



# Fuel Rail and Injectors: Fuel Rail Leak Test And Verification of Injector Functionality

## SCIOMETRIC POWERTRAIN SOLUTIONS

### Challenge

An automotive engine manufacturer was experiencing some difficulties with testing the integrity and operation of the fuel injectors during the production process. The inaccessibility of the injector nozzles and the method of assembly made it impractical to test each injector individually. In addition, delaying the test until end-of-line when the engine is fully assembled was resulting in costly teardowns and production delays.

### Solution

Sciometric's test system provided a quick, cost effective and practical solution to address the manufacturer's challenge. The test is independent of the number of injectors that the engine uses, and it is done without disturbing assembly since the test fixture is only attached to the fuel rail at the fuel inlet.

At the start of the test, all injectors are turned off and the fuel rail is leak tested. Then pressurized air is forced into the fuel rail through a "sonic" nozzle (this restricts the rate of air replenishment). This catches more serious defects such as leaks and open or missing injectors are revealed.

Secondly, a pressure sensor is connected to Sciometric's test and analysis system input to detect changes in back pressure on the rail as each of the injectors is turned on and then off sequentially. In this particular test the pressure sensor is connected in reverse so that the operating range of each injector appears at the top of the screen. The signature analysis software allows the waveform to be analyzed in specific windows so the functionality of each injector can be thoroughly checked. (The screen shot shows the pressure waveform for an engine with eight fuel injectors.) Defects such as

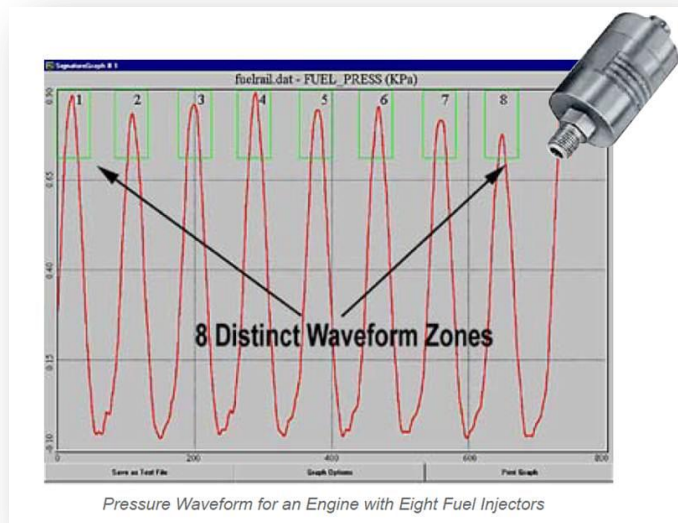
### FUEL RAIL LEAK TEST AND VERIFICATION OF INJECTOR FUNCTIONALITY KEY FEATURES

- Two-part test finds fuel rail leaks, missing injectors, broken or sticky injectors as debris
- Reliable 100% verification of all fuel injectors
- Single PASS/FAIL indication
- Eliminates costly teardown after engine assembly



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debris, sticky or broken injectors can be detected by analyzing and comparing the shape of the pulses against known good pulses. The system can use a single sensor to verify an assembly having many separate functional components, providing reliable 100% in-process testing and a simple PASS/FAIL indication to the operator.



## Results

Through the implementation of Sciometric's solution, the manufacturer was able to successfully test the integrity of each fuel injector and the operation during production. The system's ability to detect the various defects associated with fuel injectors during the production process led to increase in defects found early on, resulting in a decrease in repair costs after full engine assembly.

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