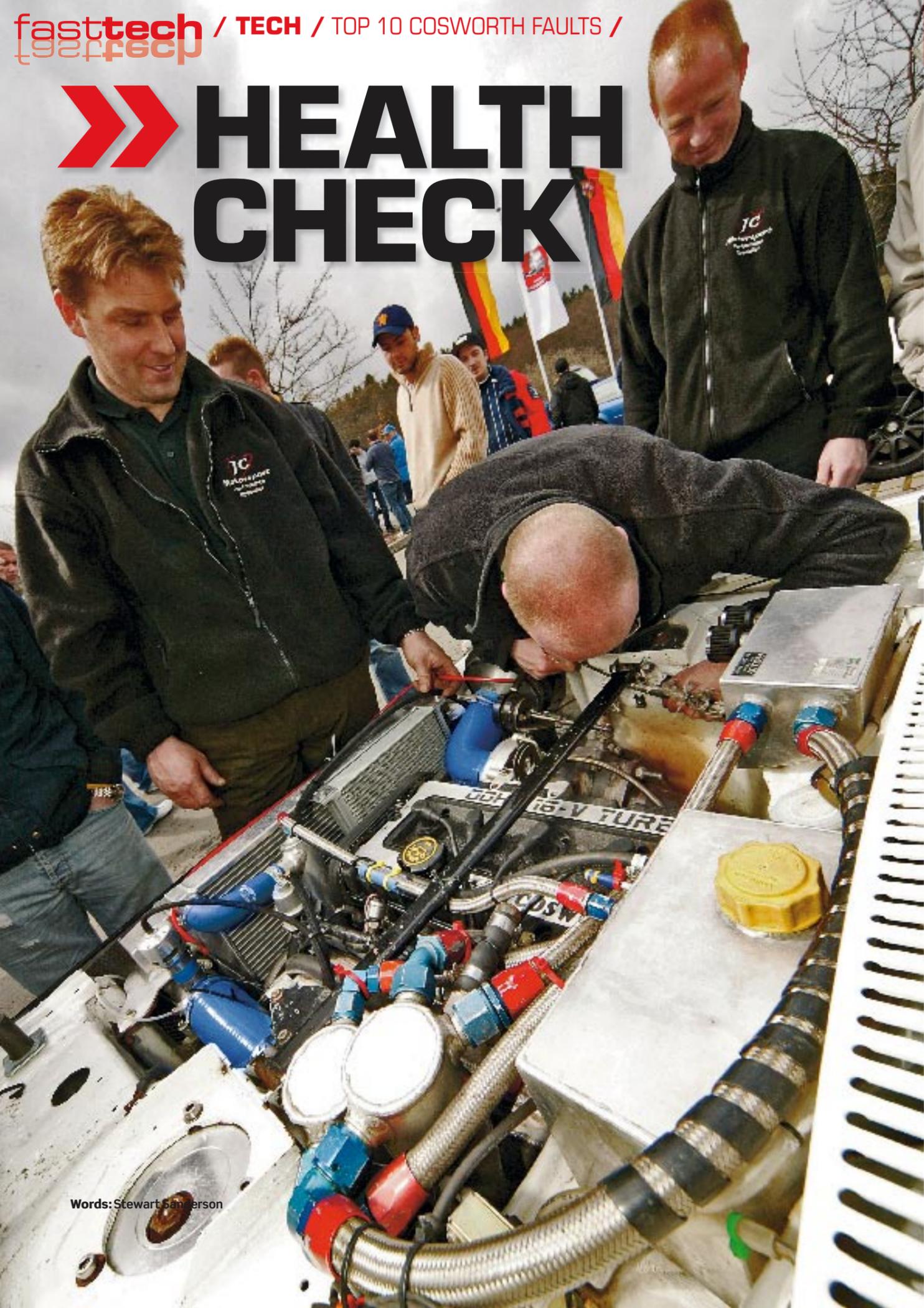


HEALTH CHECK



Words: Stewart Sanderson

Escort or Sierra Cosworth not running as well as it should? Stu explains his top 10 Cossie-related problems and how to fix them.

