

# VEHICLE DYNAMICS INTERNATIONAL

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## AV INSIGHTS

*Chief engineers at OEMs and auto organisations share their views of how dynamics should develop for the autonomous vehicle (AV) sector. The focus goes beyond ride quality...*



**Bob Bateman**

### Nissan's AV advances

Bob Bateman, senior engineer at Nissan Technical Centre Europe, discusses how AVs should ride and handle as we progress towards L4

### ADAS technology

Research and innovation taking place around the world is advancing the safety of ADAS and driving the next generation of AVs

### Acura MDX

The 2022MY MDX is Acura's new flagship, with an all-new platform and double-wishbone suspension. VDI has the exclusive full details



# Damping technology

Damper valve technology from **RAPA** optimises chassis damping characteristics



RAPA Automotive develops and manufactures innovative valves with high performance and special characteristics for the high-end automotive market. The company is one of the world's leading suppliers of valve and valve system solutions for chassis components. Almost all of RAPA's valves and systems are customised to meet the individual requirements of each OEM customer, in terms of weight, function, NVH behaviour, emissions and costs. The company's strength in innovation is reflected in its R&D efforts, which represents 15% of its workforce.

## Damper control valves

The diversity of roads and traffic situations require a wide range of vehicle damping characteristics. Adjustable shock absorbers are used more and more frequently in

passenger car series production, with the proportional valves required for continuous adjustment in rebound and compression representing the top end of the sector. RAPA's high-end products are a particularly good compromise between improved vehicle ride, handling, driving safety and agility.

An intelligent damper valve technology with two continuously adjustable control valves in the compression and rebound stages has been developed to achieve this compromise. Permanent damper regulation is thus achieved in this design, compared to conventional adjustable dampers with only one external adjustment valve or with an internal adjustment valve. With lower rebound force, comfort is increased. At a higher rebound force, handling is further improved, body structure

**ABOVE:** Serial production of damper valves at RAPA's facility in Bavaria. The site has five fully automated production lines, producing almost seven million valves per year

vibrations are reduced, and no rolling or swaying movements occur, even during compression.

RAPA's damper valve technology significantly improves ride comfort, enabling premium vehicles and SUVs to be driven even more harmoniously. The variable, adaptive shock absorption, which reacts at all times to different driving situations and the condition of the road surface, also enables fuel savings and thus contributes to reducing CO<sub>2</sub> emissions.

RAPA can offer its valves with maximum variability thanks to a modular valve system and the use of standard elements. This design makes it possible to develop the best individual solution for each customer and bring it to market quickly. The customer receives all the functions they require, such as a modification by which the



**LEFT:** The high-tech production process at RAPA's factory in Selb, Bavaria

**BELOW LEFT:** Automated production of damper valves ensures precision

**ABOVE RIGHT:** Every valve is subjected to a fully automated functional test at the end-of-line, as well as a visual inspection



valve is normally closed and has only an overpressure bypass.

**A development centre for customers**

The complete product process, from pre-development to series test, through to the finished product in series production, takes place in-house at RAPA Automotive, acting as an external development centre for customers. The partnership is based on an open and interactive co-development concept, with the customer involved at all times in the open research, development and test phases, receiving advice from engineers at every step.

The project aims and requirements, core concepts and simulations are developed in the first phase, with calculations made and basic research studies undertaken. This is followed by lifecycle, manufacturability and

production process testing in the second phase. After each phase, an assessment is made as to whether the desired product performance can be implemented.

As thorough as these development phases are, RAPA's product development is nevertheless rapid, in order to be able to offer the customer the desired product, ready for series production, in a short time.

**Testing, production and assembly**

At its headquarters in Selb, Bavaria, the RAPA Automotive division of RAPA Holding has 2,500m<sup>2</sup> of laboratory and validation space, filled with state-of-the-art measuring and testing technology. Here, every valve is subjected to a fully automated functional test at the end-of-line, during which the hydraulic properties are also measured. These

measurements are much more accurate and eliminate any possible human error. This guarantees customers maximum safety as well as reliable and precisely fitting system parts.

Around 90% of all necessary testing and validation procedures are implemented in-house at RAPA, to meet the special requirements of the automotive industry. Complex sequences with combined loads in terms of temperature, service life, climate and environment can be run in-house. The data obtained from all the tested components is stored and can be incorporated into computer simulation models. These models provide valuable insights, even before the elaborate prototype construction process starts, and can be used as references to results from newly tested prototype samples.

Insights into material properties and product behaviour is also available, from the company's own quality and testing laboratory records, which help the development and manufacturing processes advance to series maturity in less time and with a 'right first time' approach. In order to optimise the subjective driving experience and the chassis control, RAPA is an active participant in numerous OEM vehicle tests that help tune the systems.

RAPA relies on comprehensive quality management and has all the necessary certifications of the automotive industry such as IATF 16949, ISO 9001, ISO 14001 and EMAS. In addition, RAPA is certified according to the VDA quality management standard.



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