Environmental Protection Agency

vehicle may be calculated by substituting the HC, CO, and CO₂ gram/mile values and the SG, CWF, and NHV values into the following equation:

\[
\text{MPG}_c = \frac{(5174 \times 10^4 \times \text{CWF} \times \text{SG})}{(0.55 \times \text{HC} + 0.45 \times (0.6 \times \text{CWF} \times \text{HC} + 0.273 \times \text{CO} + 0.429 \times \text{CO}_2) + (0.6 \times \text{SG} \times \text{NHV} + 5471)}
\]

Example:

\[
\text{MPG}_c = \frac{(5174 \times 10^4 \times 0.868 \times 0.745)}{(0.868 \times 0.139 + 0.429 \times 1.59 + 0.273 \times 317)(0.6 \times 0.745 \times 18478 + 5471)}
\]

\[
\text{MPG}_c = 27.9
\]

(4) Assume that the same vehicle was tested by the Federal Highway Fuel Economy Test Procedure and a calculation similar to that shown in (b)(3) of this section resulted in a highway fuel economy of MPGₜ of 36.9. According to the procedure in §600.210–08(c) or §600.210–12(c), the combined fuel economy (called MPGₜₚₑₚₙ) for the vehicle may be calculated by substituting the city and highway fuel economy values into the following equation:

\[
\text{MPG}_{\text{comb}} = \frac{1}{\frac{0.55}{\text{MPG}_c} + \frac{0.45}{\text{MPG}_t}}
\]

\[
\text{MPG}_{\text{comb}} = \frac{1}{\frac{0.55}{27.9} + \frac{0.45}{36.9}} = 31.3
\]

APPENDIX III TO PART 600—SAMPLE FUEL ECONOMY LABEL CALCULATION

Suppose that a manufacturer called Mizer Motors has a product line composed of eight car lines. Of these eight, four are available with the 3.0 liter, 6 cylinder, sequential multi-point fuel injection, 4-valve per cylinder, and 3-way catalyst engine. These four car lines are:

- Ajax
- Boredom III
- Dodo
- Castor (Station Wagon)

A. A car line is defined in subpart A (with additional guidance provided in EPA Advisory Circular 89) as a group of vehicles with-in a make or division which has a degree of commonality in construction. Car line does not consider any level of decor or opulence and is not generally distinguished by such characteristics as roofline, number of doors, seats, or windows. Station wagons and light duty trucks are, however, identified separately from the remainder of each car line. In other words, a Castor station wagon would be considered a different car line than the normal Castor car line made up of sedans, coupes, etc.

B. The engine considered here is defined as a basic engine in subpart A of this part (with additional guidance provided in EPA Advisory Circular 83A). A basic engine is a unique combination of manufacturer, engine displacement, number of cylinders, fuel system, catalyst usage and other engine and emission control system characteristics specified by the Administrator. A model type is a unique combination of car line, basic engine, and transmission class. Thus Ajax is a car line but Ajax 3.0 liter, 6 cylinder manual four-speed transmission is a model type whereas Ajax 3.0 liter, cylinder automatic three-speed transmission is a different model type.

C. The following calculations provide an example of the procedures described in subpart C of this part for the calculation of vehicle configuration and model type fuel economy values. In order to simplify the presentation, only city fuel economy values are included (as determined by either the derived 5-cycle method or vehicle-specific 5-cycle based method). The procedure is identical for highway and combined fuel economy values.

Step I. Input data as supplied by the manufacturer or as determined from testing conducted by the Administrator.

Manufacturer—Mizer Motors

Basic Engine: (3.0 liter, 6 cylinder, sequential multi-point fuel injection, 4-valve per cylinder, 3-way catalyst).

<table>
<thead>
<tr>
<th>Test vehicle carline</th>
<th>Engine code</th>
<th>Trans</th>
<th>Inertia weight</th>
<th>Axle ratio</th>
<th>Harmonically averaged city MPG</th>
<th>Specific label MPG</th>
<th>Vehicle config. sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ajax</td>
<td>1</td>
<td>M-4</td>
<td>3500</td>
<td>2.73</td>
<td>16.1001</td>
<td>16</td>
<td>15,000</td>
</tr>
<tr>
<td>Ajax</td>
<td>2</td>
<td>A-3</td>
<td>3500</td>
<td>2.56</td>
<td>15.9001</td>
<td>16</td>
<td>35,000</td>
</tr>
<tr>
<td>Boredom III</td>
<td>4</td>
<td>M-4</td>
<td>4000</td>
<td>3.08</td>
<td>14.2343</td>
<td>14</td>
<td>10,000</td>
</tr>
<tr>
<td>Ajax</td>
<td>3</td>
<td>M-4</td>
<td>4000</td>
<td>3.36</td>
<td>15.0000</td>
<td>15</td>
<td>15,000</td>
</tr>
</tbody>
</table>
Step II. Group vehicle fuel economy and sales data according to base level combinations within this basic engine.

Step III. Determine base level fuel economy values.
A. For all the base levels except the base level which includes 4,000 pound, manual four-speed transmission data, the base level fuel economy is as noted in Step II since only one vehicle configuration was tested within each of these base levels.

