May 21, 1986

CD-86-09 (LDV)

Dear Manufacturer:

Subject: 1986 Model Year Passenger Automobile CAFE Adjustment
           Coefficient

This letter is notification that the passenger automobile
Corporate Average Fuel Economy (CAFE) adjustment "c" factor for
the 1986 model year is 0.0022.

on July 1, 1985, EPA promulgated final rules which established
CAFE adjustments for 1980 and later model year passenger
automobiles (50 FR 27127). These adjustments were granted to
compensate for the effects of past test procedure changes and,
thus, maintain the stringencies of the CAFE standards at their
established levels.

The adjustment equation incorporates a model year specific
coefficient, the "c" factor. The final rule established "c"
factor values for the 1980 through 1985 model years. For 1986
and later model years, the rule stated that the Administrator
will specify the "c" values after the necessary laboratory
humidity and test fuel data become available.

The EPA laboratory humidity and fuels data for the 1985
calendar year has been analyzed and it has been determined that
the "c" factor is 0.0022 for the 1986 model year. This is the
factor EPA will use in calculating final passenger automobile
CAFE's for the 1986 model year. Manufacturers should also use
this correction factor in calculating their 1986 model year
passenger automobile CAFE prior to EPA submission. The
enclosure presents the calculation of this factor. Any
questions or comments regarding the CAFE adjustment coefficient
should be directed to Mr. J. Whitehead, (313) 668-4479.

Sincerely,

Robert E. Maxwell, Director
Certification Division
Office of Mobile Sources

Enclosure

Calculation of the Passenger Automobile CAFE
Adjustment Coefficient for the 1986 Model Year

This enclosure presents the calculation of the passenger
automobile Corporate Average Fuel Economy (CAFE) adjustment
coefficient for the 1986 model year. The methodology detailed
in the Summary and Analysis of Comments (hereafter referred to
as the S&A) for the July 1, 1985 CAFE adjustment rulemaking (50
FR 27127) is used to calculate the coefficient.

The CAFE adjustment coefficient for passenger automobiles is
the "c" factor in §600.510-86(c) of the CFR.   This factor is
termed the "Combined Correction Coefficient" in the Calculations
section of the S&A. The equation for the combined correction
coefficient (see pg 122) is:

$$C = Ch + Cf + CO + Cs \qquad \text{equation (1)}$$

where:

    C   =   Combined Correction Coefficient
    Ch =   Correction Coefficient for Humidity
    Cf =   Correction Coefficient for Fuels
    CO =   Correction Coefficient for Oils
    Cs =   Correction Coefficient for Exhaust Samplers

For 1985 and later model years, the correction coefficients for
energy efficient oils (CO) and exhaust samplers (Cs) are
both zero. Therefore, equation (1) simplifies to:

$$C = Ch + Cf \qquad \text{equation (2)}$$

The Laboratory Humidity section of the S&A provides the
necessary information to develop the following equation:

$$Ch = SH (H75 - HMY) \qquad \text{equation (3)}$$

where:

    Sh = Humidity Sensitivity Coefficient
        = -1.09 x 10-4/grain H20 (for 1981 and later
           model years)
            H75 = Average Humidity in the 1975 model year

= 49 gr./lb. (as measured by a wet bulb
    psychrometer)
    HMY = Average Humidity for a Model Year.

Since the humidity sensitivity coefficient and the average humidity in the 1975 model year are known, only the average humidity for the 1986 model year needs to be determined to calculate the correction coefficient for humidity. The average humidity was established as the average humidity of the EPA laboratory over a calendar year. This average humidity level must, however, be increased by 5 gr./lb. to make the current humidity measurements (which are taken with a dew point hygrometer) comparable with the 1975 model year measurements (which were taken with a wet bulb psychrometer).

Examination of EPA test data for the 1985 calendar year showed the average humidity level to be 50 gr./lb. as measured by dew point hygrometer. This corresponds to an equivalent wet bulb psychrometer humidity level of 55 gr./lb. Using this data and equation (3), the correction coefficient for humidity was calculated to be 0.0011.

The Test Fuel Properties section of the S&A utilized an equation proposed by General Motors (GM) to calculate correction coefficients for fuels. Using this equation, the correction coefficient for fuels is:

$$Cf = [(CWFt/CWFr) \times (NHVr/NHVt) \times (R + (sgr \times NHVr \times (1-R))/(sgt \times NHVt))-1] -1$$

<div align="right">equation (4)</div>

where:

    Subscript t = test conditions
    Subscript r = reference conditions
    CWF   = Carbon Weight Fraction
    NHV   = Net Heating Value
    sg   = Fuel Specific Gravity
    R   = Ratio of % change in fuel economy resulting
                     from a given % change in volume-based
                     heating value.
                 = 0.6

The following reference fuel property values were established:

    sgr = 0-739
    NHVr = 18,507 Btu/lb.
    CWFr = 0.866

Calculation of Cf also requires determining the average annual properties (sgt, CWFt and NHVt) of the test fuel used at the EPA laboratory. For the 1985 calendar year, these properties were:

    sgt = 0.741
    NHVt = 18,472 Btu/lb
    CWFt = 0.865

Using equation (4), the fixed values (reference fuel properties and the "R" factor) and the average annual EPA test fuel properties, the correction coefficient for fuels is 0.0011 for the 1986 model year.

Summing these "Ch" and "Cf" values (per equation 2) yields a "C" factor of 0.0022 for the 1986 model year.