



BISH, BASH, BOSCH

If Stu's previous features have got you thinking about Bosch fuel injection, here are some things you need to know.

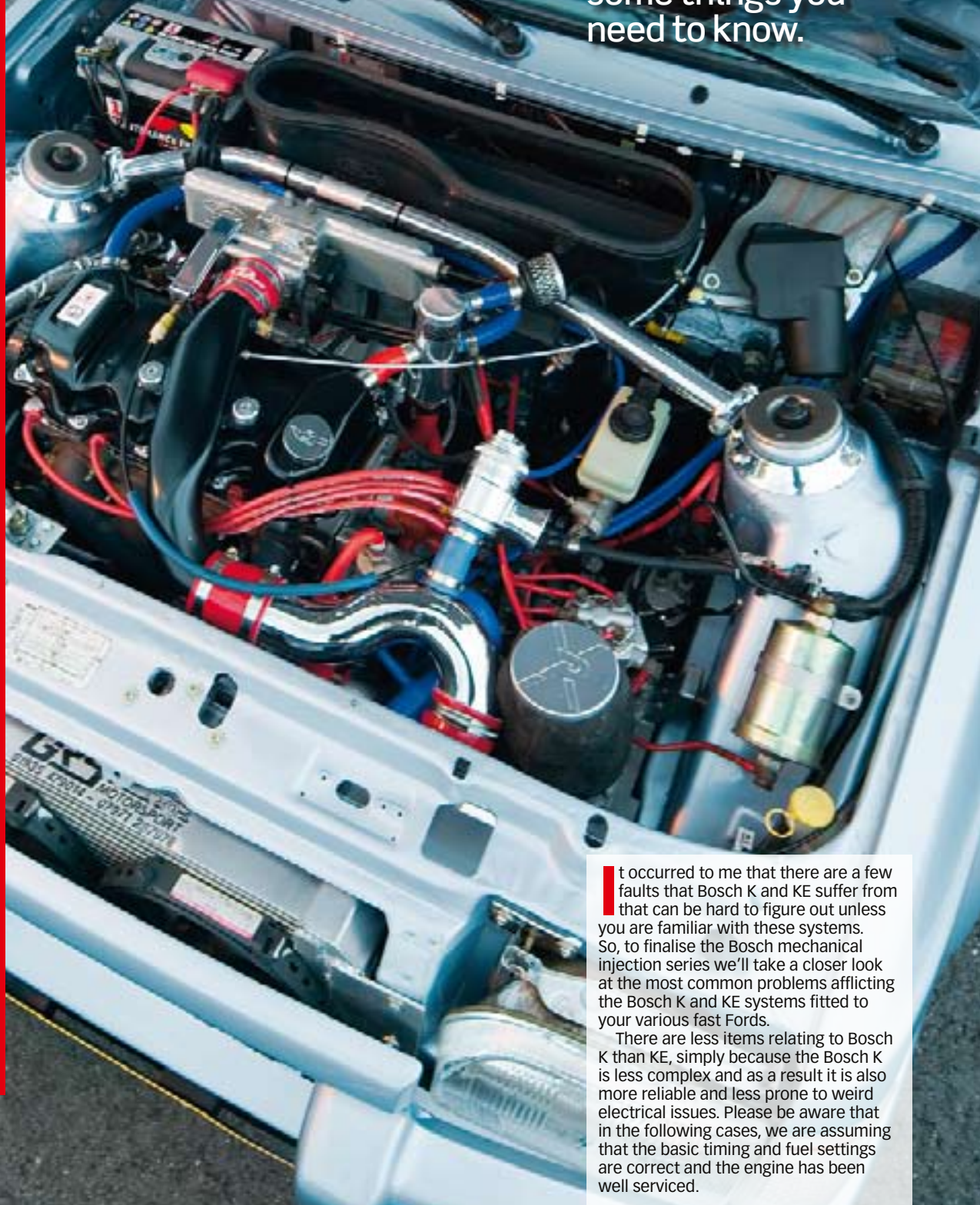
Having worked as a tuner for 17 years, Stewart 'Stu' Sanderson is one of the most-respected names in the business.

A Level 5-trained fuel-injection technician, Stu has worked for a Ford Rallye Sport dealer, a well-known fuel-injection specialist and various tuning companies.

Seven years ago he joined forces with Kenny Walker and opened up Motorsport Developments near Blackpool (01253 508400, www.remapping.co.uk), specialising in engine management live remapping, as well as developing a range of Evolution chips which are now sold all over the world.