AS I am sure many of you know there has been an influx of topics on my forum recently (www.passionford.com) about the unreliability of Ford Cosworth engines and how they are constantly breaking down and/or blowing up. This is a sad state of affairs because the Cosworth is in fact a very reliable vehicle as long as it's looked after properly. These cars were extremely reliable for many years, but

now that the youngest one is around 12 and the eldest around 22 they do, like any old vehicle, have their inherent age-related problems that can cause

breakdowns, misfires and even complete engine failure. I thought it would be nice to do a feature covering the top 10 things that tend to go wrong, why those

things go wrong and how much it costs to fix them. Let's take a look at the more common problems afflicting your common or garden Ford RS Cosworth.



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, in the past Stu has worked for a Ford Rallye Sport dealer, a well-known fuel-injection specialist and various tuning companies.

Then 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 also 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.

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 most importantly how they can be improved.

1. ENGINE MELTDOWN DUE TO FUEL PUMP WIRING

WHAT GOES WRONG AND WHY?

This is caused by nothing more than old age creeping up on the wiring. We should ideally have alternator voltage at the fuel pump itself so anywhere between 13 and 14 DC volts is fine. The problem is that this is a high current circuit, and as the years go by this high current takes its toll on the various contacts within the system such as the supply relay and the connectors in the boot, as well as on the terminals of the pump itself.

It's not uncommon to find the system as low as 9 volts on boost. Yes, on boost, as this will be a very different voltage reading to the one you get at idle due to the extra current drawn when the fuel pressure goes high. (See fuel pressure article in FF Issue 242 for more details), not to mention the other electrical

devices sharing that same fusebox spur like the entire engine management system for instance.

The lower the voltage goes, the less fuel we can get from the pump under boost and when it's affecting the ECU. This means as well as having less fuel delivered to the injectors, they actually open slower too, meaning even less fuel delivered to the engine overall. The results can be catastrophic.

HOW TO SORT IT?

It is relatively straightforward to sort this problem out. All we need to do is run a totally new and independently-fused power supply spur from the battery itself, right the way through the car to the boot area and mount a new high current capable

relay there to switch the new supply to the pump on and off. It is very important that on road cars the pump activation switching itself is still performed by the ECU as per OEM specifications, so don't stick it on a silly switch.

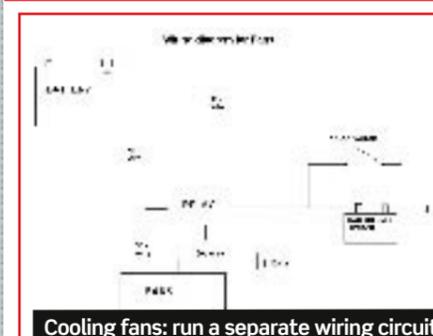
HOW MUCH?

The cost of a full pump rewire including wire will obviously vary according to labour and parts rates, but I would expect the labour and relay etc to cost you around £100 all-in.



Fuel pump wiring: redo it!

2. OVERHEATING DUE TO FAILED COOLING FAN CIRCUIT



WHAT GOES WRONG AND WHY?

This is a very common problem that afflicts all Sierra Cosworths right from the original three-door back in 1985 up to the facelift Sierra Cosworths of 1993. The cooling fan

circuit was upgraded from standard Sierras to a high-power, twin-fan system to cool the mighty Cosworths after a hard run.

However, Ford didn't see fit to upgrade the wiring harness too. That left

us with woefully inadequate power supply wiring and fuse system for such a high current circuit. In time, these circuits burn out quite nicely, leaving a molten mess in the fusebox that once resembled a fuse.

Just replacing the melted fuse is not the solution. If you inspect the terminals you will find they are a mess, as is pretty much all the wiring anywhere within 6 inches of any connection in the system. It's not unknown for the generated heat to damage the wiring in adjacent

circuits, so check the fusebox carefully.

HOW TO SORT IT?

In much the same way as we rewired the fuel pump circuit, we would rewire the fan circuit too. Normally opting for a pair of relays instead of one, we would supply an independently-fused twin spur from the battery to the fans, giving each their own power relay and activation circuit.

HOW MUCH?

You should expect to pay around £120 for a decent fan supply with all parts and labour included.

3. POOR-FITTING PRESSURE PIPES LEADING TO TURBOCHARGER FAILURE

WHAT GOES WRONG AND WHY?

