

Audi RS3

A five-cylinder, 2.5-litre turbocharged gasoline engine, seven-speed dual-clutch transmission and lightweight materials offer the performance and driveability that drivers expect from a hot hatch

By James Scoltock

The focus for the industry is undoubtedly on improving efficiency, but in some projects engineers can spend less time thinking about fuel economy and more time improving speed and acceleration.

Audi's RS3, based on the C-segment A3, is the OEM's latest addition to its performance vehicle line-up. Hot hatches like this are defined by performance, how fast they can reach 100km/h from a standing start, how much lateral g you can generate on challenging road layouts and, when you're driving through populated areas, aural pleasure.

The RS3 uses the same 2.5-litre turbocharged five-cylinder gasoline engine as the one that powers Audi's TT RS coupe. The 250kW/450Nm unit can push the RS3 from 0 to 100km/h in 4.6 seconds and on to a limited top speed of 250km/h. This new application for the engine meant that the engineers had to make adjustments to the unit.

Stephan Reil, head of technical development at Quattro, Audi's performance subsidiary, says: "The base application is the same but I would estimate that about 20% of the engine is new. The cooling packaging on the RS3 is

completely different." And, unlike other A3 variants that are available with both manual and wet dual-clutch transmissions, the RS3 only uses Audi's seven-speed dual-clutch.

"We discussed using both transmissions but, when you look at the split of manual to dual-clutch on the S3, you find that the dual-clutch transmission is the higher-volume technology," says Reil.

The sales figures helped shape the choice but so did the plant the RS3 is built in. Reil's team of 60 engineers had to

use the dual-clutch transmission, work began on meeting the packaging challenges. Much of the RS3's architecture is similar to that of the TT RS – the longitudinal members and the transversal space, for example – but engineers had to spend more time on the longitudinal axis which is different. "The RS3 is slightly different to the TT RS so every pipe and hose from the engine to the body of the car needed replacing," says Reil.

Taking the RS3 around the tree-lined mountain roads of



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Stephan Reil

choose one transmission for the vehicle: "Because the vehicle body is built in Ingolstadt and then shipped to Audi's Győr plant in Hungary – where the TT RS and A3 convertible are built – we didn't want to add extra complexity to the production line, so we had to make the decision whether to go for manual or dual-clutch," says Reil. The Győr plant also makes the 2.5-litre engine, which eases some of the logistical issues.

Having made the decision to

Velden in southern Austria, the 2.5-litre turbocharged engine and dual-clutch transmission made for a thrilling drive. Gearshifts were responsive enough for the undulating landscape. And the engine – with maximum torque available between 1,600rpm and 5,300rpm – made overtaking slower traffic very easy.

The terrain made the brakes work hard. The iron rotors and aluminium hubs were always working within their limits, and they help to save weight. But high-performance vehicles often use more exotic materials, such as ceramics and carbon fibre.

"We considered using ceramic brakes but it would have been too expensive and the installation rate too low. The cost for ceramic brakes would have been around €8,000 – 15% of the car's sticker price," he says.

But he did manage to introduce carbon-fibre reinforced plastics to the vehicle's body. The flared front fenders use the material – helping to reduce weight by

2.1kg compared to traditional steel versions.

Any weight saving is important as an aid to improving performance and driveability – the RS3 weighs 1,575kg, compared to the standard A3 2-litre TFSI Quattro which weighs 1,415kg.

But much of the driveability is down to chassis set-up. The RS3 uses a front McPherson strut and rear multilink set-up. The design meant that electronically controlled dampers weren't an option: "The system we have on the RS5 and RS6 doesn't work with a McPherson axle design," says Reil.

Work has been done to



In front: 250kW makes this the quickest A3 ever



Heart of the matter:
The five-cylinder's
450Nm gets the RS3 to
100km/h in 4.6 seconds

optimise the design to offer the best balance between performance and ride comfort. The front suspension has a 1,564mm track. The pivot bearings on the front axle support and transverse links are made of aluminium. The aluminium subframe is bolted to the body at six points, providing added stiffness.

The four-link rear suspension, with a 1,528mm track, handles longitudinal and lateral forces. The longitudinal links absorb drive forces and braking forces. The three transverse links at each wheel – the spring control arm, the upper transverse link and the track rod – are stiffly joined to the axle support to improve vehicle dynamics.

Separate coil springs and monotube dampers provide the vertical support.

The wider track has had an impact on the RS3's drag co-efficient, which is 0.36 compared to the standard A3's 0.33. Reil says: "A couple of things have affected the aerodynamics. One is the wider track, but also the larger cooling ducts, and routing air to keep the brakes cooler. All that together with a larger exhaust system has resulted in a slightly worse co-efficient than a standard A3."

Much of the work that Reil and his engineers completed on the project was done with the

benefit of computer simulation, but one area in which he wanted a more personal touch was the steering. The RS3 uses an electric power-assisted system with a steering ratio of 16.2:1, but its set-up was refined by driving the car rather than through computer simulations.

"It's always very difficult to simulate personal feelings," says Reil. "I'm one of the old heads: I don't want to see papers, I want to feel it with my hands, with my feet, with my neck, with my back, with everything. Steering tuning along with suspension and tyre development is based on feeling and the driving experience."

While the RS3 is unashamedly designed to meet hot-hatch performance criteria – aiming for the best 0-100km/h time and top-speed figures – Reil still had to improve efficiency. "We had to do everything to realise the best fuel consumption possible. The RS3 will never have a 100g/km CO₂ figure, but we have to bring in all the technology we have like recuperation, an on-demand oil pump, and a long seventh gear in the transmission."

This work, while not necessarily important to customers, helps the RS3 to emit only 212g/km CO₂ and return a fuel consumption figure of 9.1 litres/100km.

OEMs rarely like talking about competitors' vehicles, instead preferring to say that there is no competition, but the RS3 is likely to be compared to the BMW 1M coupe – a similar-sized vehicle with similar performance.

Reil isn't convinced of that: "The RS3 is a practical five-door car, while the 1M coupe is a competitor to the TT RS," he says. But the work his engineers have done on the RS3 should help it to match the competition, wherever it comes from. ■