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Air Resources Board

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TO: William V. Loscutoff, Chief
Monitoring and Laboratory Division

THROUGH: George Lew, Chief
Engineering and Certification Branch

THROUGH: Manjit Ahuja, Chief
Stationary Source Testing Branch

FROM: Dennis Goodenow, Manager
Source Test Section

DATE: August 28, 2007

SUBJECT: MODIFICATION OF VAPOR RECOVERY TEST PROCEDURE TP-201.2
"EFFICIENCY AND EMISSION FACTOR FOR PHASE II SYSTEMS"

This memorandum requests approval of alternative equipment and procedures for use with vapor recovery test procedure TP-201.2 "Efficiency and Emission Factor for Phase II Systems." Section 5 and Section 14 of TP-201.2 allows the Air Resources Board (ARB) Executive Officer to approve use of alternative equipment and procedures for vapor recovery certification testing. The Chief of the Monitoring and Laboratory Division is delegated by the ARB Executive Officer to approve use of alternative or modified vapor recovery test procedures listed in Section 94011, Title 17, CCR. Approval is based upon demonstration of statistical equivalence, when applicable, pursuant to Section 14 of ARB certification procedure CP-201.

Based upon both engineering evaluation and experience gained from field application of TP-201.2, the Source Test Section requests approval of the following equipment and procedural modifications to the October 2003 amended version of TP-201.2:

- Section 5.1.2 currently requires use of FID analyzers at Test Points 1, 3 and 4_{outlet}. This requirement is changed to allow use of either non-destructive infrared (NDIR) or FID analyzers at these test points. Previous versions of TP-201.2 allowed the use of FID or NDIR analyzers at these locations due, in part, to the relationship between analyzer range and response time for FID and the ability to continuously return NDIR samples to their point of extraction when dilution or disruption of system equilibrium are concerns. ARB demonstrated the equivalency of NDIR to FID for a gasoline vapor matrix using USEPA Method

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301 and published the results in the attached August 7, 2000 staff report. USEPA also allows NDIR for determining hydrocarbon emissions from gasoline loading at bulk terminals (40CFR60 Subpart XX).

- Section 5.6.1 currently requires installation of a liquid trap at the inlet to the volume meter at test point 2. This requirement is changed to a recommendation due to spatial constraints when configuring test point 2 for sample collection. Transparent tubing shall be used to connect the volume meter to the test dispenser if the liquid trap is omitted. A determination of statistical equivalency is unnecessary as the volume of liquid gasoline recovered from the vapor return line is not applied to any subsequent efficiency or emission factor calculations.
- Section 5.6.3 currently requires isolation valves to allow for the removal of sampling equipment from test point 2 during non-test periods. This requirement is changed to a recommendation due to spatial constraints and the consideration that removal and reinstallation of sampling equipment may necessitate additional pressure integrity testing using TP-201.3. A determination of statistical equivalency is unnecessary since the installed sampling equipment cannot increase vapor return path frictional losses (pressure drop) by more than 10%.
- Section 5.7.1 implies a required sampling rate of 20 cfm at Test Point 3 (vent sleeve). This section is changed to require a minimum sample rate of 0.5 cfm. The sampling rate must be sufficient to prevent detection of hydrocarbon vapors in excess of 10% of the LEL (2100 ppmv, as propane) at the inlet ports to the housing. A sampling rate of 20 cfm is practically unattainable, and unnecessary considering the static pressure limitations placed on EVR systems. The vent sleeve sampling apparatus requires validation testing to demonstrate capture efficiency within $\pm 5\%$ of the metered hydrocarbon vapor mass from a mass flow controller, bubble meter or precision rotameter. Therefore, a determination of statistical equivalency is unnecessary.
- Section 5.8.1 and Section 7.4.5.1 reference sample collection at the vapor processor inlet (Test Point 4_{inlet}). This reference is amended to indicate Test Point 4_{inlet} applies only to vapor processors employing a destructive principle such as thermal oxidation. A determination of statistical equivalency is not applicable to a change in nomenclature.
- Section 8.2 requires repetition of the nozzle sleeve response time determination if the sampling apparatus or dispenser location for Test Point 1 is changed. This requirement is changed to require repetition of the nozzle sleeve response time determination only when nozzle sleeve sampling apparatus is modified or replaced. Dispenser location is not a nozzle sleeve response time variable and,

therefore, has no influence on this parameter. A determination of statistical equivalency is not applicable to this modification.