Turbocharger failure is a common one on the YB, but why? Are our turbo suppliers all giving us substandard turbos or is there an underlying cause? Well, in 80 per cent of cases there are other causes. One of the things we do, as part of a set-up at MSD is to pressurise the intake system to a little above whatever boost you intend to run.

On a YB with let's say a T34 and Siemens injectors, we would pressurise your entire system to 36 psi and see what leaks. You would be astounded; I estimate that only 1 in 20 cars pass this test! Normally leaks will be found from 10 psi onwards. The engine would have been leak-free if left standard. Funny how standard ones were also reliable too, eh?

So, why does an air leak kill turbos? Well, a turbo is designed to flow air as a volume, so let's say our turbo is designed to reliably provide 35 lb per min of air at 2 bar of pressure all day long. Now imagine you have set your boost to 2 bar as the manufacturer suggested, but we had a lot of quite large air leaks. The first thing we have is more lag, but you may blame this on your new bigger turbo. More importantly, as far as reliability goes is the fact that the turbo, due to the way a wastegate operates, will continue to supply

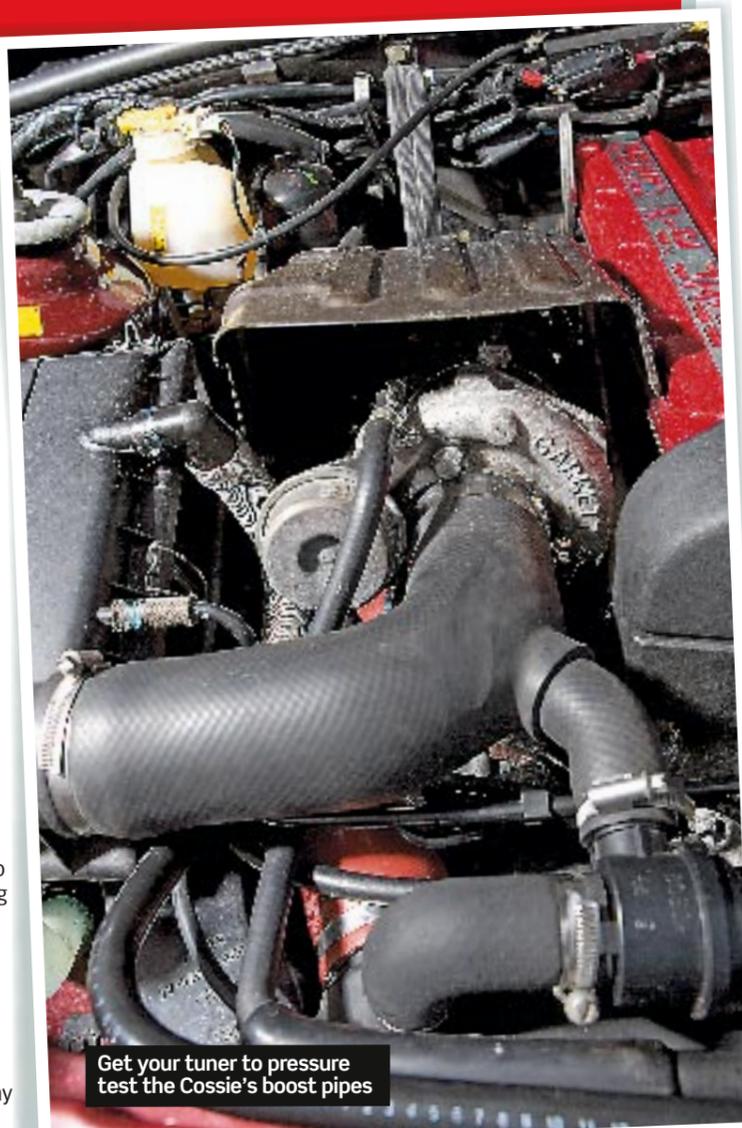
air until it is forced to stop by its wastegate opening and bypassing gas from the turbine. This means we will often be supplying 35 lb of air to the engine as intended, but another 10 lb per minute of air out to the atmosphere through all our leaks. Your turbo is really doing 45 lb of air per minute which is almost 30 per cent too much airflow. Expect it to fail in a considerably shorter time than normal, even though you are sure you did nothing wrong. Oops.

HOW TO SORT IT?

