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Bertrandt*magazine*

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VW Touareg – Development partnership

Opel Meriva – Insulation On-board electrical system Interior

Binz – Complete development of bodies

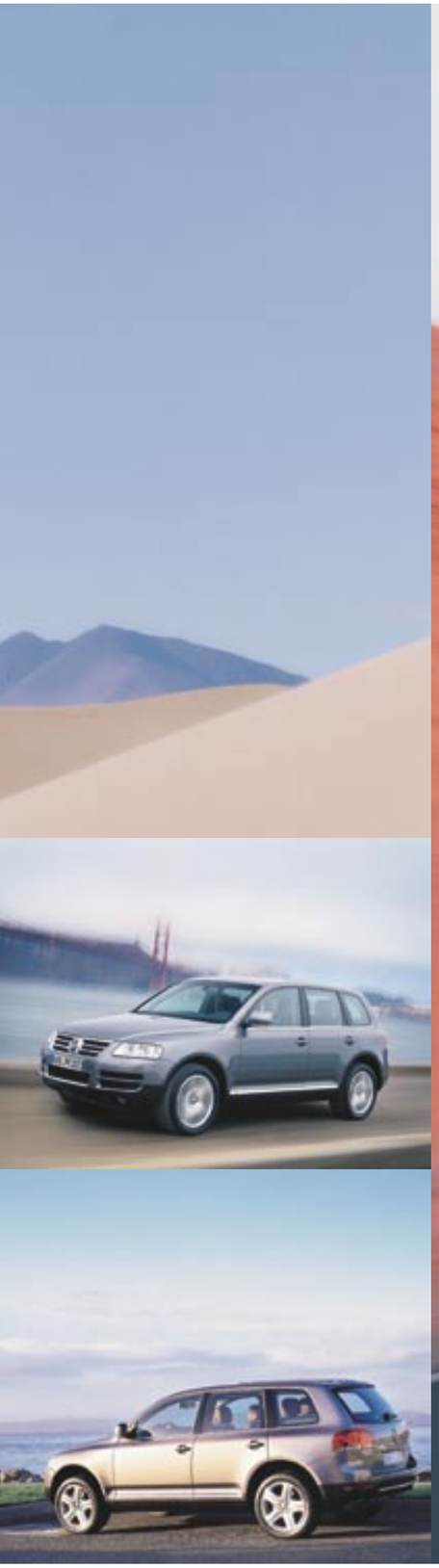
Bertrandt Engineering Network – Body-in-white development

In this issue

Editorial

Working in networks – that's how many companies who are successful in the automotive value-added chain will meet the growing demands of the future as projects become increasingly complex.
We at Bertrandt also combine our expertise with your products and processes – in the Bertrandt Engineering Network. We have organised our services into four Divisions: Supporting Services, Specialized Services, Engineering Modules and Derivates.
In order to make the Bertrandt Engineering Network transparent for our readers, future editions of Bertrandt*magazine* will select some examples of modules and present them in detail. For example, this edition describes our body-in-white development, showing how processes are interlinked in our Bertrandt Network. Why are we starting with body-in-white development? The reason has something to do with our past. In spite of the tremendous dynamics involved in establishing new fields of business, we have not forgotten our roots in body development, from which, over the past thirty years, we have grown from a "one-man" engineering company to become one of Europe's leading development service providers. Even today, body-in-white development still accounts for more than 20 % of our entire range of services, making it a core competence in the Bertrandt Engineering Network. Based on our many years of expertise, we develop vehicle bodies, integrate all of the components involved and build drivable prototypes.
The following pages will offer you an insight not only into how we work but also into the network that integrates you, our business partner, and the specialist knowledge of our workforce. We hope you enjoy reading our magazine as it takes you on a guided tour through our networked value-added chain – and we invite you to accompany us and our developments in the future, too.

