



# Cool running!

**The Forge Motorsport intercooler upgrade for the RS 3 provides much more power even on a standard engine, and so must be considered an essential on any modified example...**

WE'VE FEATURED the VAGtech RS 3 previously, in our December 2012 issue. The RS 3 is no slouch even in standard form but, being owned by VAGtech's MD Jon Watts, it didn't take long before this car was modified for improved performance and handling. Initially, the combination of a Revo Stage 2 re-map of the ECU and a Milltek Sport exhaust pushed the power up to 420 PS, then the addition of a Bilstein B16 PSS10 coilover suspension kit reduced the ride height slightly and generally enhanced the handling, while retaining a reasonable ride quality. Most recently, the car has seen the addition of a set of 8.5 x 19-inch RH Alurad alloys, fitted with grippy Dunlop Sport Maxx RT tyres.

An over-riding priority throughout was to improve the performance of the

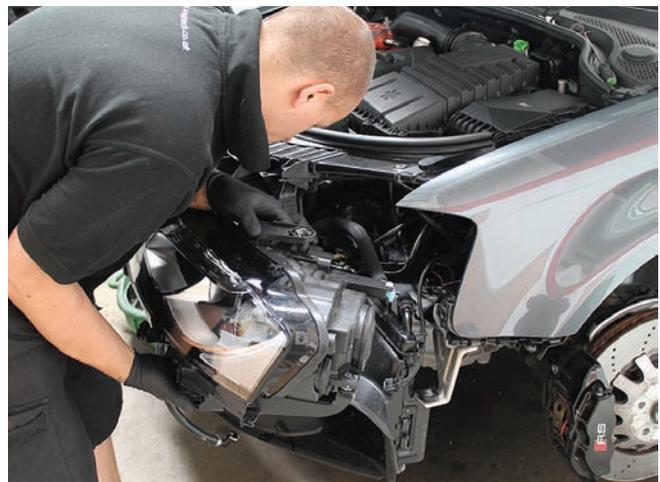
car for reliable use in all conditions, without compromising its practicality or appearance, and so Jon next turned his attention to improving the intercooling arrangement. It's well known that cooling the induction charge on turbo'd engines significantly improves both performance and efficiency, but often the addition of a larger intercooler involves modifications to the bodywork of the car. That's not really a problem on a highly modified track or race car, where function takes priority over form, but it wasn't a desirable option for Jon's low-mileage road car, his prized personal possession.

But when he looked at the options available Jon found that Forge Motorsport had recently developed a highly effective intercooler upgrade

## **Back to basics**

When an engine is supercharged or turbocharged, the induction airflow is pressurised to force a denser volume of air into the cylinders. But, in addition to the heat generated by the exhaust-driven turbo itself, pressurising the airflow significantly increases its temperature which, if unchecked, can actually result in reduced performance due to decreased density and can even result in detonation, pressure spikes during combustion which can damage the engine.

Cooling the pressurised induction airflow, by passing it through an intercooler, counteracts the charge heating effect and ensures a more consistent performance, especially in conditions of high ambient temperature. Most automotive intercoolers are of air-to-air design, passing the forced induction airflow through a cooling matrix, in much the same way as water is passed through a conventional radiator, with the cooling effect provided by the external airflow over the intercooler achieved by the forward motion of the car. Generally speaking, the larger the intercooler core, the greater the cooling effect, although effective intercooler design must also take account of pressure drop through the intercooler itself.



for the RS 3, one which didn't involve any external bodywork modifications. Indeed, it was almost a straightforward bolt-on conversion. It seems that there's a huge amount of space between the radiator and the inside of the front bumper, but that the Audi engineers had seen fit to install only a fairly modestly sized intercooler as standard.

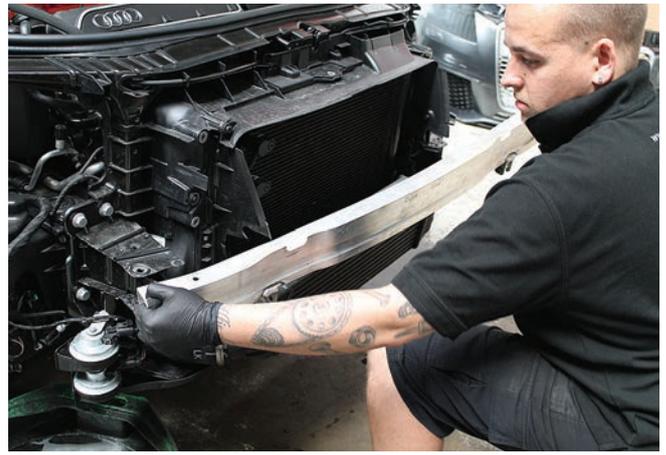
As soon as they'd inspected the standard set-up, Forge Motorsport's engineers seized the opportunity to design a much larger intercooler core to take full advantage of the space available. Providing much more surface area and cooling efficiency than the

**'The installation process is very straightforward, with the total fitting time taking less than three hours...'**

stock intercooler, the Forge Motorsport core measures a massive 530 x 130 x 225 mm, and is of bar and plate design, with the end tanks designed so that the standard boost hoses can be retained.

In fact, the only alteration as such is that Forge Motorsport has modified a genuine Audi crash bar – the horizontal metal reinforcing panel which provides rigidity for the front bumper – to support the larger intercooler core.