Get a professional with the correct equipment to check your system over. Looking at boost hoses etc is pointless, as the amount of air pressure we are talking is immense. Ask yourself if you would expect a hose clip to reliably hold your tyre on nice and air tight. We are talking about similar pressures here and it's amazing that a normal hose clip can hold it in at all when you consider the engine is also lurching around and everything gets very hot and oily.

HOW MUCH?

Tricky to say, should be done by all tuners as part of the job when setting up or prior to mapping, but if done separately I would say expect to pay around £30.



Get your tuner to pressure test the Cossie's boost pipes

4. FUEL REGULATOR LEAKS CAUSING MELTDOWN



FPR (above left) set-up as it should look...

WHAT GOES WRONG AND WHY?

Hopefully regular readers will know all about how this system works as I did an in depth article on it sometime ago.

In a nutshell, that tatty looking fuel pressure regulator on the top of your fuel rail at the front with the tatty looking pipe on it with no clip, quite possibly sharing its tatty looking pipe with boost gauges, dump valves, and Lord knows what other tack, is one of the most important components in the engine bay. If that pipe leaks, you may lose

your whole engine due to catastrophic meltdown!

The regulator regulates the fuel pressures at 3.5 bar with the engine off. With it on it leans off a little whenever vacuum is present, and increases whenever boost is present. It increases at a ratio of 1:1 with an extra 1 psi of pressure for every psi of boost. For example 36 psi boost MUST have 36 psi extra fuel pressure or the engine will melt. It is as simple as that.

Your fuel regulator signal pipe must have some form of clip on it.

It shouldn't share its line from the plenum with anything that may potentially leak and lead to the engine's destruction.

HOW TO SORT IT?

Make sure it has clips on it, it doesn't share its line with aftermarket items and above all that it doesn't leak at full boost pressure. Simple as that.

HOW MUCH?

Pennies. Not even enough pennies to equal the VAT on just one of the gaskets your dead engine will require if you don't sort it.

5. MISFIRES CAUSED BY OLD IGNITION SYSTEM

WHAT GOES WRONG AND WHY?

I am sure even the hardened Cosworth fan will admit that misfires are the most common of all Cosworth YB problems, plaguing pretty much every owner at least once or twice, if not daily! The most common problem is again poor maintenance and old age.

The distributor cap and rotor arm system is from the Dark Ages and does not lend itself well to high-power engines at all. There are virtually no genuine performance cars built in the last 17 years that were sold with the system instead of solid waste spark configuration.

What goes wrong? Well, it's poor to start with, so any increase in gap will cause

misfires. The distributor cap and rotor need to be in perfect condition to start with. HT leads must be in A1 condition and the spark plugs must be gapped correctly, and that does not mean gapped as per the handbook. The handbook tells you the gap for a standard engine, nothing else.

It's also not uncommon for the old coil to be causing a low voltage problem, nor is it uncommon to find the power supply to the coil is down to 10 volts.

HOW TO SORT IT?

New distributor cap, rotor arm and spark plugs can cure many problems, as can new HT leads, coils and a new power supply



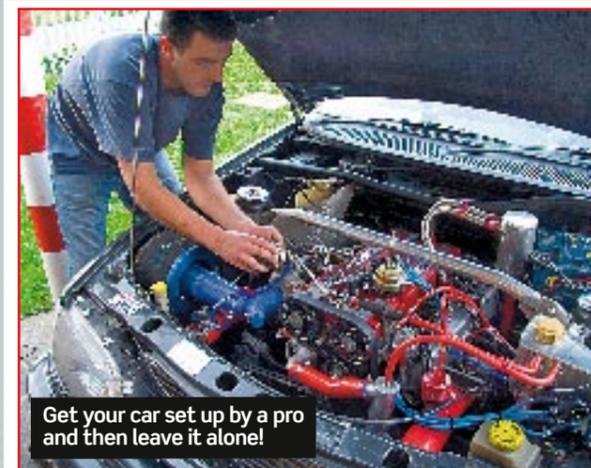
Original, tired ignition system often causes misfires

spur. Ultimately though, a conversion to solid state wasted spark is the real way forward, the only gap you really want in the system is the one at the spark plug. Throw the rest away and get the ignition up to date.

HOW MUCH?

