

# FSI Fizzle

*This article is a true description of an AECS technical help desk problem and how it was solved.*

## Vehicle

2005 VW Golf GTX 2.0 Ltr FSI (AXX engine).

## Problem presented to the Helpdesk

This car was presented to a workshop with AECS support by another garage.

Engine starts and idles fine, but as soon as you try to accelerate, the engine fizzles away. No misfiring, it just runs out of power.

Fuel and air filter have been replaced, which made no difference.

We have measured ignition over injection and seen nothing irregular. It feels as if the throttle shuts without lifting your foot off the accelerator.

We looked at relation faults, for example speedo not working, steering wheel in an angle, ABS issues, gear change faults (all reasons for the accelerator to be shut by the engine ECU). There are no fault codes.

*What would you suggest we do next?*

## Technical support help desk.

Let us first determine if the ECU actually shuts the throttle by measuring the throttle position sensor. The throttle position sensor scope recording showed that the throttle never got controlled back to the closed position when the engine ran out of power. We needed to look elsewhere.

## Stratified

On FSI engines (direct injected), it is hard to hear when the mixture becomes too lean as they are meant to still run fine on super lean mixtures. When a 'normal' engine starts to develop lean burn misfire, some direct injected petrol engines, due to the shape of the piston and combustion chamber, still sound fine. The shape of the combustion chamber is such that the part of the intake gasses holding the richest

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mixture is directed to the spark plug (stratified mixture), still allowing combustion.

Let us look at fuel pressure as the injection duration showed nothing untoward (no backing off) in the injection vs ignition recording.

However, when the injection rail runs out of fuel pressure the power of the engine runs out.

## Pressure control.

This is where on VW direct injected engines things become nice and complex. In the EMS 1-3 Training seminar we focus in depth on low fuel pressure closed

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loop control and high fuel pressure closed loop control and how the two control systems support each other. Read the following carefully: The low pressure system is an EFI lift pump in the tank which is controlled by its own separate controller. It works in closed loop with a low pressure sensor in the high pressure pump.

This low fuel pressure (up to 6.5 Bar) enters a high pressure pump which is running off the camshaft. The pump has a pressure control valve which is controlled by the engine ECU as a direct result of a high pressure sensor signal in the fuel rail (closed loop control).

## Launch data block

Before looking with the scope, let us look at the fuel pressure on the Launch Scan tool.

On VW products, the scan tool data comes out in data blocks. The reason for this is explained in the SCAN1 course. Each data block has got its own diagnostic purpose, but not knowing what data each block holds makes it hard to find the correct block.

We advised to use data block 106, which holds rail pressure control information and of which two lines were of great importance; Line one: Fuel rail pressure, and line two Electric fuel pump duty cycle.

We were reading in block 106

Fuel rail pressure 5.1 Bar

Electric Fuel pump1 89%

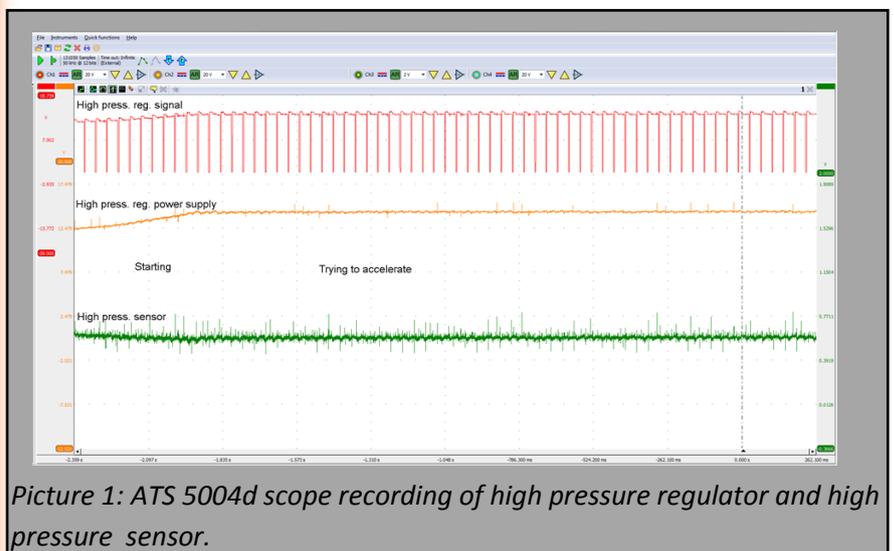
When revving up the rail pressure fell back to 4.5 Bar, while the engine bogged down.

The live data showed that the fuel pressure stayed too low and that the low pressure pump is almost fully activated (89%). In this FSI system, the low fuel pressure pump is regulated back at idle to conserve energy.

## Measure

Is the pressure staying low as a result of a fault or a restriction in the low pressure system?, or is the pressure low as a result of a problem with the high pressure pump?

Time to measure, we needed to see the high pressure sensor, the high pressure control valve duty cycle and its power supply.



Picture 1: ATS 5004d scope recording of high pressure regulator and high pressure sensor.