He's jointly responsible with Webmaster, Petrucci for www.passionford.com. Started in 2003, it's grown rapidly from a few friends contributing, to one of the biggest Ford communities on the web. His new forum, www.fordrsforums.co.uk, is running too.

Stu's enviable knowledge of the workings of modern-day Ford performance engines means that every month he's just the man to explain how and why things work, and importantly how they can be improved.



It occurred to me that there are a few faults that Bosch K and KE suffer from that can be hard to figure out unless you are familiar with these systems. So, to finalise the Bosch mechanical injection series we'll take a closer look at the most common problems afflicting the Bosch K and KE systems fitted to your various fast Fords.

There are less items relating to Bosch K than KE, simply because the Bosch K is less complex and as a result it is also more reliable and less prone to weird electrical issues. Please be aware that in the following cases, we are assuming that the basic timing and fuel settings are correct and the engine has been well serviced.

1 POOR QUALITY IDLING AND STALLING

This is a problem with both systems, and when not found to be caused by poor mixture it is almost always down to air leaks. Let's look at the various causes individually...

LEAKING OIL FILLER CAP

I wonder how many of you want to know whether your CVH stalling when you take the oil filler cap off is correct?

Well, you can relax, because it is right if the breather system is as per Ford's design and goes back to the air box. If your base fuel mixture setting is correct, then the smallest of air leaks will compromise your fuelling to the point the idle speed may become unstable, or worse still your engine may actually stall.

The seal on the oil filler cap can introduce a fresh air source to the cam cover and thus the crankcase, which in turn is piped into the metering head. So, technically air leaking in via the oil filler is no different to air entering through a leaking intake pipe, or any other part of the intake system.

All air leaks are to be avoided but most people don't see the connection between the oil filler and the intake system, but there is one with the CVH systems. The same goes for dipstick tubes - make sure they are sealed and airtight or the same can happen.



Leaking oil filler cap can actual cause poor idle speed or even stalling

CRANKSHAFT OIL SEAL

I've had many a CVH in with unstable idle speed and the rest of the system's absolutely pristine, making it hard to figure out what it was. It often turns out that they had an oil leak from the crankshaft oil seal inside the bellhousing.

Fixing that oil seal stopped the air leak into the sump and restored the idle to how it should be. An oil leak here can introduce air too, and that is just like having the oil filler cap off.

AUXILIARY AIR VALVE PIPING

There's no real reason for this to be common other than the fact it isn't a great fit when it's had a few years' use. The rigid auxiliary air valve pipes have a rubber-sleeving piece inside them, which perishes with age. They are no longer available from Ford, but a smear of sealant usually makes this airtight again and restores idle quality.

2 INCORRECT IDLE SPEED

It's not uncommon to find an increased idle speed being caused by an auxiliary air valve that's seized in the open position allowing extra air through to increase idle speed. Close the pipe down between that item and the throttle body. If the speed drops, the valve's open and you need to find out why.

The most common cause of idle speed being too low, is that the air bypass channels in the throttle body and the area around the throttle butterfly are filthy. Often a good clean of these items will result in a nice idle speed again. Failing that, a tweak of the idle speed screw under the throttle body normally has you back to speed again, if everything else has proven to be correct.

3 REVS HUNTING UP AND DOWN

This is almost always caused by too lean or too rich an idle mix. The cure? Have it adjusted. (I know I mentioned that we're assuming fuelling is correct, but it's so common I wanted to mention it.)

4 INCORRECT DUMP VALVE/FAILURE

I would hazard a guess that 75 per cent of Escort RS Turbos are fitted with dump valves, and they cause nothing but problems due to a number of them being the wrong type for the engine.

If you have a diaphragm or single piston dump valve operating without the aid of an electronic dump valve controller, your engine is set up wrongly in order to accommodate it. You should get a pro to set it up with a twin piston dump valve as soon as possible.

A single piston or diaphragm dump valve should be open when the throttle is closed. Bosch K and KE cannot meter the correct amount of fuel for idle passing through the air flap if there is a big hole in a pipe somewhere, in this case the dump valve. Take it off and get one that only opens when under positive pressure or better still, take it off altogether unless your tuner has recommended otherwise due to your turbocharger type.



The wrong type of dump valve is a common problem on RSTs

5 ENGINE CUTS OUT WHEN USED HARD

Total loss of engine drive when used hard for maximum acceleration is common, but causes can vary. Some of the early cars had a mechanical rev limiter built into the rotor arm and when these develop faults they can activate by accident, so well worth checking those out.