A decent distributor cap, rotor and plugs can be had for as little as £30. The way forward though is to go for a full DIY wasted spark kit at around £400.

6. EXCESSIVE BOOST CAUSING ENGINE MELTDOWN



Get your car set up by a pro and then leave it alone!

WHAT GOES WRONG AND WHY?

Big boost. It seems to be the main requirement of all turbocharged car owners. Very few owners pay any heed to the amount of available fuel, and it's rare I see a fuel pressure gauge on a dash, only a boost pressure one, yet the fuel is so much more important.

So, what's the problem? We don't have much room to go into detail but more boost equals more air and more air equals a need for more fuel. If you don't provide the latter, your engine will die. Notice I didn't say it may die, I said it will...

HOW TO SORT IT?

Easy one this, if your tuner (assuming it was all set up by a tuner with professional monitoring equipment) set the boost to say, 14, 24 or 34 psi, leave it there. Do not listen to your pal in the pub who had 65 on that set-up and thinks you need to add a bleed valve or a tweak of the actuator. Do not let anyone other than professionals with boost and fuel monitoring equipment adjust power settings on your engine.

HOW MUCH?

I would advise a full set-up to go through everything and ensure engine safety at a cost of £141.

7. VARIOUS PROBLEMS CAUSED BY ENGINE BAY LOOM DEGRADATION

WHAT GOES WRONG AND WHY?

The wiring harness, as previously mentioned is old, and yet we expect it to carry air temperature, air pressure, coolant temperature, crank, cam and throttle position signals to the ECU when pulling 7000 rpm in fourth and fifth gears, without a second thought.

So, what do you think happens when that signal is degraded due to old wiring and connectors? One thing that happens is the injector signal is degraded and the 18 milliseconds

open command the ECU issued to the injectors is dropped to say, 14 milliseconds instead and the motor leans out. Bang!

HOW TO SORT IT?

First of all have a pro check it all out and datalog some runs with it. If at all dubious, just buy a new one.

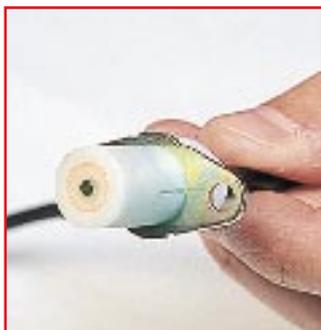
HOW MUCH?

Costs vary to check looms but datalogging sessions should be done as part of a set-up. A new loom is around £400.



Engine bay loom is notorious for breaking down. You're best off replacing it

8. SENSOR CONDITION GAPS AND ALIGNMENT CAUSING NO OR POOR RUNNING



Crank and phase sensors must be gapped correctly

WHAT GOES WRONG AND WHY?

The camshaft and crankshaft position sensors both have a gap that requires careful and accurate setting. This gap is crucial to the sensors' correct operation, especially at higher engine speeds and during acceleration. These gaps can change over time, especially the camshaft sensor (also known as phase sensor) as this is subject to distributor shaft wear.

When these settings are wrong you will get all manner

of driveability problems, misfires and bizarre fuelling issues. As well as the gap, the crank and phase sensors have a special alignment position relative to each other that is too complicated to go into right here, but suffice to say it's critical that this is correct or your ECU will be firing the injectors at the wrong time. Not ideal.

HOW TO SORT IT?

Get a professional to check the gaps and alignment of the

sensors. It would be done as par for the course during a set up.

HOW MUCH?

This will depend on how long it takes your technician to do it as it's a little fiddly.

Budget for one hour maximum to get the car in the air, clean and check/adjust crank sensor and remove distributor cap, access rotor arm etc, then check and adjust the phase sensor.

9. OIL CONTAMINATION FROM FUEL DESTROYS BEARINGS

WHAT GOES WRONG AND WHY?

Sadly a very common problem we see on a regular basis. The problem is very poorly set up engines and/or often extremely poor 'chips'. The basic problem is that some people are happy to tune a car running poor fuelling figures and, whilst safe from piston meltdown, it does wear the rest of the engine rapidly by leaving a damp mixture of fuel on the bores and rings so that the lubricating oil is washed away. In extreme cases the excess oil will find its way down into the sump and dilute the oil.