- Section 8.2.3 defines nozzle sleeve response time as the time interval between exposing the nozzle sleeve to a hydrocarbon vapor source and 90% of the final stable analyzer reading is observed. This definition is changed to the time interval between exposing the nozzle sleeve to a hydrocarbon gas calibration standard and a response corresponding to 90% of the selected analyzer range or final stable analyzer reading. This change is necessary due to the use of multiple analyzer ranges at this sample location and will provide a consistent, reproducible response time, which establishes the time period between the conclusion of dispensing gasoline to the test vehicle and the termination of sampling. Statistical equivalency cannot be established; as the basis for comparison may yield inconsistent results when a gasoline container is used as a hydrocarbon vapor source.
- Section 8 and Section 10 require daily pretest and post test sampling system bias checks at each test point. The requirement is modified to require pre-certification and post certification test bias checks, as defined in TP-201.2, at all test points. Alternatively, pre and post certification test collection efficiency checks may be performed using a metered mass of hydrocarbon calibration standard for all test points. Collection efficiency results must agree within $\pm 5\%$ of the metered hydrocarbon vapor mass. System bias checks were originally intended to evaluate the effects water vapor and sample conditioning have on water soluble compounds in a combustion gas matrix. Source Test Section (STS) staff believe daily bias checks are excessive, considering the lack of water vapor in the sample matrix and that sample system components are leak checked and constructed from materials that do not provide a source or sink for hydrocarbon vapors as specified in TP-201.2. The STS believes this modification provides an acceptable level of quality assurance without the additional time investment necessary to perform twice daily bias checks during an already time intensive 200 car test schedule. Statistical equivalency is not applicable since mass collection efficiency, when applied, is a more conservative quality assurance standard than concentration bias.
- Section 9.4.3 requires collection of nozzle sleeve emissions data from the conclusion of dispensing for a period equal to the nozzle sleeve response time. This requirement is modified to collect nozzle sleeve emissions data from the conclusion of dispensing for a period equal to or greater than nozzle sleeve response time and the nozzle sleeve hydrocarbon analyzer concentration is less than 100 ppmv as propane. Terminating nozzle sleeve sample collection one

response time after concluding dispensing will result in under reporting emissions occurring at nozzle shut off. The loss of this emission data will introduce high bias to system efficiency and low bias to system emission factor. Statistical equivalency cannot be established as the reference procedure cannot produce representative results.

- Section 9.4.3 requires the sleeve be hanged on the dispenser with the nozzle at the conclusion of dispensing. This requirement is changed to remove the sleeve from the nozzle before replacing the nozzle in the dispenser. This change will extend the service life of the nozzle sleeve and reduce the potential for bias from spillage during replacement. A determination of statistical equivalency is not applicable.
- Section 12.7 currently calculates Phase II vapor recovery system efficiency using the following equation:

$$EFF = 1 - \frac{M_1 + M_3 + M_4 + M_5}{M_1 + M_2 + M_3 + M_4 + M_5} \times 100$$

Where:

- M₁ = Mass emission factor at Test Point 1, lbs/1000 gallons
- M₂ = Mass recovery factor at Test Point 2, lbs/1000 gallons
- M₃ = Mass emission factor at Test Point 3, lbs/1000 gallons
- M₄ = Mass emission factor at Test Point 4, lbs/1000 gallons
- M₅ = Mass emission factor at Test Point 5, lbs/1000 gallons

This equation is changed to the following equation which is more consistent with the Phase II vapor recovery system efficiency equation found in previous versions of TP-201.2:

$$EFF = \frac{M_2 - (M_3 + M_4 + M_5)}{M_1 + M_2} \times 100$$

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Statement of Approval:

Under the authority granted in ARB Executive Order G-834, I hereby approve the modifications to TP-201.2 contained herein.

William V. Loscutoff, Chief
Monitoring and Laboratory Division
Air Resources Board

Date

Attachment

cc: Dianne Johnston
Office of Legal Affairs

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