California Environmental Protection Agency

Air Resources Board

Vapor Recovery Test Procedure

PROPOSED: TP - 201.2D

Post-Fueling Drips From Nozzle Spouts

Adopted:____________

All text is proposed for adoption.

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Post-Fueling Drips from Nozzle Spouts

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 "CARB" refers to the California Air Resources Board, and the term "Executive Officer" refers to the CARB Executive Officer, or his or her authorized representative or designate.

1. PURPOSE AND APPLICABILITY

1.1 The purpose of this procedure is to quantify the quantity of liquid gasoline drips from nozzles used during refueling events. It is applicable for determining compliance with the performance standard for the maximum allowable number of liquid gasoline drips as defined in Certification Procedure CP-201.

2. PRINCIPLE AND SUMMARY OF TEST PROCEDURE

2.1 The vapor recovery nozzles and associated hanging hardware are inspected and verified to be in good working order, as specified in CCR 94006, including the requirement that the nozzle's shutoff mechanism is in good working order.

2.2 The vapor recovery nozzle is used to dispense gasoline into a vehicle fuel tank. Upon activation of the nozzle's primary shutoff mechanism, ten (10) seconds are allowed to elapse prior to removal of the nozzle from the vehicle fillpipe. The nozzle is then inverted and the number of drips of liquid gasoline are quantified.

3. BIASES AND INTERFERENCES

3.1 Nozzle orientation during refueling can affect the response time of the primary shutoff mechanism. To eliminate this bias, the nozzle shall be inserted into each vehicle fillpipe in the same orientation, as specified in Section 7.

3.2 Nozzles or associated components that have defects pursuant to CCR 94006 may bias the test toward non-compliance. Do not conduct this test if the nozzle, or any associated component contains a defect.

4. SENSITIVITY, RANGE, AND PRECISION

4.1 The procedure is capable of determining spills as small as one drop per refueling event. The calculation below demonstrates the air quality impact attributable to a single drop of gasoline spilled during each refueling event in California, assuming 14.2 billion gallons per year and an average refueling event of 10 gallons.

$$\left(\frac{1\,\text{drop}}{10\,\text{gallons}}\right)\left(\frac{14.2\times10^{9}\,\text{gallons}}{\text{year}}\right)\left(\frac{1\,\text{ml}}{20\,\text{drops}}\right)\left(\frac{1\,\text{gallon}}{3{,}785\,\text{ml}}\right)\left(\frac{6.28\,\text{lb}}{\text{gallon}}\right)\left(\frac{1\,\text{ton}}{2{,}000\,\text{lb}}\right)=\frac{58.9\,\text{tons}\,\text{HC}}{\text{year}}$$

4.2 Maximum sensitivity and precision is obtained by measuring the drips of liquid gasoline from 10 vehicle refueling events and calculating the arithmetic average of the number of drops per refueling event. For the purpose of this test procedure, a refueling event shall consist of any refueling episode of at least 4.5 gallons, terminated by activation of the nozzle's primary shutoff mechanism.

5. EQUIPMENT

5.1 Field Data Sheet. Use a Field Data Sheet to record the number of drips from each acceptable refueling event.

5.1.1 An example of the Field Data Sheet is shown in Form 1.

5.2 Stopwatch. Use a stopwatch accurate to within 0.2 seconds to measure the dispensing rate.

6. PRE-TEST PROCEDURES

6.1 Inspect the vapor recovery nozzles and associated hanging hardware and verify that all components are in good working order, as specified in CCR 94006, including the requirement that the nozzle's shutoff mechanism is in good working order.

7. TEST PROCEDURE

7.1 Assign, and record on the Field Data Sheet, a Survey ID # to each vehicle included in the test.

7.2 The tester shall select a vehicle for the test by choosing the next vehicle that appears, for which the refueling event is about to begin.

7.2.1 The tester should introduce themselves to the customer and ask if the refueling event is to be a fillup. If the answer is no, the tester shall select the next potential test vehicle.

7.2.2 If the customer acknowledges that they want a fillup, the tester should ask to refuel the vehicle, explaining the purpose and details of the test.

7.3 Properly insert the nozzle, with the nozzle spout pointed upward in the 12:00 o'clock orientation for side fill vehicles and as close to 12:00 o'clock orientation for rear fill vehicles.

7.4 Begin dispensing with the nozzle trigger in the hand-held, wide open position to achieve the maximum dispensing rate. Start the stopwatch when dispensing begins.

7.5 Upon activation of the nozzle's primary shutoff mechanism, stop the stopwatch and record both the gallons dispensed and the time required for the refueling event.

7.6 Wait for ten (10) seconds before removing the nozzle from the vehicle fillpipe.

7.6.1 After ten seconds, carefully remove the nozzle, keeping the spout pointing downward until the spout tip exits the fillpipe. Immediately tilt the nozzle such that the spout is vertical, pointing upward.

7.6.2 Pointing the nozzle away from the vehicle and customer, tilt the nozzle downward until the spout is vertical, pointing downward. Count the number of drops of liquid gasoline that spill from the nozzle, starting with the initial downward tilting through having the nozzle in an inverted position for five seconds. Record this quantity on the Field Data Sheet along with the number of gallons dispensed and the refueling time, in seconds.

8. POST-TEST PROCEDURES

8.1 Calculate the arithmetic average of the number of drops of liquid gasoline from each of the refueling events included in the test. Record this average on the Field Data Sheet.

9. CALCULATING RESULTS

9.1 Calculate the dispensing rate for each refueling event as follows:

$$Q_d = \left(\frac{(G_d)(60)}{t_d} \right) \qquad \text{Equation } 9-1$$

Where:

Q_d = Dispensing rate, gallons/minute
G_d = Quantity of gasoline dispensed during the refueling event, gallons
t_d = Time to dispense G_d gallons, seconds
60 = Conversion factor from seconds to minutes

9.2 Calculate the arithmetic average of the number of drops for each refueling event as follows:

$$N_{drips} = \sum_{i=1}^{n} \left(\frac{D_t}{n} \right) \qquad \text{Equation } 9-2$$

Where:

N_{drips} = Average number of drips for all refueling events, drops/refueling event
D_t = Total of all drops from all refueling events, drops
n = Number of refueling events during test

10. REPORTING RESULTS

10.1 Reporting the results of the quantification of the number of drops per refueling event shall include:

10.1.1 All data shown in the Field Data Sheet.

Form 1
Field Data Sheet
Dripless Nozzle

Facility:	Test Date:	Tester(s):
Address:	Phase II Equipment Type:	

Survey ID #										
Vehicle Information										
Year										
Make										
Model										
Refueling Information										
Time Start										
Nozzle Position [1 - 12 O'clock]										
Gallons Pumped										
Fueling Time, seconds										
Dispensing Rate, Gpm										
Spitback, Yes or No										
NOZZLE DRIP DATA										
Number of Drops										
TOTAL DROPS										
Comments										