Air Toxics Benefits
Associated with Vehicle I/M Programs

AMERICAN LUNG ASSOCIATION

Target Cities and Analysis Methodology

Factsheet

The purpose of this analysis is to document a frequently overlooked benefit of Inspection and Maintenance (I/M) programs: the significant reduction of emissions of toxic chemicals (in addition to other pollutants) that are present in vehicle exhaust. The primary objective in selecting cities/regions for this analysis is to look at areas with enhanced I/M programs, while providing some variability in terms of regional fuel use and ambient conditions. A secondary consideration is the level of vehicle congestion in the city.

Identifying Target Cities

Identifying Target Cities – Step 1: Enhanced I/M for Ozone

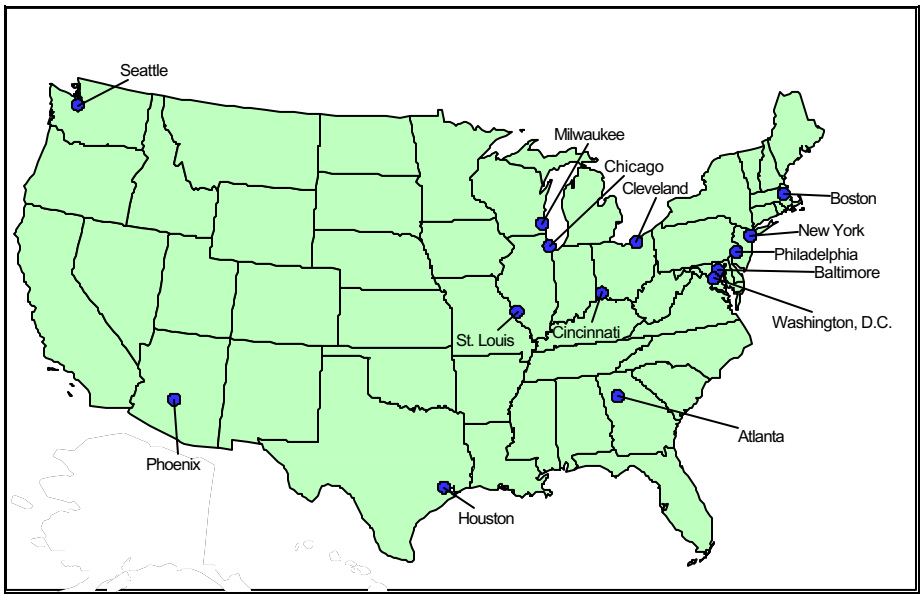
The first step involved narrowing down the total number of areas with I/M programs based on two criteria. The first criterion is that the city must have an enhanced I/M program. There are currently 20 states which have implemented an enhanced I/M program in at least a portion of the state. Because the focus of this analysis is on air toxics, which are a subset of a hydrocarbon emissions, the report considered cities with enhanced I/M programs that have been implemented for demonstrating compliance with the ozone NAAQS, not the carbon monoxide NAAQS.

The second criterion is that the city is not located in California. Cities located in California are omitted from this analysis because California has developed a unique model (EMFAC) for predicting motor vehicle emissions factors. In developing mobile source emission factors, the other 49 states use EPA's MOBILE model, on which MOBTOX is based. Since the complexity of correlating the results of the two different emission factor prediction models prevented a meaningful comparison of data, California cities were omitted.

Identifying Target Cities – Step 2: Vehicle Congestion

Vehicle congestion levels in each city was the next criterion. Ideally, vehicle miles traveled (VMT) and speed data from each city could be used to further refine the list of cities, because travel speed is a primary influencing factor in

Figure 1: Cities Selected for Analysis



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calculating emissions because emission rates generally increase as speed decreases. VMT is also influential as a direct multiplier within the emission calculation. However, to avoid the complexity of obtaining VMT and speed data for the many cities in the U.S. that have enhanced I/M programs, roadway congestion was used instead because congestion is an indicator of VMT and speed. For congestion data, *The 1999 Annual Mobility Report* produced by the Texas Transportation Institute (TTI) was used as a resource. This report provides data on the travel characteristics of 68 urban areas throughout the U.S. The primary piece of information taken from this report is the Roadway Congestion Index (RCI), which is "a traffic density indicator (vehicles per road space) that indirectly measures traffic congestion."[1] An RCI cutoff of 1.0 was chosen when considering the list of potential cities in order to limit the cities to those that experience significant congestion during morning and evening peak travel hours. An RCI of 1.0 or greater indicates that congestion occurs for two hours or more during both the morning and evening peak travel hours. This threshold results in the 14 cities that were included in this study: Atlanta, Baltimore, Boston, Chicago, Cincinnati, Cleveland, Houston, Milwaukee, New York City, Philadelphia, Phoenix, Seattle, St. Louis, and Washington, D.C.

Emission Factor Determination

Although many factors influence the impact an I/M program has on air toxic emissions, total VMT and average speed are important predictors of how extensive the benefits can be in a given area. In addition, both of these parameters are used either in determining an emission factor, or estimating emissions for the city/region. Roadway VMT and speed data were collected from the relevant local or state agencies for each of the targeted cities. Because data for only one year were usually provided, VMT estimates for the other years were obtained using either a supplied growth rate or an assumed rate of 1.5 percent per year. This latter growth rate assumption is based on recommendations from representatives of different state agencies that provided VMT data. Based on the growth rate, an estimate of VMT across the calendar years for each roadway/ speed classification was developed. VMT and speed data are integral parts of the overall analysis because changes in either variable produce a direct effect on the calculation of total emissions.

Calculating Emissions

Toxic air pollutant emission levels from motor vehicles were projected for each of the target areas of for calendar years 2003 through 2012.

The first step was to establish an emission rate for the four toxic pollutants of interest, acetaldehyde, benzene, 1,3-butadiene, and formaldehyde. These rates are generated based on localized conditions such as roadway travel, speed and ambient temperature as an output from EPA's mobile source toxic emission factor model known as MOBTOX. The emission rate from MOBTOX was combined with the VMT data to calculate the amount of toxic air pollutants emitted from motor vehicles in each city.

In the final step, emission factors were developed for each city based on two scenarios: (1) where the current I/M program continues intact through 2012, and (2) where the I/M program is discontinued beginning in 2003. A yearly comparison of the two scenarios for each pollutant shows the impact on toxic air pollutants associated with removing an I/M program.

[1] Schrank, David, and Tim Lomax, "The 1999 Annual Mobility Report—Information for Urban America."