



15-Day comment

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Legal  
MSD

Ford Motor Company

The American Road  
P.O. Box 1899  
Dearborn, Michigan 48121-1899

July 6, 1994

Board Secretary  
Air Resources Board  
P.O. Box 2815  
Sacramento, CA 95812

Dear Board Secretary:

Ford Motor Company (Ford) submits the attached comments in response to the State of California Air Resources Board (ARB) Mail Out # 94-25, Notice of Public Availability of Modified Text regarding adoption of amendments to the evaporative emission standards and test procedures.

Because the changes identified in Mail Out # 94-25 are needed to certify Ford's 1995 Model Year vehicles, it is critical that the amendments be adopted in a timely manner. Ford respectfully requests an expedited review by the Office of Administrative Law for the amendments identified in Mail Out #94-25.

Ford is submitting several comments pertaining to the Mail Out for consideration by the Executive Officer prior to final action. Ford is also submitting comments for future consideration regarding alternative fuel vehicles (AFV).

If you should have any questions, please do not hesitate to call.

Sincerely,

  
M. J. Schwarz

Attachment

cc: Mr. K. D. Drachand  
Mobile Source Division  
Air Resources Board  
7528 Telstar Avenue  
El Monte, CA 91731

Mr. J. Kitowski  
Mobile Source Division  
Air Resources Board  
7528 Telstar Avenue  
El Monte, CA 91731

## Ford Comments On California Air Resources Board

### Mail Out # 94-25 - Amendments To Regulations Regarding

### Evaporative Emission Standards And Test Procedures

July 6, 1994

#### Introduction

Ford appreciates the efforts of the California Air Resources Board Staff in addressing the many technical issues concerning the new enhanced evaporative emissions procedure that have been identified by Ford and the rest of industry through AAMA and AIAM. The amendments identified in Mail Out # 94-25 represent significant progress in refining the enhanced evaporative emissions test procedure, allowing the test to be performed more consistently and in a manner more representative of real world conditions. Significant improvements include:

- Allowing for fuel preheating to ambient temperature prior to the start of the fuel tank temperature profile generation (used in the running loss test).
- Allowing a manufacturer to conduct unscheduled maintenance at the end of useful life during the optional durability procedure.
- Extending the 105 F soak after the exhaust emissions test to avoid unrepresentative vapor temperatures and pressures in the fuel tank.
- Requiring the fuel tank vapor temperature to match the on-road profile during the running loss test.
- Allowing for transitory pressure events to exceed the requirement (10 inches H<sub>2</sub>O) if it can be demonstrated that pressure meets the requirement during on-road testing.
- Modifying the cold soak period preceding the vehicle preconditioning to a minimum of six hours instead of 12 to 36 hours.

Also, many of the changes help align ARB's procedure with EPA's procedure.

Because the enhanced evaporative emissions test procedure is substantially different from the old procedure and requires the use of very sophisticated test equipment, additional technical issues will most likely arise and need timely resolution. Ford will continue to work closely with ARB staff (individually and with AAMA) to help ensure that issues get identified and resolved in a timely matter.

Ford is providing the following comments for consideration by ARB prior to final action. These comments pertain primarily to corrections/oversights, and do not alter the rule substantially. For this reason, Ford believes that the suggested changes should not trigger a new 15 day review/comment period. Because finalization of this rule is critical for the 1995 Model Year (MY) certifications, we request that ARB hold the comments for future consideration if ARB does not agree with Ford's assessment that the changes are non-substantial. Ford is also submitting comments for future consideration not specifically pertaining to this Mail Out.

