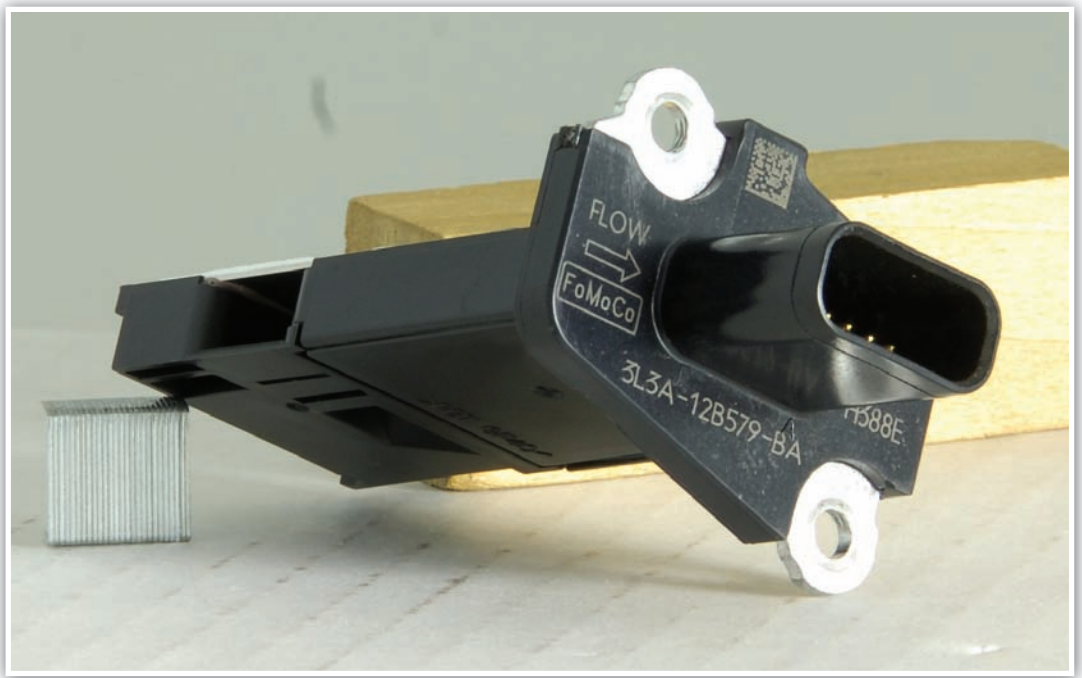
We use a microscope capable of 500x magnification, because it is nearly impossible to inspect a sensor accurately with the naked eye. If any contaminants other than normal wear or dust buildup were observed on the sensor, we would send the sensor to a forensics lab to have the contaminant identified. We also installed the sensor into a test fixture that we built with a variable airflow source. Then through computer-aided data acquisition we checked the sensor's function. Surprisingly, almost two-thirds of the sensors we test function normally and have nothing wrong with them. In the few cases where a contaminant was present, the sensor would still function, but it would cause the sensor to give an inaccurate reading. Common sensor contaminants that we found were silicone, trace oil (such as PCV vapor), or a material defect which causes de-lamination or complete electrical failure (loss of conductivity). Our experience has shown that when a dealer takes the results of our testing and uses the information we provide to fix the problem, the customer walks away satisfied.

With the increase in popularity of turbocharged vehicles, another area in which we have occasionally experienced misdiagnosis is that of turbocharger failure. Again, our research found that most diagnoses were based upon a visual inspection of the turbo inlet and compressor wheel. Unlike mass airflow sensors, the turbo is larger and easier to inspect, and also much more expensive to replace, but its location inside the engine compartment doesn't always allow easy access to make an accurate visual inspection.

Customers usually bring the vehicle in due to a drivability problem, be it lack of power, smoke in the exhaust, engine noise, or some combination of concerns.

On the rare occasion that one of our consumers approaches us with a possible turbocharger failure, we follow a specific, thorough procedure for diagnosis. Many times, we will acquire the turbo core from the consumer's service department and completely disassemble it in our lab. We also collect the air intake equipment from the vehicle and perform a filtration test, to see if the filtration equipment contributed to the turbo's demise. Finally, we obtain an oil analysis to check for abnormal wear patterns in the engine. Only then can we start to see an accurate picture of what happened. We have observed a number of turbo failures which were diagnosed as ingestion / filtration issues, but actually turned out to be completely unrelated to the intake / compressor mechanism.

> "When we first looked into repairs our consumers had paid for related to the mass airflow sensor (MAF), we discovered that we needed to backtrack to find out what happened when the car was in the hands of the service department."



Mass airflow sensors can become contaminated from PCV vapor, a potting compound leak from the circuit board, unburned fuel, water – even a spider searching for a new home. Unfortunately, visual inspection usually won't reveal if contamination caused a sensor to fail; nor will it determine if a sensor still functions.