The long-term results are catastrophic for the engine

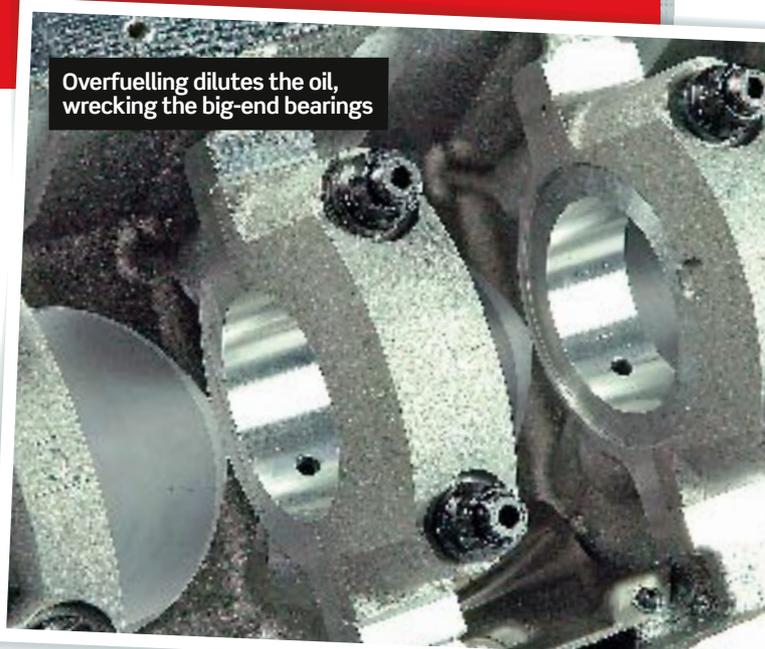
bearings and turbocharger etc. More oil leaks are created as it lowers the viscosity of the oil and attacks all the seals it comes into contact with. The first clue you have is poor fuel economy...

HOW TO SORT IT?

Get it checked over professionally. A set-up would pinpoint any problems like this and alleviate them where possible.

HOW MUCH?

Normally requires a full set-up to ensure the extra fuel is not due to a sensor or fuel pressure error.



Overfuelling dilutes the oil, wrecking the big-end bearings

10. POOR GENERAL SET-UP CAUSES ALL MANNER OF PROBLEMS

WHAT GOES WRONG AND WHY?

When was the last time you had your base idle setting adjusted, or your wastegate pre-load checked? Are you sure your cam timing's spot on? What about your base idle fuel setting (known as the CO)? All these items are adjustable and intended to be adjusted once in a while by experienced technicians to allow the engine to operate at its best.

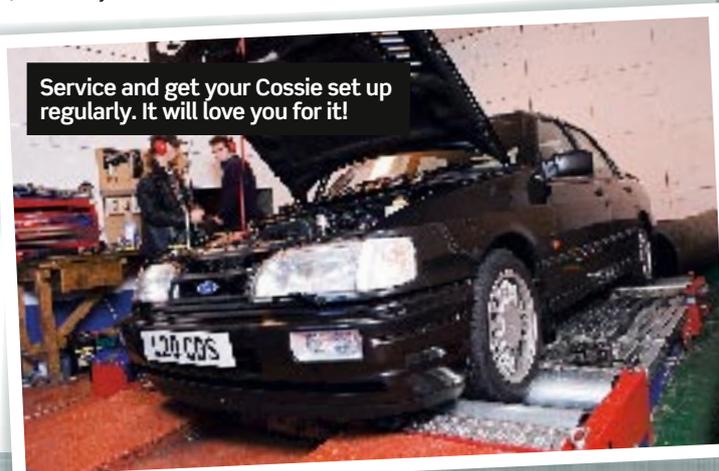
If they are wrong or you haven't had them checked in ages, you have no right to complain if the engine grinds to a halt on you

HOW TO SORT IT?

Ensure all your adjustable settings are correct and the engine is fully serviced at all times.

HOW MUCH?

A full set-up with most tuners will be between £100 and £150.



Service and get your Cossie set up regularly. It will love you for it!

So there you have it. I would say those accurately represent the most common 10 failure causes we see daily at Motorsport Developments. There are of course many more but I haven't the space to go any further. I hope this article will save one or two of you a breakdown or blow up one day.



NEXT MONTH

Rolling roads: what are they, how do they work and what different types are there?