### Comments Pertaining to Mail Out # 94-25

#### 1. Hot Soak Enclosure Calibration - Page 28, Section 4.e.(e)(2)(v)

A new paragraph was added at the hearing describing the calibration procedure for a hot soak enclosure. The procedure allows the hot soak enclosure calibration to be conducted in accordance with the diurnal procedure specified in paragraph (e)(1), but with a 4 hour retention check at 105 F. The four hour retention check is unnecessary because the diurnal enclosure already specifies a 24 hour retention check with temperature cycling. This is a worse-case procedure and should not require an additional 4 hour retention check. It is recommended that the procedure read as follows:

*Hot soak enclosure. The hot soak enclosure calibration consists of the following parts: initial and periodic determination of enclosure background emissions, initial determination of enclosure volume, and periodic hydrocarbon and alcohol retention check and calibration. If the hot soak enclosure is used for diurnal testing, the calibration shall be conducted according to the method specified in section (e)(1). Otherwise, the hot soak enclosure calibration shall be conducted according to the method specified in section (e)(1) with a retention check of four hours at 105 F or the method specified in section (e)(2)(iv).*

#### 2. Enhanced Evaporative Flow Diagrams - Figures 4 & 5

The referenced figures are the flow diagrams of the enhanced evaporative emissions procedure for the 2 day and 3 day sequences. For the 2 day sequence, the box labelled "Cold Soak Parking Canister Purge & Load" is mislabeled. The two day sequence does not specify a purging of the vehicle canister during preconditioning. The word "purge" should be omitted.

### 3. HC Mass Calculation For the Variable Volume Variable Temperature (VVVT) SHED-

Page 59, Section 4.k (Page 25, Section 4.e(1)(iii)(F) & (G); Page 54, Section 4.g.xi.)

With the Board approved amendments, ARB now allows the use of a fixed volume enclosure for diurnal testing. Along with the allowance of a fixed volume enclosure, ARB modified its equations in calculating HC mass and have matched the EPA calculations. Ford agrees that for a fixed volume enclosure, the calculations identified in the Mail Out are appropriate because enclosure volume remains constant. However, for a variable volume enclosure, the original equations are more appropriate because volume of the enclosure does not remain constant due to barometric pressure changes. Attachment I provides more detail on this issue.

EPA is in the process of adopting technical amendments for its enhanced evaporative emissions procedure. Ford will request that EPA adopt the "old" ARB calculation method for VVVT enclosures. To avoid differences in procedure, Ford recommends that ARB add language to the above section (4.k.) allowing the use of the EPA calculation for HC mass.

*Upon prior written approval of the Executive Officer, a manufacturer may use the comparable federal requirements in Title 40, CFR, Part 86 in lieu of the carry-across specifications of paragraph 4.c. of these test procedures, the multiple canister loading requirements of paragraph 4.g.iii.D., the HC mass calculations for background and retention of paragraph 4.e(1)(iii), the HC mass calculation for the diurnal test and running loss enclosure method test of paragraph 4.g.xi, and the running loss road profile correction factors of paragraph 4.f.. The Executive Officer shall ...*

### 4. Canister Loading For 2-day Diurnal Test Using Repeated Heat Builds

Page 41, Section 4.g.iii.E.II.2

This section states that fuel can be dispensed at 60 +/- 12 F but the heat build is to start at 65 F within one hour. The proposed language allows for the fuel to be artificially heated to 65 F but does not allow for cooling of the fuel to 65 F if dispensed at a higher temperature (66-72 F). The cited section should be changed to:

2. *The fuel may be artificially heated or cooled to the starting diurnal temperature of 65 F. ...*

## Comments For Future Consideration

### 5. Alternative Fuel Vehicle (AFV)

Ford is experiencing significant difficulty in developing AFVs to the new enhanced evaporative emission requirements. An example of the problem involves testing with M10 fuel. When using M10 fuel with a very optimistic fuel tank temperature profile for the running loss test, vapor generation increases by approximately 2 to 2.5 times when compared to gasoline. This presents a major problem because with such high rates, vapor generation exceeds the engine fuel consumption rate during a significant portion of the running loss test. If vapor generation exceeds consumption, the canisters will increase in loading versus continuing to be purged. If the canisters load during the running loss test, a high probability exists that storage capacity will be exceeded and breakthrough will occur either during the running loss test, or the hot soak plus 3 day diurnal test. At altitude, the task becomes even more difficult with vapor generation of M10 increasing approximately 5 times over gasoline at sea level.

Without some special consideration for AFVs regarding evaporative emissions, these vehicles will most likely be prohibited when 100 % phase-in is mandated in 1998. Ford believes this is counter productive due to the benefits associated with AFVs including potential for improved exhaust gas emissions performance and energy diversification. Ford would like to begin working with ARB and EPA in trying to develop acceptable solutions. Potential solutions being considered include switching to a reactivity adjusted NMOG standard, and increasing the standard for AFVs.

