

Greater than the sum of its parts



The Audi A5 marks the OEM's shift away from platforms, into component-based development. It was also produced with more virtual development than ever before. By **James Griffiths**

Audi doesn't have platforms any more. Instead, it is developing components that can be used often in different cars. It will develop future vehicles using the chassis as a base on to which the different components are added.

The advantages are considerable, says Arne Leetz, head of technical development. "The main advantage is in quality. If you use a component in multiple products then it's safer for us and the customer. It's an improved part."

Moving to the component approach also has an effect on the chassis, says Horst Glaser, general manager for chassis development. "It was important to build up the car's GT character," he says. "That means good comfort but sporty handling and high-speed stability."

One of the biggest changes came from creating a more precise steering feel. Normally the steering gear goes behind the axle, but on the A5 engineers were able to attach it in front. "This gave us the

opportunity to introduce the steering forces directly from the wheel into the knuckle, as opposed to the upper end of the knuckle," says Glaser.

Audi had to overcome some packaging issues. It moved the front axle 150mm toward the front and altered the layout of the drivetrain. "Normally you have engine, clutch and differential in a front-wheel-driven car," says Glaser. "We switched the positions of the differential and clutch inside the gearbox. It gives much better front to rear load dispersion."

Audi also looked closely at "brake-diving". "We switched the rear axle's virtual point of rotation," says Glaser. "We moved it from beneath the rear axle to the front of the rear axle. It's the only Audi where we've been able to do this."

Audi believes the switch to component-based construction will provide a big pay-off for the A5 in the future, but there were unexpected challenges in development. "You have to develop components from new. That means investment in headcount. You also need a new gearbox and powertrain," says Glaser. "But when you have components and can use them in other cars, development gets easier."

Early in the A5's development, Glaser's team encountered a strange phenomenon that affected the ride comfort. Luckily this was just a result of using new components and, discovered at an early phase, it was relatively easy to resolve.

The A5 involved about 20–30 per cent more virtual development. "Every time you make a new product, you must do it in less time than before," says Glaser. "Virtual development lets us try all the possibilities and then can choose more wisely."

Audi says it is looking to increase its range – from 22 to 40 models by 2015 – and the rate at which it introduces models. Of the €11.8 billion earmarked for the expansion, €8.4 billion is designated just for new products.

Component-based construction will play a key role in making this possible. The A5 is clearly just the first step, but it is an important part of how efficiently the firm will be able to launch new vehicles and how successful the expansion will be.

British road test

For the past three years Audi has been taking its cars on to UK roads for testing and set-up work. The ride settings for the TT and RS4 were both done in the UK. The reason, Audi says, is that the road surface is more convex with larger stones in the tarmac than is the case in Germany, ensuring a smoother ride.

Inside the A5, top: Changes to the layout of the Audi A5 drivetrain sharpens the steering while at the rear the axle has been altered to reduce 'brake-diving'

AUDI'S COMPONENT SUPPLIERS

Autoliv	Curtain airbags (inflatable curtain), seatbelt systems
Continental Automotive Systems	CVT, brake hoses, rear axle caliper, seat control module, door control modules, central gateway, lane departure warning camera system
Draexlmaier	Interior center console, door trim, side trim panel, cockpit wiring harnesses, electrical components, elastomer components
Dura	Cross member, side frame trim, rear window
Eberspaecher	Exhaust technology
Getrag	Transmissions
Goodyear	Lead development partner for tyres
Dunlop	
Hella	Lighting
Hirschvogel	Gear shaft, forged fuel injection parts
Hutchinson	Brake diaphragm, heating hoses, air duct, power steering hose
Kautex	Fuel tank, headlamp cleaning system
LuK	Dual mass flywheel
Magneti Marelli	Instrument cluster
Rieter	NVH damping
ZF	Six-speed automatic, chassis components, twin-tubes front and rear, continuous damping control, chassis bushing, engine mount bushings shifting systems, axle drives, differential, clutch, dual-mass flywheel

