

All Torque No Revs



All Torque no revs - Simon McBeath CCC

VW's amazing Golf TDi took the '99 British Rally Championship by storm, but what's it really like to drive? CCC's Simon McBeath waits for the glow plug to go out and takes a ride



What do you get if you cross a Formula 2 rally Kit Car with a London taxi? You get a car that has attracted as much attention within its category as those sensational asphalt-spec Citroens did in the World Rally Championship, because the VW Golf turbodiesel rally car certainly caused a stir in its debut season in the Mobil 1 British Rally Championship in 1999. And in truth there is absolutely no comparison with a taxi, beyond the use of Citydiesel fuel...

When VW Motorsport first entered a Mk3 Golf TDi rally car in the Mintex series in 1998, it produced a fair bit of interest and notched up some pretty impressive results, often bettering the rest of the two-wheel drive brigade in that championship. It was hard to judge though, on an International scale, just how good the car actually was. Its driver, Neil Simpson, already had an impressive record behind him, with sixth in the 1996 BRC in a Boland Motorsport Escort, and a fifth place in a one-off outing in the Mk3 Golf Kit Car on the '97 Manx International, which contributed to VW's Manufacturers' title. So when the combo of a new Mk4 Golf Kit Car fitted with the 1.9-litre turbodiesel power plant was entered in this year's BRC in the newly instigated Diesel Cup, (run within the BRC), we were given the opportunity to assess more accurately just how good turbodiesel power really is.

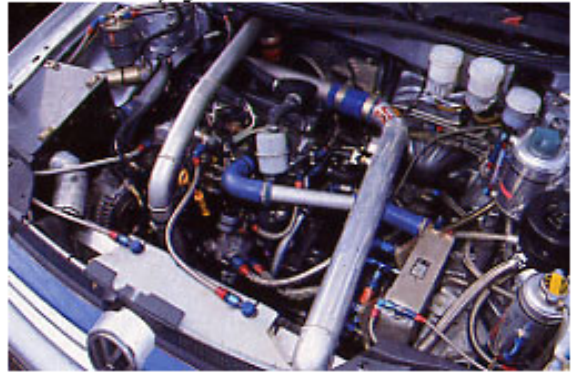
And in a season that saw the kind of progress any championship would be proud of, Neil Simpson and his TDi startled observers with second overall on September's Sony Manx International. Simpson earned the "Star of the Rally" award for this achievement and commented afterwards think most of our

rivals wrote us off as a bit of a joke at the beginning. But they're not laughing now!" Apparently Toni Gardemeister remarked to Neil after the Manx "I think you have very good car!"

So how has a diesel-powered production car been transformed into a competitive rally car?

As with all competitive machinery, attention to multifarious detail was needed, but one of the things that prompted the go-ahead for the project in the first place was that the TDi has tremendous mid-range torque.

Steve Bagnall, manager of the new-for-1999 VW Motorsport UK organisation, stated at the project's outset that "It's plain to see that the TDi has enormous pulling power and is hence ideally suited to rallying, where low-down power is often more important than outright speed." However, the engine also has a lot less peak power than its petrol-fuelled rivals, and needed plenty of specifically targeted development effort to enable it to compete with the regular F2 machinery. Offered the opportunity to try the car and find out for ourselves how it has been made competitive, how could we refuse?



Although the Mk4 Golf rally cars were built at VW Motorsport in Hanover, Germany, and the TDi's remarkable engine is the result of that body's development effort, the TDi rally car was actually run, prepared and developed as a package by Neil Simpson Motorsport at Neil's base in Colne, Lancashire. Working with "crew chief" Giles Phillips plus a small but loyal band of mechanics, a "weather crew" of two and one lady in motorhome providing much needed sustenance,

the team was one of the more compact outfits to tackle the BRC in 1999.

As Giles explained, "We don't have lots of resources like the top teams. Take the number of rims and tyres we could use for instance - we have a total of 32 rims available, which is about a quarter the number the top cars have. That meant we had far less tyre choices available, so we had to try and be clever about our choices. We carried two spares in the car, and this sometimes gave Neil more options, but obviously meant that he had to do a lot of tyre changes between stages. He also carried a load of tools and spares with him so he could do his own repairs if necessary. Yes, it meant we ran heavy, up to 1170kg or more, but we had more chance of getting the car home that way."

This thoughtful approach is typical of the way Neil and Giles go rallying. They seem willing to consider details that some competitors don't even think about, and they have also put in a great deal of test and development time to sort the chassis to match it to that engine.

The engine itself is obviously worthy of closer inspection. It is based on the 110bhp, 170 lb.ft, 1896cc, 79.5mm bore by 95.5 mm stroke production TDi engine as fitted to the Polo, Golf, Bora, Passat and Sharan, and the block, head and crank for the rallying units are taken off the production line. But how do you get more performance out of a diesel?