### 6. Other

Ford would like to preserve the comments stated in previous AAMA responses with respect to Mail Outs 93-46, and 93-26 not addressed in Mail Out 94-25 including differences in numerical standards with EPA's procedure and the use of EPA certification data for California certification.

### Conclusion

Ford is requesting an expedited review by the Office of Administrative Law of the amendments identified in Mail Out # 94-25. Ford is relying on several of the amendments to certify two engine families for the 1995 MY. If these families are not certified to the enhanced evaporative procedures, Ford cannot comply with the 10 % phase-in requirement for California. We understand that because the amendments identified in the Mail Out are not expected to become effective for several months, ARB intends to issue an Executive Order for the affected engine families which are conditional upon the amendments becoming effective by a fixed date.

It is imperative that the amendments identified in the Mail Out be finalized in a timely fashion to avoid unnecessary expenditures by both ARB and Ford plus time to establish compliance under the 1995 rules now in effect.

## Attachment I: HC Mass Calculations

The California Air Resources Board (ARB) and the US EPA allow the use of either a variable volume enclosure or a fixed volume enclosure. If a variable volume enclosure is used, the equations in Mail-out #94-25 are not correct.

### Background Mass Calculation

The Mail-out equation is:

$$M_{HCe1} = 3.05 \times V_n \times 10^{-4} \times [P_2 \times (C_{HCE2} - rC_{CH3OH2}) / T_2 - P_1 \times (C_{HCE1} - rC_{CH3OH1}) / T_1]$$

But, the above equation is not correct for use with the variable volume SHEDs because the Standard Temperature and Pressure (STP) volume is a constant due to the fact that the trapped atmospheric mass cannot change during the test.

Therefore, based on the ideal gas law and derived from  $M_{HC}$  as a function of  $C_{HC}$ , the correct equation is:

$$M_{HCe1} = 3.05 \times V_n \times 10^{-4} \times [P_1 \times ((C_{HCE2} - rC_{CH3OH2}) - (C_{HCE1} - rC_{CH3OH1})) / T_1]$$

### Retention Mass Calculation

The Mail-out equations are:

$$M_{HCe1} = 3.05 \times V_n \times 10^{-4} \times [P_2 \times (C_{HCE2} - rC_{CH3OH2}) / T_2 - P_1 \times (C_{HCE1} - rC_{CH3OH1}) / T_1] \text{ and}$$

$$M_{HCE2} = (3.05 \times V_n \times 10^{-4} \times [P_3 \times (C_{HCE3} - rC_{CH3OH3}) / T_3 - P_1 \times (C_{HCE1} - rC_{CH3OH1}) / T_1]) + M_{HC,out} - M_{HC,in}$$

For the variable volume enclosure, the STP volume at the beginning is the same as the volume at the end. There is no  $M_{HC,out}$  or  $M_{HC,in}$ .

The correct equations are:

$$M_{HCe1} = 3.05 \times V_n \times 10^{-4} \times [P_1 \times ((C_{HCE2} - rC_{CH3OH2}) - (C_{HCE1} - rC_{CH3OH1})) / T_1] \text{ and}$$

$$M_{HCE2} = 3.05 \times V_n \times 10^{-4} \times [P_1 \times ((C_{HCE3} - rC_{CH3OH3}) - (C_{HCE1} - rC_{CH3OH1})) / T_1]$$

### Diurnal and Hot Soak Mass Calculations

The Mail-out equation is:

$$M_{HCD} = \{2.97 \times (V_n - 50) \times 10^{-4} \times [P_f \times (C_{HCEf} - rC_{CH3OHf}) / T_f - P_i \times (C_{HCEi} - rC_{CH3OHi}) / T_i]\} + M_{HC,out} - M_{HC,in}$$

For the same reasons as above, the correct equation is:

$$M_{HCD} = 2.97 \times (V_n - 50) \times 10^{-4} \times [P_i \times ((C_{HCEf} - rC_{CH3OHf}) - (C_{HCEi} - rC_{CH3OHi})) / T_i]$$