Dietmar Bichler



VW Touareg

Pleasure in the Extraordinary

The VW Touareg made its debut on the German market in the autumn of 2002. This premium SUV marks VW's entry into a new vehicle segment, guaranteeing not only an extremely high level of driving comfort but also a great deal of off-road fun.
As the development partner, Bertrandt Tappenbeck ensured that the Touareg is optimally equipped for the future with its innovative technology and functionalities.

Digital Mock-Up – Prototype Build – Start-up Support

Bertrandt began work on the virtual design of the front end of the 6 and 10-cylinder Touareg in 1999. Their specific task was to accommodate the engines into the front end of the car. The bodyshells were then built by VW's prototype build department and the very first attempts at integrating the 6 and 10-cylinder power units were made at Bertrandt in Tappenbeck.
After a two-year development period, the first release date arrived: the body for the 10-cylinder was to go into pre-series production. For this purpose, representatives from all of VW's specialist departments went to Bertrandt: quality assurance, engine development, electrics, chassis, acoustic insulation, damping, climate control and cooling, fuel and body design. This date also saw the release of the front end and the underbody. It was already clear: the Touareg was going to be a car that people will want to drive.

VW Touareg

In cooperation with the VW team responsible for the front end and the pilot production facility in Bratislava, the vehicle was built under series production conditions. Back in Tappenbeck, the front end then underwent fine-tuning to production readiness.

The VW Touareg can do just about everything that is possible on four wheels: it masters 45-degree slopes just as majestically as it wades through rivers up to 58 cm deep. A car that leaves nothing to be desired – offering fun without limits.

Virtual Product Data Management optimises development

A decisive success for the development engineers was the use of Virtual Product Management (VPM), involving a digital mock-up (DMU). The objective of this is to enable data matching to be performed at any time and to make the design status transparent throughout the development process. This allows the data status within the project to be continuously optimised in the subsequent process.

Virtual data matching was carried out in a structured DMU-VPM process on Bertrandt's in-house system, before being transferred to the VW system. Tappenbeck is linked with the DMU centre in the main VW plant in Wolfsburg via a 100-Mbit line for the direct exchange of data.

A further advantage was that the Bertrandt workshop had a special DMU room. This ensured that the virtual world could be brought right into the workshop, allowing any changes between the real and virtual vehicles to be executed with real-time data matching. The scope of the Bertrandt project also included compiling the database required for the front end DMU.

The use of VPM gave a completely new dimension to the development period, thus providing cost-cutting potentials that have a considerable effect on the development costs of a new vehicle.

Series maintenance

Now that the car is in production, the aim is to structure, analyse and further develop the platform of the Touareg with the engines introduced so far. This includes maintenance of the component statuses as well as the introduction of new power units. These tasks are facilitated in the long term by the intensive preparatory work carried out over several years.

Online Link with VW due to many years of partnership

On the basis of mutual trust, expertise and innovation, the team in Tappenbeck has succeeded in establishing an online link with the VW partner for the necessary data maintenance. Following many years of fruitful cooperation with the responsible persons in Wolfsburg, this unique regional achievement was made possible in August 2003. After coordination with VW's data security centre, the specialists in Tappenbeck are now able to directly match the design status data in the VW data structure in their online room. Bertrandt fulfils the high security standard required by VW.

The structured process thus created allows other subsidiaries in the Group to access these data structures. In the future, Bertrandt Tappenbeck will continue to be responsible for all design services for the front end, as well as maintenance of the virtual data. For this purpose, they will also support the VW Group's prototype build department by supplying experimental vehicles. In the initial stage, this will involve the testing of components, involving such aspects as temperature, acoustics and the durability of alternators and component parts. All in all, this represents a comprehensive service programme that the VW Group is happy to take advantage of. ■

Scope of the Touareg *project in brief:*

Surfacing:
Interior trim finishers, pillar coverings, roof lining, second row seats

