EMISSION & TUNE-UP STANDARDS

MANUFACTURING STANDARDS

Federal and state governments have established air quality standards during the past 20 years. Automobile manufacturers design their vehicles to conform to standards where the vehicle will be sold. These standards cover carbon monoxide (CO), hydrocarbons (HC) and oxides of nitrogen (NOx).

Federal and California standards which must be met by manufacturers are specified in units easily measured in a testing laboratory. Since 1970, these standards have been in "grams per mile". This means no vehicle, whether 2-cylinder or V8, may emit more than a set weight (in grams) of pollutants for each mile it travels. Since large engines burn more fuel per mile than smaller ones, they must be "cleaner" per gallon burned if they are to meet these standards.

When manufacturers certify vehicles, the cars are placed on a dynamometer and the exhaust gases are collected in a bag. After the vehicle runs for a specified time, the gases are analyzed and weighed. Engines and emission systems are designed so the weight of emissions will be less than the specified grams per mile.

Infra-red exhaust analyzers are commonly used in automotive test stations. They use a test probe placed in the exhaust stream, and measure the percentage of CO in the exhaust gas, or parts per million of HC. These are not the same units used by the manufacturer when the car is certified. (NOx emissions can be measured only in a laboratory.)

TUNE-UP STANDARDS

When a tune-up is performed, the mechanic must have specifications to use when adjusting the vehicle. The first few years of emission-regulated vehicles were adjusted using carbon monoxide percentage or hydrocarbon parts per million. These are the units measured by an exhaust gas analyzer.

In the past few years, manufacturers have made their vehicles much cleaner (measured in grams per mile). The CO% and HC ppm have become very low, especially when measured AFTER a catalytic converter. It has become hard to accurately measure the effect of turning the idle mixture screws.

One solution to this problem requires the use of artifically-enriched propane adjustments. The added propane boosts the emissions by a known amount, and makes the effect of turning the mixture screws easily measureable. However, CO and HC can only be accurately measured while the propane is being added.

As computer-controlled systems were developed, it became possible to have the vehicle adjust its own mixture throughout the entire engine operating range, not just at idle. These "feedback" systems use oxygen sensors to measure how much unburned oxygen is left in the exhaust. The computer can then determine when the air/fuel mixture is too rich or too lean, and correct it as necessary. Even if a mechanic incorrectly adjusts the mixture, most computers can compensate enough so the vehicle will still run clean. In fact, the newest cars burn fuel so completely that changes in the pollutant levels after the catalytic converter are hard to measure accurately.

New vehicles are now adjusted by measuring the percentage of time that the computer-controlled system is adding fuel versus the time fuel is shut off. The mechanic checks this percentage with a dwell meter (normally used to measure the time a set of points is open/closed), then adjusts the fuel system until the percentage is correct.

Although many shops have exhaust gas analyzers which measure tailpipe emissions, manufacturers do not use CO or HC specifications for tuning. These specifications would be neither useful or possible for adjusting new vehicles. This manual provides procedures and specifications given by the manufacturers and does not list CO or HC specifications.

STATE TEST STANDARDS

Some states have established standards for testing used vehicles to see if they are still running clean. Generally speaking, these standards are given in CO% and HC ppm. They can be checked with an exhaust gas analyzer. Typical standards for newer cars would be less than 2.0% CO (non-catalyst) or 0.5% CO (with catalyst) and less than 200 ppm of HC. If vehicle emissions are below these levels, the vehicle passes inspection. The important thing to remember is that these specifications are NOT to be used for TUNING. They are only for testing to see if the vehicle is functioning properly. If it isn't, it must be tuned using the manufacturer's procedures and specifications, then tested again.

Test standards change each year and vary from state to state, and even by county within each state. It is not possible to provide an accurate and up-to-date list in this manual. Specifications can be obtained from your local county or state government. Remember that these standards are ONLY for test purposes. The manufacturer's adjustment procedures and specifications MUST be used when actually tuning a vehicle.