Whereas increasing engine revolutions is part of the process of extracting more power from a petrol-fuelled engine, the slowness of the diesel engine combustion process means that high rpm is not an option. In fact the TDi is governed to a maximum of 5000rpm. Thus, it was the engine's breathing system that came in for most attention, with enlarged ports, a larger Garrett turbo, a modified injection pump able to deliver more fuel and enlarged injector nozzles. The cam and valves were also blueprinted, a lightened flywheel with an AP Racing cerametallic clutch was attached and the engine mountings were updated. The car also boasts a water spray-cooled intercooler, akin to a WRCar, sited in front of the water radiator, and also a small fuel cooler, located at just above the water rad. There is also an oil/water heat exchanger neatly plumbed in and located at right angles to the water rad just to the left front of the engine.



Needless to say, the control of the fuel injection is critical, and the Bosch engine management system looks after that side, also controlling turbo boost. The result is a power output of just over 200bhp at 4100rpm, and torque of 258lb.ft at 3550rpm. Compare those figures with the Golf Kit Car petrol engine, which turns out somewhere near 280bhp at 8500rpm and 181 lb.ft at 6500rpm, and you can see that the TDi has about 80bhp less peak power, but 77 lb.ft more peak torque. It also has over 220 lb.ft of torque ready and available from as low as 2000rpm up to 3900rpm, so in normal use it can always deliver more torque than the petrol fuelled engine. It is the very delivery of this engine performance that required specific chassis development. Oh, and fuel consumption in this spec is an amazingly frugal 15mpg, approximately.

As early as the first Mintex Championship event in 1998, when the Mk3 TDi was in use, it became evident that, particularly on gravel, high torque was the cause of traction problems. But lessons learned with the boys from Proflex that year were transferred to the triple adjustable damping fitted to the Mk4 and enabled a better starting point with that car. Furthermore, the previous car's plate-type limited-slip differential was the cause of further problems on the Mk3 and even my own brief experience of that diff in the Mk3 petrol car, with its lesser torque demonstrated the car's tendency to weave as you came on or off the throttle, for example when changing gear or lifting for a corner. This year the Golf has a combined plate and viscous LSD which has "made the diff action much more forgiving," to use Neil's words.

The chassis still needed lots of refinement work though, and plenty of gravel and asphalt mileage was put in, trying out different springs, and damper and diff settings. Giles tells of one particular test in Ireland, just south of the border, where the tarmac is so bumpy that "you couldn't drive down the road at over 40mph without it flying off. By the time we'd worked away on the TDi settings Neil could virtually drive down it flat without worrying."



The gearbox is a development of the six speed sequential Gemini Transmissions dog clutch used in 1998, with a new casing. Interestingly the diff is not only lubricated by splashing in its own oil, it is also cooled by a small pump which sprays some oil on to the top of the diff. Cleverly, the Bosch boffins have been able to incorporate a flat-shift facility into the engine management system so that full throttle clutchless upshifts may be accompanied without undue strain on the gears.

The last time I said "Gis a go then" to Neil and the crew everyone was very polite, but the answer was a firm "No.", mind you, on that occasion we were at a press day up in the Welsh Mountains, and the test track was a narrow gravel stage, so I didn't really blame them, although Neil did get his chance to terrorize me. But the vast open spaces of Bruntingthorpe are seemingly a place where even CCC journos can be trusted, and so to the Leicestershire proving ground we proceeded on a cheerless but dry November day.

With VW PR man Nick Carter adopting the unaccustomed physical role of trailer tilt mechanism operator, Giles trundled the Golf off the transporter and I went ooh and aah as the big-arched silver and blue Golf - I'm strange like that around cool-looking, competition cars. With the turn of a master switch and a flick of a power switch, followed, by a ten-count on the glow plug button (now that's something you don't have to do with a petrol engine), Giles hit the starter and the TDi chattered into life, only briefly making a noise and a very small black billow before settling into a barely audible, smog-free tickover of less than -1000rpm. There's no silencer on this car either, just the turbo sucking energy out of the exhaust gases, and the catalytic converter, and nowhere has the TDi come close to 100dB in noise tests. In fact so environmentally friendly is the Greenenergy Citydiesel-fuelled Golf TDi that it puts out a fraction of the pollution of a regular petrol burner. Makes you think doesn't it?

Neil hopped on board to twirl the Golf around the south-western loop at the end of the proving ground and warm everything up, while Nick put his PR hat on and got a brew going! As we sipped hot coffee and watched Neil hurling the Golf at the fast 180 bend at the end of the loop, it was evident that not only is the man at one with his machine, but the TDi didn't look like a regular front-wheel drive car because there didn't appear to be any understeer whatsoever. Giles told me he'd put some stiffer rear springs on for this test in order to balance the car up on the high-grip



he'd put some stiffer rear springs on for this test in order to balance the car up on the high-grip surface.

This was going to be interesting.

But first I had to indulge Mr Simpson while he got his "let's frighten the journo" party piece over and done with, so I strapped into the co-driver's seat alongside him and donned the Peltor lid complete with intercom so we could natter on the way round. As mentioned earlier this was the second time he'd inflicted this experience on me, and I've also had the pleasure of sitting beside Alistair McRae at a press day at the Silverstone Rallysprint, and each occasion has made me wonder how co-drivers manage to do the job they do - my admiration goes out to all co-drivers. I'd much rather be the nut behind the wheel.