Electrics:
Wiring for tow bar

Electronics:
Control unit flashing in Bratislava

Rapid technologies:
Laminated parts for camouflaged vehicles

Interior:
Trim finishers, roof lining, pillar coverings, including deformation elements as supplied by subcontractors
FMVSS Modifications
Second row seats

Powertrain:
Engine mounts and auxiliary unit mounts
Support for configuration of engine assembly and implementation in Bratislava

Suspension:
Hoses for power steering and oil cooler
Front axle ventilation

Vehicle Construction:
Modification of vehicles, e.g. left-hand drive to right-hand drive
Modification and reworking of vehicles for presentation at motor shows, events and market launch

Quality Management:
FMEA

Digital Car:
Complete DMU of front end

Launch Support:
Launch support, front end
Launch coordination, net partition

Documentation:
1,000 PDM pages, interior
Parts lists, front end

Flexible Allrounder

Bertrandt Rüsselsheim supports development

In the spring of 2003, Adam Opel AG launched the "baby brother" of the Zafira onto the German market – the Meriva, which was developed on the basis of the Opel Corsa. Bertrandt's Rüsselsheim branch was commissioned by the OEM as well as by various system suppliers to develop some aspects of the new minivan.

Insulation and carpets

The company was given the go ahead in the spring of 2001. Based on European requirements with regard to acoustics and ergonomics as well as crash behaviour, Bertrandt developed the engine compartment components and carpets. Special emphasis was placed, for example, on developing the complete insulation package. Among other things, this involved covering specific acoustic weak points with insulating material. It also included a consideration of the manufacturability and assembly of some insulation components.

The on-board electrical system

The wiring layout and the on-board electrical system were designed and installed in cooperation with Delphi. For example, this included the wiring layout around the body, the wiring of the doors and the engine compartment wiring. Since Bertrandt was also responsible for the insulation package, the short communication distances within the company were a major advantage that allowed them to supply high quality on schedule.

Appealing and functional interior design in the Opel Meriva.

Scope of the* Meriva *project in brief:

Powertrain:
Insulation package, engine compartment

Electrics:
On-board electrical system in development partnership

Interior:
Feature box
Carpets
Storage compartments I-shelves
Side trim, bulkhead
Glove box (components and tools) as supplier's subcontractor

The "feature box" offers new functionalities

Also included in the scope of the project for Bertrandt Rüsselsheim was the development of the double floor in the boot – the so-called "feature box". The idea of utilising the space between the body and the floor of the luggage compartment set new challenges for the engineers. After all, the empty space also had to provide enough room for the warning triangle, a removable tow bar and the first aid kit, without however impairing access to the spare wheel. At the same time, the closure for the spare wheel had to be easily accessible. For this reason, extensive package investigations were carried out in the run-up to the start of development. Concepts for dividing up the luggage compartment using various manufacturing techniques were developed and implemented based on Opel's decisions.

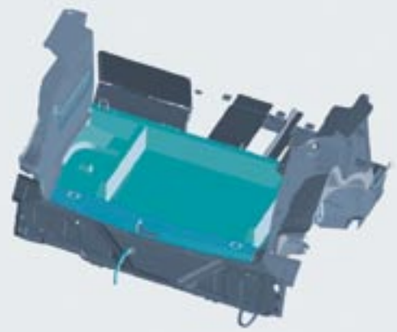
Interior

The development of the glove box was carried out in cooperation with a system supplier. The company, which is located in Strasbourg, had been commissioned to develop the tools and components for the glove box as well as to manufacture the tools themselves. On behalf of the supplier, Bertrandt took on the complete development work – from the initial concept right up to series production readiness.
In the concept phase, emphasis was placed above all on meeting the crash and safety requirements. A good deal of creativity was called for in the design of the opening mechanism. For the European version, Opel wanted a special catch that had to pass the "Misuse Test: Lid Open".

