



FULL CIRCLE BY FRANK MASSEY

ELECTRONIC FUEL INJECTION

Although now a part of total engine management fuels injection control can be examined as a separate subject.

A note of caution, never begin to evaluate fuelling without establishing the quality of the ignition system, often emission errors are due to poor spark burn time.

Fuel injection testing can be split into two distinct electronic and mechanical. Let's consider the mechanical finders first.

The fuel pump is responsible for lifting fuel from the tank and supplying the fuel rail at pressure with enough flow to meet all load conditions. The pressure regulator controls the rail pressure.

The fuel is delivered into the cylinder via the manifold by solenoid injectors whose delivery rate and spray pattern ensures efficient fuel atomisation.

Now the science bit, always check flow first, never check flow, with less than 1/3rd full, check the rate of flow on the return circuit open into a container and examine the contents for contamination and cavitation (air pockets). Next check pressure, connect the pressure gauge on the supply circuit before the pressure regulator. Reminder air compresses therefor may give us a false pressure test, resulting in a lean mixture and noisy fuel pump. Closing the return circuit is an excellent proof test for pump pressure and current, the integrity of the fuel lines is also tested. The pump pressure should double with a current rise of no more than 2-4 amps increase. Injectors can only be tested off the vehicle in a professional flow bench; period we operate an ASNU bench, which can simulate all speed load conditions, the important factor pattern and flow rates must balance. Electronic testing demands completely different skills and test equipment. There are two opinions; both can be used together for a completely focused view.

1. Serial communication, how the ECM "sees" the inputs.
2. Parallel circuit testing the "actual" inputs. A simple rule that must never be broken, check inputs, power and ground references before considering an output error. The definitive electronic test tool is the oscilloscope, a high performance electronics industry standard oscilloscope is without compromise, when accessing an electronic circuit. Injector pulse time and circuit measurement will produce all the necessary data to evaluate the circuit, component and ECM testing.

The technique of using serial and parallel testing is essential to evaluate the ECM response to the various inputs. Serial data values must match exactly with actual nput values, if they do not, then the ECM is suspect, not omitting the power and ground references. To be honest it's not always that simple but you will be amazed how often it is.

Closed loop control, the subject where the week fear to tread. It's quite simple, like man and wife the lambda sensor and ECM are always disagreeing. The lambda sensor if operational will monitor the content of oxygen in the exhaust and send a control signal to the ECM fuel pulse time. However it has no artificial intelligence, an air leak up stream will confuse a normally fuelling engine into a rich fuelling error, the ECM like the husband just does what it's told. The exhaust gas analyser is for me the last diagnostic tool i would choose, an error here is caused at the engine, so start there. Never replace a damaged catalyst until the fuelling is correct. Rely on a correctly switching lambda sensor before assessing the catalyst performance never replace a damaged catalyst until the cause is rectified. This brings us back to ignition misfires are the kiss of death to a catalyst.