Oxygen Sensor Adjustment - General Information

Almost all modern vehicles employ oxygen sensors to tell the vehicle's computer if the air/fuel mixture is too rich or too lean. The computer uses the information from the 02 sensor to determine if more or less fuel should be added to the mix in order to maintain the correct proportion.

Gas vehicle engines (as opposed to diesel engines) are designed to operate at an air/fuel ratio of 14.7 to 1. When these proportions are being supplied to the engine, a certain amount of oxygen will be detected in the exhaust by the 02 sensor, and this information is fed into the vehicle's computer. If *more* oxygen is sensed, the computer thinks the mixture is too lean (not enough fuel), and adds fuel to the mix. Likewise, if *less* oxygen is sensed, the computer thinks the mixture is too rich (too much fuel) and cuts back on the fuel fed to the engine.

There's a big problem with this scenario as soon as you start adding a workable fuel efficiency device. For any given air/fuel ratio, burned more efficiently, the oxygen content in the exhaust will *rise*. If you have two or more efficiency devices installed, even more oxygen will be present in the exhaust. The oxygen content rises as the fuel is burned more efficiently for a number of reasons. Chief amongst these are a) less fuel is being used to produce an equivalent amount of horsepower, and b) less oxygen is being consumed to create carbon monoxide in the exhaust. The bottom line is there is more oxygen in the exhaust as the fuel burning efficiency is increased.

So, now that we have spent time and money to install a fuel efficiency device or two, and we are getting a more efficient fuel burn, what does the vehicle's computer do? It dumps gas into the mix in an attempt to get an oxygen reading in the exhaust equal to it's earlier, *inefficient* setup. This will then negate the fuel savings of just about any efficiency device, and in some cases will actually cause an *increase* in fuel consumption, despite having a workable fuel efficiency device.

The Solution

The handling for this situation is simple. The signal coming from the 02 sensor needs to be adjusted to compensate for the increased fuel efficiency being achieved. Basically the added oxygen in the exhaust fools the computer into thinking the mixture is too lean, causing it to (incorrectly) richen the mix. We need to un-fool the computer so it continues to give us the same amount of gas as before. We do this by making it think there is less oxygen in the exhaust than

there actually is. The amount of change to the signal has to be easily adjustable to accommodate the different types of efficiency devices that are available.

The oxygen sensor produces voltages to communicate the oxygen content to the computer. When the sensor reads below .45 volts, that means it's lean, and when it reads above .45 volts, it's saying the mix is rich. If you connect your volt meter to an oxygen sensor signal wire and ground, while the engine is running, you'll see the voltage is constantly changing, and you'll probably see voltages in the range of .2 to .8 volts or so. In actual fact, the voltage is changing back and forth from about .1 volt to about 1.0 volts, once or twice per second. But a hand held meter is not quick enough to show this. You can view our short Sensor Voltages Video, to see what the oxygen sensor signal looks like.

The EFIE adds it's voltage to the sensor's voltage, which shifts the voltage that the computer receives towards rich. This causes the computer to provide less gas. Many people think we're trying to fool the computer with an EFIE. That's actually not accurate. The extra oxygen in the exhaust because of a more complete combustion is what's fooling the computer. It's making the computer think the mix is too lean, and it's compensating by adding gas that is not needed. The EFIE is un-fooling the computer. All we want to do is get it back to giving us a 14.7 to 1 air/fuel ratio again.

It should be noted that an oxygen sensor handling device, by itself, is not a fuel efficiency device. It possibly could be used to control the vehicle's computer, and make the engine burn a little leaner, and this could *possibly* give a small increase in gas mileage. But this is not what it was designed to do. It was designed to complement, and in some cases make possible, increased gas mileage using other fuel efficiency devices.