Bertrandt would like to thank Adam Opel AG, the system suppliers and all partners for their trust that they showed in awarding this contract. The excellent and close cooperation made it possible to complete the project within a very tight schedule.
Bertrandt Rüsselsheim was able to provide its customers in this project with a particular benefit due to its interdisciplinary development work in the field of insulation and electrical system development. Internal synergies and short communication distances within the Rüsselsheim facility as well as the Bertrandt Engineering Network ensured that the project ran smoothly. The provision of innovative services in whole vehicle development are a guarantee that Bertrandt will continue to be a competent and reliable partner for its customers. ■

Opel Meriva

Insulation: engine compartment and carpets.



The "feature box" offers plenty of space for accessories and also allows easy access to the spare wheel.

Complete development of bodies for special vehicles – from sketch to final product

Filling the Niche

Technikum Ehningen

"We want a product that is optimised in every aspect" is how Gerhard Kurr, Managing Director of the company Binz in Lorch, formulated his aims at the initial meeting on the development of the latest range of ambulances and hearses. This statement is fully in keeping with Bertrandt's own ideology, and forms the basis for the long-standing successful cooperation between Binz and the Technikum in Ehningen.

Everything is new

The launch of the new E-Class was a reason for coachbuilders Binz from Lorch in Southern Germany to upgrade their product range and adapt it to the increased requirements.
The Bertrandt Technikum in Ehningen was commissioned with the complete development of the superstructures for the K211 ambulance (see "Technology and Design", Bertrandt*magazine* No. 1) as well as the H211/2 and H211/4 hearses on the basis of the extended chassis of the VF211 E-Class. Areas that are well established at the Technikum – design, concept, construction and computation as well as model making and prototype build – ideally meet Binz's requirements.

The surfacing, design and body-in-white departments at the Technikum also played a major role in the development of the six-door stretched limousine in Binz's product range, which is based on the E-Class saloon. In this respect, the Binz projects are good examples of the intention inherent in the Bertrandt Network concept to offer comprehensive support to customers in the development of holistically defined products.

Successful change of image

The teams at Binz and Bertrandt worked together at an early stage within the framework of the joint project.
As a result, constructive communication was established between the engineers and the sales personnel at Binz even during the concept phase. At the same time, the holistic consideration of the design aspects at Bertrandt allowed the shape and concept to be proven within just a few weeks. The designers succeeded in giving each vehicle type an independent identity while at the same time defining the family character of the Binz product range. The change of image from an E-Class saloon to an extravagant, six-metre-long stretched limousine or from an E-Class T-model to an ambulance or hearse was successfully achieved.

High level of innovation due to Integrated Frame Technology

Since a good relationship between unladen weight and maximum payload plays an important role in these special vehicles, which are sold only in relatively small numbers, Binz decided to use a glass-fibre sandwich design for the body of the new model. The new manufacturing methods and joining techniques involved were defined jointly and then adapted and further developed for each new vehicle.
Once the basic requirements for each of the vehicles had been determined, the strength and superstructure concept were developed using new Integrated Frame Technology. The components have a high level of innovation with regard to their form, function, assembly and weight. In some cases, the joining concept and the optimised component separation even made it possible to do without some assembly equipment. Such highly integrated components have to meet extremely high design requirements, since they have to form both the outer skin and the interior surfaces.

Complex parts in a glass fibre sandwich design form the inner and outer surfaces.

Process of continuous improvement

Developing the various vehicles turned out to be quite a complex process. The superstructure principle and the manufacturing technologies were basically maintained in each case. However, due to the functional and formal differences, there were in some cases considerable deviations in the design of the vehicles. In view of the tight cost and time framework, all those involved were fascinated to see how the solutions developed. The designers succeeded in achieving a process of continuous improvement in the three vehicle projects. The tasks and roles performed by all the companies involved soon crystallised into their optimum form, resulting in higher project efficiency.