For the full list of component suppliers visit www.ae-plus.com

The suppliers behind Audi's component-based approach

APAG Elektronik	Tracking ECU
ATS	Light alloy wheels
Autoliv	Curtain airbags (Inflatable Curtain), seatbelt systems
BASF	E-coat, basecoat, clearcoat
Boysen	Exhaust system for 3.2 V6 gasoline, exhaust system, manifold, compensator pipes for 3.0 V6 diesel
Bridgestone	Tyres
Brose	Manual and power seat adjusters, lumbar support
Continental Automotive Systems	CVT, brake hoses, rear axle calliper, seat control module, door control modules, central gateway, lane departure warning camera system
ContiTech	Slush-skin for instrument panel, Yorn unsupported expanded vinyl for door panel and armrest, Roy supported expanded vinyl for door Insert and rear middle-armrest, compact foil for sun visors, belts, hoses and lines
Dana	Cylinder head and exhaust system gaskets (4.2L V8)
Dow Automotive	Structural bonding
Draexlmaier	Interior centre console, door trim, side trim panel, cockpit wiring harnesses, electrical components, elastomer components
Dura	Cross member, side frame trim, rear window, ATX cables
EaglePicher Wolverine	front axle shims for noise reduction of the braking system
Eberspaecher	Exhaust Technology
Elringklinger	Cylinder head gaskets, specialty gaskets, heat shields
Emhart Teknologien	Fender skirt fastening on weld studs; S-line and rough-road model: fastening for door sills; fastening for under aero shield
FAG	Rear wheel bearing
Freudenberg	Seals for engine and transmission
FTE Automotive	Clutch pipe assemblies
Geiger	Front and rear air ducts, power steering reservoir, engine mounted coolant water pipes
Getrag	6-speed transmissions for Audi A5 Quattro 3.0-litre diesel and 4.2-litre V8 gasoline. From 2008 also for the 2.7-litre diesel.
Goodyear Dunlop	Lead development partner for tyres
Harman/Becker	Head unit, display, stereo, radio, navigation and voice recognition system
Hella	Lighting systems
HellermannTyton	Fixings for harnesses and lines
Hirschvogel	Gear shaft, forged fuel injection parts
Honeywell CPG Bendix	Front disc braking pad
Hutchinson	Brake diaphragm, heating hoses, air duct, power steering hose

Hydro	Aluminium fuel coolers (diesel version)
INA	Valve lash adjuster, chain and accessory drive elements, water pump bearing, overrunning alternator pulley, gearbox bearings
Johann Borgers	Rear parcel shelf
Kautex	Fuel tank system, headlamp cleaning system
Key Safety Systems	Passenger airbag, knee airbag, seat belt buckles
LuK	Dual mass flywheel
Lydall Gerhardi	Tank heat shields
Magna Mirror Systems	Outside mirror with heating and power fold
Magna Steyr	Fuel Filler System
Magneti Marelli	Instrument cluster
MAHLE	Piston, Piston Rings and Piston Pins, Conrods, Camshafts, Valves, Oil Mist Separators and Oil Filter Modules
Methode Electronics	Electric park brake switch
Mubea Fahrwerksfedern	Stabilizer bars and suspension springs front and rear
Rehau	Stone guards, sills
Rieter	NVH Damping
Saint Gobain	Glass for rear window, windshield
Scapa Automotive	Technical adhesive tapes
Sidler	Make-up lamp
Sintercast	CGI block for the 2.7-litre diesel
Speedline	Aluminium wheels
Takata Petri	Side airbags, front seatbelts
ThyssenKrupp	Crankshafts, camshafts, differential bevel gears
TRW Engineered Fasteners	Grab handle, hole plugs, door trim panel clip
UFI Filters	Fuel filters
Winkelmann Powertrain	Pulleys, torsional vibration dampers and drive plates
ZF	Six-speed automatic, chassis components, twin-tubes front and rear, continuous damping control, chassis bushing, engine mount bushings shifting systems, axle drives, differential, clutch, dual-mass flywheel
ZF Lenksysteme	Hydraulic Power Steering Gear or ZF Servotronic 2 Steering Pump Steering Column