Did I fix the failure, or not?

By: Scott Shotton

If you are like me, you probably like to prove a car has been fixed before you return it to the customer. Solving the customer's complaint, and knowing the problem is fixed, can be both rewarding and profitable. Most of the car repairs we perform can be verified with a simple test drive or the disappearance of a check engine lamp. However, some repairs are not so simple to verify. IM-240 failures are different.

The reason that an IM-240 failure is different is simple: the complaint cannot be duplicated. And if a technician cannot duplicate an IM-240 test in a shop's bay, like a misfire or engine noise, how do we know it has been fixed before we send it back to the test lane? The price of a dynamometer and a constant sampling gas analyzer to duplicate the test lane conditions aren't exactly cost effective. Guessing doesn't do the technician, shop, or customer any good either. As a result, we as technicians are left with a dilemma: Did we fix the car or did we damage the shop's REI and customer's opinion of us?

Relax. There is a way to gauge the effectiveness of an IM-240 repair using the portable four or five gas analyzer you probably already own. The whole formula hinges on a "reduction percentage". You need to take the test papers that were handed to you by the customer and figure out how much you need to reduce any given gas. Once you calculate this "reduction" then you simply apply it to your test equipment. It's really rather simple and here is how it works:

1. Establish a route around your shop that has some accelerations, decelerations, and cruise conditions. Remember the route because you will use it more than once.
2. Do not touch or repair anything on the car. Changes made between the initial failure and your baseline test drive will render this process useless. This includes anything done by the customer. Ask the customer questions to make sure. A simple set of 4 spark plugs that an owner installed in their driveway could skew the results enough to cause problems.
3. Connect your portable gas analyzer to the vehicle and drive your route. Record the gas data while you are driving so that you can review it when you return to the shop.
4. Choose one of the diagnostic calculations available on your particular analyzer. For example: average GPM or average emissions. Record these numbers as your baseline readings.
5. Now you need to calculate the reduction required to pass the test and a goal for the vehicle to beat that applies to your test equipment. In a nutshell, the formula goes like this: Reading / Standard = X and Baseline / X = Goal (or R/S=X and B/X=G).

   Example: Lets say the failure sheet from the test lane says HC reading is 2.50 GPM and the standard is 1.20 GPM. You did your baseline test drive and came up with an HC number of 4.25.

   2.50 / 1.20 = 2.08 (R/S=X) then 4.25 / 2.08 = 2.04 (B/X=G) therefore your HC goal is 2.04.

   Using the failure sheet and your readings, you have just calculated the HC number to beat as it pertains to you test equipment.

6. Fix the failure. Use whatever method you deem appropriate to fix the problem at hand.
7. When you believe you have the problem solved, repeat step 3 as close to the original drive as possible. Be sure to record the gas information again.
8. Use the same function as step 4 to find your finished readings.

   Are your finished readings lower than your goal? If that's the case then the problem is solved and the car can go back to the test lane. If not, it's back to the drawing board to find what you have missed. Another test would only result in another fail and all the headaches that come with it. However, you can continue fixing the car without starting completely over. Your calculated goal

from the first test drive still remains the same.

To summarize the whole process: you take the test lane numbers, calculate a reduction, apply this reduction to your test equipment, and use that information to check your repair.

Here are some important things to remember:

1. Keep as many constants as possible. For example, have the same test drive route.
2. Make sure the car is fully warm and try to get the catalyst hot before your test drives. If you do this the converter might be functioning more efficiently than it was during the emissions test and skew the your calculations in the test lanes favor. The result in that situation would set a slightly higher standard for you to meet. Meeting this standard only increases your chance of passing the next test.
3. Keep records of the work you have done. If you do this you will have something to refer back to when questionable results are obtained.

After developing this method, and using it for the duration of IM-240 here in Illinois, I can honestly say that it has proven to be a tool that I would not tackle an IM-240 failure without. Barring the occasional freak incident, such as an intermittent MAP connection on a Taurus or an O2 on a Hyundai that quits during the second test, it has been extremely effective. I hope you find the same results.