Another common cause is an over boost situation on a turbocharged version. The ECU has a built in boost limit; if you exceed it you will find the ignition is cut out. The solution in this case is to lower the boost back to where it should be by means of adjustment or repair if there is a damaged actuator.



Faulty mechanical rev limiter can often cause problems

6 SUDDEN LOSS OF POWER ON BOOST

This can be a number of things, and if your boost hoses are standard, then it's likely to be that the intake hose is collapsing with the inlet depression. It's not easy to diagnose as you need to be able to see the hose in action, but a good clue is the boost gauge reading falling right off at the same time.



7 EXCESSIVE FUEL CONSUMPTION

Feeling the pinch every time you fill up? Check your car's fuel consumption against the manufacturer's figures. There can be a few causes, so let's look at them one at a time.

COLD START INJECTOR

With Bosch K and KE it could be down to a leaking cold start valve, so unplug it and see if that helps. If it does, bear in mind that the thermo time switch could be activating it when it's not required. Don't just assume it is faulty.

COOLANT TEMPERATURE SENSOR

On the KE systems, it could easily be a faulty coolant temperature sensor causing the problem, telling the ECU the engine is cold when in fact it is hot and so doesn't require the extra fuel at all. Details of where it is and what it does were discussed last month.

MALADJUSTMENT OF FUEL PRESSURE

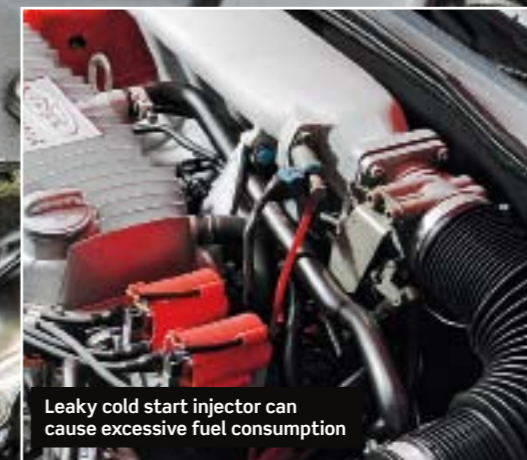
The most common thing I find is that people have just tuned their cars badly. On Bosch K I see too much fuel pressure caused by the shims, and on KE I find people have gone bananas on the electro hydraulic fuel pressure actuator to get more fuel for on-boost. This is a bad way to tune and the system will need a pro to put it right again safely.

POPPING AND BANGING ON THE OVERRUN

Mainly for Bosch KE and is caused by maladjustment of the throttle position sensor or failure of one of its switches. If this switch doesn't activate at idle, the ECU won't operate its overrun fuel shut-off strategy, so you will run rich on overrun and use more fuel for nothing. Get it fixed/adjusted.



Maladjustment of TPS can cause popping and banging



Leaky cold start injector can cause excessive fuel consumption

8 HOT AND COLD STARTING PROBLEMS

The Bosch K and KE systems can suffer from starting problems when either hot or cold. The main culprits are:

BLACK BOX ON KE

These problems are most common on the Bosch KE black box. This box controls the extra fuel for cold start via the electro hydraulic pressure actuator and it can be inoperative for a number of reasons. The most common is that its fuse is missing. Labelled as the heated seats it's no surprise owners don't think it's an important one. It's not uncommon for the box to fail totally and supply either none, or too much current at all times. Depending on which yours has done would depend on whether it affected hot or cold start. If it's hot starting issues, unplug the pressure actuator and see if it starts easier, if it does, look at the black box or any input signal that may cause it to think that the engine is cold.

