the equation in section 3.3.1 of CP-206 to determine the emission factor (pounds HC/1000 gallons/day) of the technology being tested.

10.2 Data shall be entered on the “Summary of Temperature Attenuation Factor Test Data” form (Form 1).

11 ATLERNATIVE TEST PROCEDURES

This procedure shall be conducted as specified. Any modifications to this test procedure shall not be used for certification unless prior written approval has been obtained from the ARB Executive Officer, pursuant to Section 15 of Certification Procedure CP-206.

FORM 1

SUMMARY OF TEMPERATURE ATTENUATION FACTOR TEST DATA

SOURCE INFORMATION	
GDF Name and Address _____ _____ _____	GDF Representative and Title: Contact Phone No. ( )
Product Grade/RVP: Tank Capacity (gallons): Gasoline Volume (gallons): Ullage (gallons):	Vapor Recovery System Description: GDF # _____ A/C #
Static Pressure Test Conducted:_____ (pre)	Pass ☐ Fail ☐

Temperature Attenuation Factor Data			T_f (°F)		T_a (°F)	
Day	Comments	Hours of valid data	Min	Max	Min	Max
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
Static Pressure Test Conducted:_____ (post)			Pass ☐		Fail ☐	

Test Conducted by:	Test Company:	Date of Test:

Figure 1
Fuel Surface Thermocouple on Float