B. Since data from more than one vehicle configuration are included in the 4,000-pound, manual four-speed transmission base level, this fuel economy is harmonically averaged in proportion to the percentage of total sales of all vehicle configurations tested within that base level represented by each vehicle configuration tested within that base level.

Base level fuel economy formula:

\[
\text{Base level: M4 transmission, 4000 pounds:} \quad \frac{1}{\frac{10000}{14.2343} + \frac{15000}{15.0000}} = 14.6840 \text{ miles per gallon}
\]
Therefore, the 4000 pound, M4 transmission fuel economy is 14.6840 miles per gallon.

Note that the car line of the test vehicle using a given engine makes no difference—only the weight and transmission do.

Step IV. For each model type offered by the manufacturer with that basic engine, determine the sales fraction represented by each inertia weight/transmission class combination and the corresponding fuel economy.

<table>
<thead>
<tr>
<th>Car Line</th>
<th>Transmission</th>
<th>Weight</th>
<th>Fuel Economy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ajax</td>
<td>M4</td>
<td>0.4000 at 3,500 lb</td>
<td>16.1001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.6000 at 4,000 lb</td>
<td>14.6840</td>
</tr>
<tr>
<td></td>
<td>A3</td>
<td>0.3000 at 3,500 lb</td>
<td>15.9020</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.7000 at 4,000 lb</td>
<td>13.8138</td>
</tr>
<tr>
<td>Dodo</td>
<td>M4</td>
<td>0.4000 at 3,500 lb</td>
<td>16.1001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.6000 at 4,000 lb</td>
<td>14.6840</td>
</tr>
<tr>
<td></td>
<td>A3</td>
<td>0.3000 at 3,500 lb</td>
<td>15.9020</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.7000 at 4,000 lb</td>
<td>13.8138</td>
</tr>
<tr>
<td>Boredom III</td>
<td>M4</td>
<td>1.0000 at 4,000 lb</td>
<td>14.6840</td>
</tr>
<tr>
<td></td>
<td>A3</td>
<td>0.2500 at 4,000 lb</td>
<td>13.8138</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.7500 at 4,500 lb</td>
<td>13.2203</td>
</tr>
<tr>
<td>Castor</td>
<td>A3</td>
<td>0.2000 at 4,500 lb</td>
<td>13.2203</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.8000 at 5,000 lb</td>
<td>10.6006</td>
</tr>
</tbody>
</table>

Step V. Determine fuel economy for each model type (that is, car line/basic engine/transmission class combination).

Ajax, 3.0 liter, 6 cylinder, A3 transmission, model type MPG is calculated as follows:

\[
\text{MPG} = \frac{0.4000}{16.1001} + \frac{0.6000}{14.6840} = 15.2185, \text{ which rounds to } 15 \text{ MPG}.
\]

Similarly, Ajax and Dodo 3.0 liter, 6 cylinder, M4 model type MPG is calculated as follows:

\[
\text{MPG} = \frac{1}{16.1001} + \frac{0.6000}{14.6840} = 15.2185, \text{ which rounds to } 15 \text{ MPG}.
\]
The model type fuel economy values rounded to the nearest mile per gallon, are the fuel economy values listed in the EPA Fuel Economy Guide and used on the general labels (window stickers) for production vehicles for that model year.

\begin{align*}
\frac{1}{15.9020} + \frac{0.7000}{13.8138} &= 14.3803 \text{ mpg, which rounds to 14 MPG}^1 \\
\frac{1}{0.2500} + \frac{0.7500}{13.8138} &= 13.3638, \text{ which rounds to 13 MPG}^1 \\
\frac{1}{0.2000} + \frac{0.8000}{13.2203} &= 11.0381, \text{ which rounds to 11 MPG}^1 \\
\end{align*}

Note that even though no Dodo was actually tested, this approach permits its fuel economy figure to be estimated, based on the inertia weight distribution of projected Dodo sales within a specific engine and transmission grouping.

[71 FR 77958, Dec. 27, 2006]

APPENDIX IV TO PART 600—SAMPLE FUEL ECONOMY LABELS FOR 2008 THROUGH 2012 MODEL YEAR VEHICLES

A. Gasoline (or diesel)-fueled vehicle label

\[ \frac{1}{15.9020} + \frac{0.7000}{13.8138} = 14.3803 \text{ mpg, which rounds to 14 MPG}^1 \]

Boredom III 3.0 liter 6 cylinder M4 model type MPG = 14.6840 mpg, which rounds to 15 mi./gal

Boredom III 3.0 liter, 6 cylinder, A3 model type MPG is calculated as follows:

\[ \frac{1}{0.2500} + \frac{0.7500}{13.8138} = 13.3638, \text{ which rounds to 13 MPG}^1 \]

Castor 3.0 liter, 6 cylinder, A3 model type MPG is calculated as follows:

\[ \frac{1}{0.2000} + \frac{0.8000}{13.2203} = 11.0381, \text{ which rounds to 11 MPG}^1 \]

\[ \text{Note that even though no Dodo was actually tested, this approach permits its fuel economy figure to be estimated, based on the inertia weight distribution of projected Dodo sales within a specific engine and transmission grouping.} \]

\[ [71 \text{ FR 77958, Dec. 27, 2006}] \]