COOLANT TEMP SENSOR

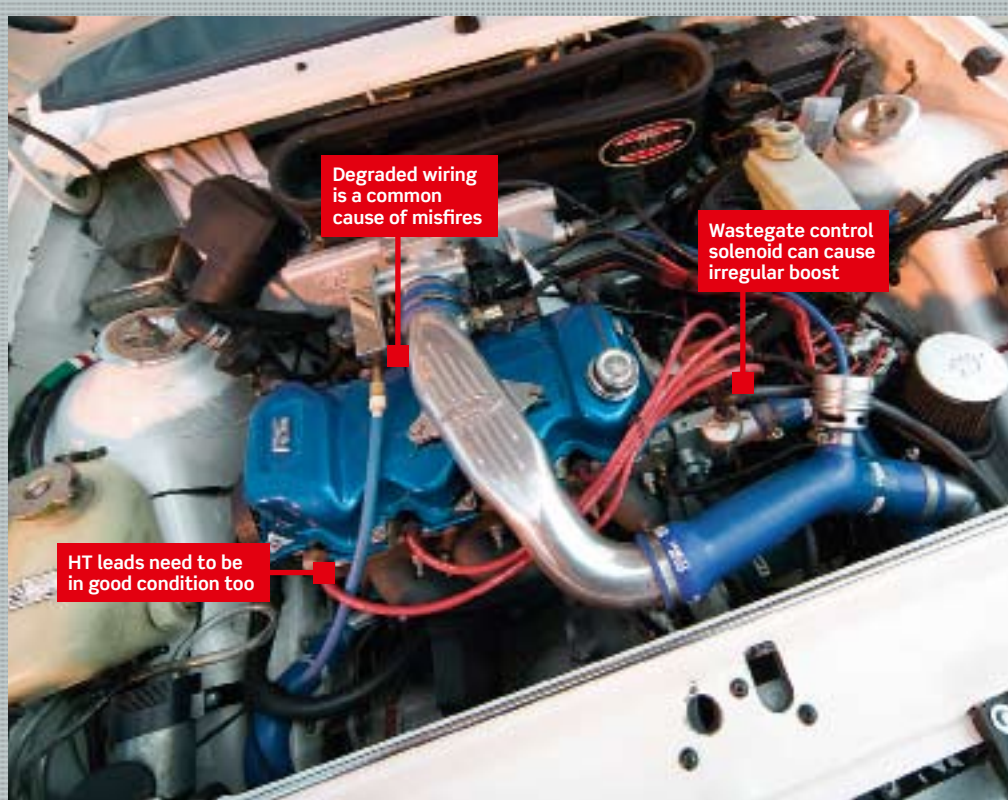
On KE systems, it could be a faulty coolant temp sensor causing problems. It may be telling the ECU the engine's cold when it's hot, or that it's hot when it's cold. This will mean starting fuelling will be incorrect and it may not start, or it may run poorly once it does. Location of this sensor and what it does was discussed last month.

COLD START INJECTOR

With Bosch K and KE it could be a leaking or inoperative cold start valve. However, these tend to cause bad warm start, as they are only used when extremely cold and in the UK rarely operate. If it is activating and causing poor warm start, the thermo time switch could be activating it when it's not required.



'Black box' is a common failure on KE systems



Degraded wiring is a common cause of misfires

Wastegate control solenoid can cause irregular boost

HT leads need to be in good condition too

9 GENERAL MISFIRES

Bosch K and KE ignition systems varied from car to car and none of the installations are particularly prone to misfires, so look at general ignition system

condition, paying attention to rotor arms when they have the mechanical limiter built in.

Spark plugs, gaps, HT leads and caps all need

to be in great condition, as does the main ignition coil or coils. Don't overlook coil voltage, this needs to be around alternator voltage for a good system. I've seen them right down in the 9v area due to bad or old and degraded wiring.

Escort RSTs are afflicted with two common but hard to find misfire problems. One is the green signal wire that comes out of the distributor. This wire goes all the way to the front of the car, and then across the lower cross member, before travelling up the inner

wing on the driver's side, and across to the ECU. On more than a few occasions I've found that this wire has rubbed through near the intercooler area, causing intermittent ignition misfires and sudden power loss.

If you get a misfire that nobody can trace and it's from none of these suggestions, try unplugging the wastegate control solenoid, even if it's not plumbed in. When these fail internally it shorts the ECU out and the only clue is a real headache to find misfire...



Faulty plugs and incorrect plug gaps cause misfires

10 IRREGULAR BOOST PERFORMANCE

A common problem for the turbocharged cars is sudden lack of boost. Complaints like one minute you have full boost, next you don't, are common. The most common cause is a faulty wastegate control solenoid valve or a poor connection to it.

The wastegate control solenoid bleeds signal away from the wastegate and increases the boost pressure. If you turn it off/ remove the plug from it, your boost will drop. Check the connection is clean and that it doesn't have an intermittent or broken connection on the valve.

The other most common cause is a sticking wastegate. We come across turbos with wastegates that jam halfway in so that after boost has been achieved and you back off, the wastegate doesn't fully close. As a result you will have no, or a lethargic, boost response.

CONCLUSION

This list of faults is not exhaustive by any means; I have just attempted to give you the common problems that we see and an idea as to what may cause it.

NEXT MONTH

Breather systems: what are they and why do we need them?