From the above recording, it can be read that the pressure control valve

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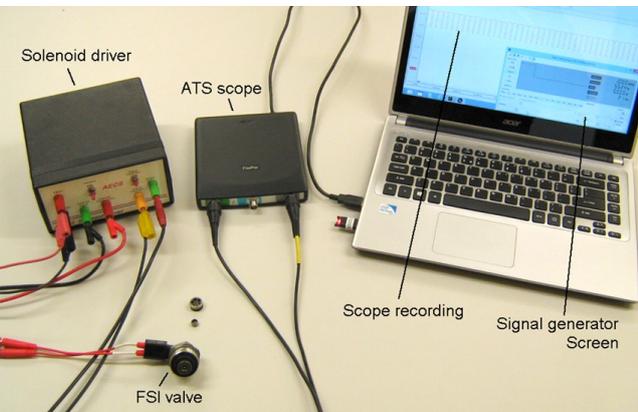


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*ATS scope and solenoid driver, connected to FSI high pressure control valve on AECS bench during tech assistance.*

This had absolutely no effect on the high pressure sensor reading, leading us to conclude that the 5 bar present in the high pressure rail was solely coming from the low pressure pump. Also at this stage it was not

important anymore to see if the valve was NO or NC type. The logical following conclusions were that the low fuel pressure system was fine, and that the problem was with the high pressure pump or pressure regulator valve.

Since the high pressure valve is fitted in the high pressure



*High pressure pump with FSI pressure regulator.*

pump, the decision was made to remove the pump from the cylinder head and inspect it for mechanical damage on the bench.

High pressure pump with FSI pressure regulator.

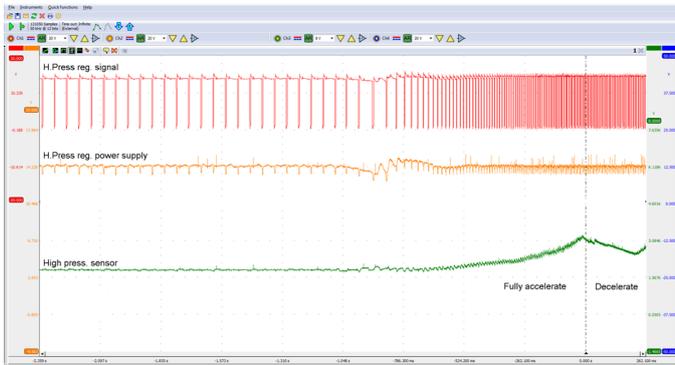
**Beauty!**

The diagnostician saw immediately what the problem was. The pump plunger shaft is running on a cam lobe on the end of the cam shaft. The plunger shaft has a 'bucket' (very much like tappet buckets) fitted, to stop the cam shaft from bending the plunger shaft when it is rotating.



The bucket (cam follower) was totally worn through,

causing the pump plunger having no lift at all anymore. No pump plunger lift stops the pump from pressurising the fuel in the high pressure rail!  
 A new cam follower was fitted, after which the diagnostician recorded the following data:  
 In the recording of this now perfect running vehicle, it



*ATS scope recording of high pressure regulator and rail pressure sensor.*

can be seen that the high pressure sensor rises and falls with demand on the engine. Also with the Launch scan tool reading data block 106, we read;

- Fuel rail pressure 49 Bar (idle) and 107 Bar (at 3000rpm)
- Electric Fuel pump1 36% (idle) and 42% (at 3000rpm)

**Charge**

This was beautiful data, we at the help desk were confident that this car was perfect plus the customer is happy. Time for the workshop to charge for an efficient job done!

**Conclusion**

To come to the conclusion that, the high pressure pump was faulty could not have been done in the same short

period of time without the ATS scope and solenoid driver. Maybe with luck that someone would have pulled the pump off to have a look, but otherwise the job would have gone down the path of swap and change parts to see if that fixes it.

The most intriguing part of the job to me was that this car ran without misfire when running out of power (fuel). I had asked the very experienced diagnostician if according to his feeling the bogging down was sounding like a lack of fuel or the throttle closing on this drive by wire throttle system. To him it sounded like the throttle backing off.

For example on Hondas (e.g. the Stream), a similar symptom occurs, but here the lobe wears away from the cam shaft. Older Mitsi GDI's also have cam shaft and filter problems.

It is advisable to make sure that engines like these get the exact correct type of oil and that the long service intervals get ignored! Extreme pressures and forces on the oil are present even under every day running circumstances.

The three of us at the AECS help desk are extremely busy with an enormous and ever increasing amount of electronic faults on cars. However, the fault in this article was mechanical. We used our electronic knowledge to help diagnose the fault quickly and accurately.

Quality back up from your equipment provider is surely just as important as quality tools!

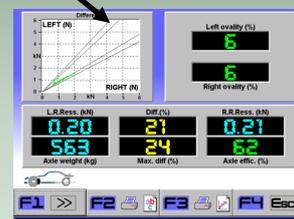
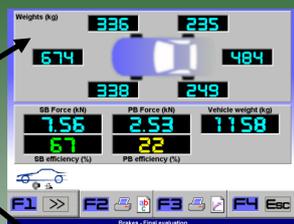


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