**Table 1. Summer Emission Effects of Replacing MTBE with Ethanol in Reformulated Gasoline**

| Property | Baseline Fuel | MTBE 11.2 Volume Percent | | Ethanol 5.8 Volume Percent | | Ethanol 10 Volume Percent | | Federal RFG Emission Requirements |
|---|---|---|---|---|---|---|---|---|
| | | Target Fuel Properties | | Target Fuel Properties | | Target Fuel Properties | | |
| MTBE (wt% oxygen) | 0 | 2.0 | | 0.0 | | 0.0 | | |
| ETBE (wt% oxygen) | 0 | 0.0 | | 0.0 | | 0.0 | | |
| Ethanol (wt% oxygen) | 0 | 0.0 | | 2.0 | | 3.5 | | |
| TAME (wt% oxygen) | 0 | 0.0 | | 0.0 | | 0.0 | | |
| Sulfur (ppm) | 339 | 132.0 | | 140.0 | | 133.8 | | |
| RVP (psi) | 8.7 | 6.4 | | 7.5 | | 7.4 | | |
| E200 (%) | 41 | 45.9 | | 42.6 | | 45.2 | | |
| E300 (%) | 83 | 77.3 | | 75.9 | | 77.0 | | |
| Aromatics (vol%) | 32 | 25.7 | | 27.3 | | 26.1 | | |
| Olefins (vol%) | 9.2 | 9.1 | | 9.6 | | 9.2 | | |
| Benzene (vol%) | 1.53 | 0.3 | | 0.4 | | 0.3 | | |
| | mg/mi | mg/mi | Percent Change from Baseline | mg/mi | Percent Change from Baseline | mg/mi | Percent Change from Baseline | |
| Exhaust VOC | 907.0 | 790.9 | -12.80 | 856.2 | -5.60 | 822.7 | -9.29 | |
| Nonexhaust VOC | 492.1 | 245.5 | -50.11 | 326.2 | -33.71 | 316.0 | -35.78 | |
| **Total VOC** | **1,399.1** | **1,036.4** | **-25.92** | **1,182.4** | **-15.48** | **1,138.7** | **-18.61** | |
| Exhaust benzene | 53.5 | 28.6 | -46.55 | 29.7 | -44.60 | 26.9 | -49.83 | |
| Nonexhaust benzene | 5.5 | 0.7 | -87.26 | 1.0 | -82.43 | 0.9 | -83.58 | |
| Acetaldehyde | 4.4 | 4.2 | -6.09 | 7.6 | 71.76 | 10.9 | 144.71 | |
| Formaldehyde | 9.7 | 11.8 | 22.08 | 10.7 | 10.40 | 10.8 | 10.97 | |
| Butadiene | 9.4 | 9.1 | -3.27 | 9.6 | 2.14 | 8.8 | -6.40 | |
| POM | 3.0 | 2.7 | -12.80 | 2.9 | -5.60 | 2.8 | -9.29 | |
| Total exhaust toxics | 80.1 | 56.4 | -29.65 | 60.4 | -24.54 | 60.0 | -25.06 | |
| **Total toxics** | **85.6** | **57.1** | **-33.35** | **61.4** | **-28.26** | **60.9** | **-28.82** | |
| **$NO_x$** | **1340.0** | **1231.3** | **-8.11** | **1243.6** | **-7.20** | **1234.5** | **-7.87** | |
| **VOC Reduction** | | | **-25.92** | | **-15.48** | | **-18.61** | ≥25.9-percent Reduction |
| **Toxics Reduction** | | | **-33.35** | | **-28.26** | | **-28.82** | ≥20.0-percent Reduction |
| **$NO_x$ Reduction** | | | **-8.11** | | **-7.20** | | **-7.87** | ≥5.5-percent Reduction |
| **Benzene Vol%** | | **0.3** | | **0.4** | | **0.3** | | ≤1.0 volume percent |

Definition of abbreviations and technical terms:

wt% = weight percent;
ppm = parts per million;
psi = pounds per square inch;
vol% = volume percent;
VOC = volatility organic compounds;
POM = polycyclic organic materials;
mg/mi = milligrams per mile;
MTBE = methyl tertiary butyl ether;
ETBE = ethyl tertiary butyl ether;
TAME = tertiary amyl methyl ether;
RVP = Reid vapor pressure.

Source: Energy Information Administration.