The installation process is very straightforward, with the total fitting time taking less than three hours; indeed, it could almost be considered a DIY job, within the capability of the average competent enthusiast on the driveway at home. Of course, full workshop facilities always make any job so much easier and in this case VAGtech's chief technician Ben Thomson soon had



**‘Forge Motorsport seized the opportunity to design a much larger intercooler core to provide more surface area and cooling efficiency than the stock intercooler, with the number plate repositioned to provide maximum airflow through the grille...’**



the car up on the ramp to remove the undertray, front arch liners and front bumper. It’s also necessary to disconnect the headlamp washers and remove the headlamp assemblies to gain access to the bolts which secure the standard crash bar in place.

The replacement crash bar, supplied as part of the installation kit, has been reprofiled to achieve the necessary clearance and also provide mounting points for the larger intercooler core. With the lower mountings engaged, and the hoses fitted, the Forge Motorsport intercooler is positioned against the crash bar, with rubber grommets and



aluminium sleeves fitted into the top brackets, and the drill bit supplied in the kit is used to drill perfectly positioned holes to attach the intercooler accurately at the top.

In fact, one very subtle alteration is required. To supply a good airflow through the front grille to provide maximum cooling effect for the air-to-air intercooler core, Forge recommends repositioning the front number plate to a slightly higher position on the grille, such that the top edge is almost flush with the four-ring logo. For track-day use, of course, the number plate can be removed completely, to provide maximum airflow through the grille. Rather than re-drill the number plate, using unsightly screws, Ben elected to attach it using high-grip double-sided tape, for a neater appearance. →

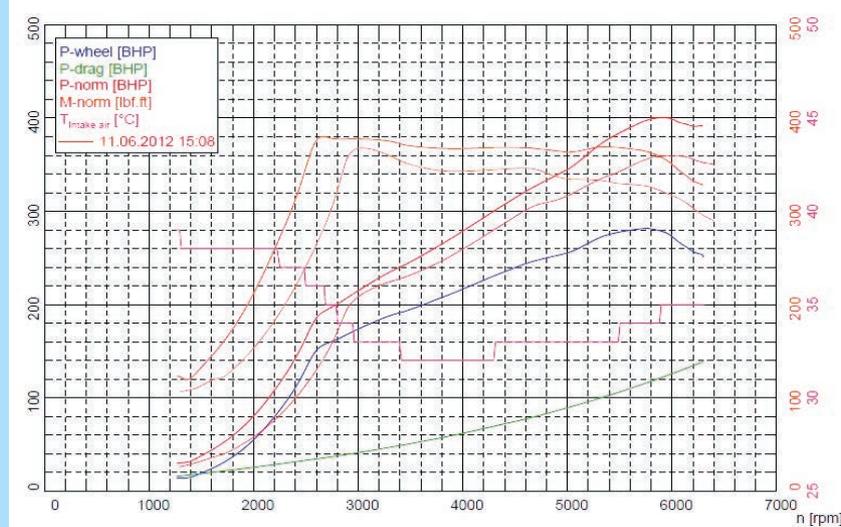
'The real test, though, came at GTI International where the VAGtech RS 3 consistently ran in the low 12s, despite the hot conditions...'



So, it's easy to fit, but is it effective? Jon is a very experienced and discerning driver and he didn't have to venture far around his well-known test routes in the Milton Keynes area before he was reporting a much improved response and urgency to the RS 3's performance. Bear in mind that this is a car which was already producing 440 PS, such that it is seldom possible to explore the full outright performance when driving on public roads.

The real test, though, came at the recent GTI International at the Shakespeare County Raceway, when the VAGtech RS 3, driven by Simon Houldsworth, was run repeatedly on the quarter-mile drag strip on the sweltering hot Sunday. In the sort of conditions which often see turbo cars suffering from heat soak and impaired performance, it clocked consistent times in the low 12-second bracket, with a best elapsed time of 12.09 within a smidgeon of breaking into the 11s.

Priced at £958 inc VAT for the complete intercooler and installation kit, clearly it's a very worthwhile improvement, even on a standard RS 3, and almost essential on any re-mapped or modified engine, to ensure that the



Forge Motorsport claims to have seen excellent results with this intercooler upgrade on both standard cars and several that have been re-mapped. In fact, they had to repeat the dyno tests several times because they couldn't believe the figures they were achieving at first, with peak gains of as much as 40 PS recorded in back-to-back testing on a standard RS 3.

Temperature drops were 25°C at the intercooler outlet, compared to the stock set-up which peaked at 60°C, in 21°C ambient temperatures. Also significant is that the intercooler inlet temperature also drops, compared to the stock core, indicating that – as well as reducing the differential pressure across the core – the turbo is not having to boost as hard, to achieve the same performance.

full performance can be realised in all climatic conditions. Far too often we hear of the owners of turbo'd cars having to back off in hot conditions because of diminishing power, or even suffering from detonation problems, but with an effective intercooler upgrade the enhanced performance can be fully exploited at all times. 🇩🇪

## Contacts

**Forge Motorsport**  
Tel: 01452 380 999  
[www.forgemotorsport.co.uk](http://www.forgemotorsport.co.uk)

**VAGtech**  
Tel: 01908 410 424  
[www.vagtech.co.uk](http://www.vagtech.co.uk)