But watching Neil at work I could see, more or less, how to deal with the car's set-up. A brief flick of the power-assisted steering got the car turned in, but then he was taking lock off again as the back stepped out. With that caught he was hard on the loud pedal and the car then drifted in a very neutral-feeling stance at whatever angle to the direction of travel was dictated. But that engine seemed to be unlike any competition engine I've ever experienced - flexible, completely fuss-free, but with up changes at just over 4000rpm... OK, now gis a go!



So Neil and I swapped seats - yep, he was going to be driven by me, the first time he'd sat passenger in his own rally car. What an honour (for him, of course) and a pleasure (for me) to be able to get my own back... I don't think. With an insured value of £70K I wasn't going to do anything stupid - I hoped. Neil's carbon and kevlar seat is set pretty well forward, so stumpy here could reach the pedals with no problem, and

the dished steering wheel meant a NASCAR-style bent arms grip was needed, which I quite liked, never having being a proponent of the straight arms technique. The tall, blue anodised, carbon-fibre topped gear shift was nice and close to the wheel, and though the pedals were positioned so left foot braking could be achieved, my heel 'n toe preference was also possible. Nothing against left foot braking, I just can't do it without either head butting the steering wheel or failing to slow at all. Pentti, are you reading this? Isn't it time CCC sent me on a course at your school?

So in with the light-action clutch, tug back on the gear stick to engage first with a car-shuddering thump, ease out the clutch and off we go to feel what gives with this machine. Up through the superb Gemini sequential shift box, we're in sixth in no time and tearing down the straight at 100mph plus in... well I didn't count, but very few seconds. Then searching for the turn in to the top bend, I spot it late, dab the brake pedal, which is very firm but very effective as the six-pot water-cooled front Alcon calipers grab the huge 355mm vented discs, and snick down a couple of cogs to turn in, and straight away I felt what I'd seen when Neil was driving. The car naturally oversteers, but in a very catchable, confidence-inspiring way. Out of the top corner, on down the straight and I watch what the engine's doing this time. The boost display is registering somewhat over 2 bar on full chat (2.53 bar is the quoted maximum), which obviously tails off when you lift off. What I can't feel though is when the boost starts to come in, and that reflects the superb job VW and Bosch have done on the management system. There just seems to be lag-less urge from below 2000rpm round to a little over 4000rpm. After that you can sense there's nothing left, so you snick up a gear and there it is again, bags of flexible pulling power.

Neil is sitting quietly beside me, listening to my comments and probably wondering when we were going to get a move on. So I thrash around a few more times, revelling in the handling and balance of the Golf, learning to change up at what no longer seems ridiculously low revs now I was used to the motor, and wishing we were on a tighter, twistier track so I could really get a feel for the chassis. One

very evident aspect of the car, even though the dry concrete did its best to mask it, was the scabble-free traction it provided. Coming off the tightest corner we had available and standing on the throttle there wasn't a hint of a front inside wheel spinning, or any odd torque-steer effects. You could just nail it and the car would accelerate in the direction you wanted.

Neil had another thrash around at this point with Tomcat Vento Challenge and VW Cup 2000 co-ordinator Kay Carter in the co-driver's seat, and in spite of much macho opposite locking, and Nick Carter's protestations of "Oi, that's my wife!" the twinkle in Kay's eye afterwards was undimmed by young Simpson's attempts at showing off. But what this display of reckless bravado did do was root the rear tyres... So in I got for another go on my own, and boy did I get a surprise at the first corner, as the previously benevolent chassis had now turned into a very nervous oversteerer. Giles later assured me that once the tyres cooled down the grip would come back, but this was a vivid demonstration of how a chassis' behaviour can change if driven... err... insensitively.



The VW Golf TDi rally car is one heck of a machine, a thoroughbred F2 rally car with leading-edge turbodiesel motivation, which has demonstrated an ability to compete with some of the best petrol-fuelled F2 cars in the world. Is there a place for diesels in rallying's future? The Diesel Cup is set to continue within the BRC in 2000, but its continued viability depends on others taking up the gauntlet thrown down by VW. Sadly, as I write this, even VW has no budget for running the TDi again. So diesel power may fade from UK rallying as rapidly as it emerged. With the environmental benefits to be gained from running efficient turbodiesels, and the spin-offs that their development in motorsport would feed back into mainstream automotive manufacturing, you would have thought VW's pathfinding would light up the way for others to follow.

Tech Spec	
Golf Rally Diesel	
Body/Chassis:	Strengthened shell, welded tubular roll cage.
Weight:	1150kg approx
Engine:	1.9-litre turbodiesel, Garrett intercooled turbocharger, Bosch EMS, 190bhp (officially)
Suspension:	McPherson strut and lower wishbone at front, beam axle at rear
Transmission:	Gemini Transmissions 6-speed sequential, AP cerametallic clutch
Brakes:	Alcon 6-piston water-cooled calipers front (tarmac), 4-piston rear, 355x32mm ventilated front discs (tarmac), 300mm solid rear
Wheels:	8x18 OZ Magnesium
Tyres:	225/650-18 Pirelli
Fuel Capacity:	50 Litres