Ambulances

The design of the ambulance body was based on a "central package" that fixes the positions of the patient and carers in the vehicle interior from a psychological point of view. This structure then determines the volume for the outer skin. The external shape of an ambulance, especially the window contours of the superstructure, are a good example of how constructive, formal and functional aspects are combined, thus producing an appearance that is both unusual and appropriate. In keeping with the positive image of the ambulance personnel, the window is wing-shaped. The high sides create a protective feeling for the injured persons, at the same time shielding them from onlookers. The upper edge of the window extends well into the roof, allowing the injured person or the carers to look out. The shape and colour of the window symbolically unite the ambulance space with the driver's compartment, giving the vehicle an appropriately dynamic appearance.
In accordance with regional differences, the ambulance has to be equipped to meet different regulations. The concept therefore allows for a variable design of the interior.
For example, in Sweden, ambulances are used mainly as rescue vehicles. The passenger car suspension offers maximum comfort over long distances and on unpaved roads.
In the rest of Europe, these vehicles are mainly used for transporting sick and elderly people. Often, they have to transport people who have been injured abroad back to their home countries, for example from skiing resorts. In such cases, the ambulances are fitted with DVD players and other entertainment electronics.

K211

Many years of partnership

VF211

The company Binz in Lorch has been modifying E-Class saloons and estates from Mercedes-Benz since 1951. All in all well over 50,000 vehicles have been extended and supplied as road-going chassis to Mercedes dealers or coachbuilders mainly in Europe. These chassis are then used to build special vehicles – ambulances and hearses of various types – that no doubt encounter mixed feelings among the public.
Bertrandt has for many years been the design partner in developing long-wheelbase chassis for the Mercedes-Benz E-Class. Following the launch of the new model of the E-Class, the 211 series, the body-in-white development teams at the Technikum Ehningen were responsible for the complete body-in-white extension as well as the necessary extension of the prop shaft, the exhaust system and the brake and fuel lines. Together with engineers from the Technical Computation department, Bertrandt was able to support the proving of the finished product by performing strength tests. In accordance with the motto "from the sketch to the final product", a project team had joint responsibility for the entire product development process of all the vehicles, right through to production. Right from the start, the concept and design of the vehicles were centred around the end customer. This involved not only the integration of constructive and functional requirements but also a fundamental consideration of attributes for the identification of the buyer.

Complete development of bodies for special vehicles

Excellent results on the Hydropuls: the Binz K211 using adhesive bonding technology.

Show model and marketing

The modelmaking team in Ehningen produced a 1:6-scale model of the H211/4 hearse for the "Funéraire 2003" fair in Paris.

For this occasion, Bertrandt was also active in the field of marketing for Binz. Their services included designing advertising material and graphic presentations as well as giving a presentation in Britain.

Best customer response for Binz vehicles at fairs.

Superlative eye-catcher: six-metre-long billboard with a full-size picture of the H211/4.

Scope of the Special Vehicles *project in brief:*

Body-in-white:
Complete development of superstructures

Powertrain:
Constructive adaptation of brake lines, fuel lines, exhaust system and prop shaft

Design:
Concept and package
Draft/rendering
Representation of variants
CAD implementation
Graphics
Design of advertising material
Presentations

Surfacing:

Computation/Simulation:

Modelmaking:
1:6 model, hearse
1:5 model, ambulance
Individual models of SLS parts

Summary

Binz's products are currently the only vehicles of their kind that are developed and designed exclusively on the computer in the same way as a large-volume series production vehicle. Strength testing on the DaimlerChrysler Hydropuls system produced excellent results for the Binz designs. The holistic approach and the consistent pursuit of a product philosophy for Binz allowed them to make a spectacular comeback in the hearse sector. Their ambulance model was also immediately accepted by customers and experts alike. The design and construction of the vehicles set them apart from their competitors.

Bertrandt sees the high level of acceptance on the part of the end users and the success for Binz as recognition for its work. It is a reason for all those involved in the project to be proud of what they have achieved. ■

Gerhard Kurr, Managing Director of the company Binz in Lorch:

"The committed and responsible cooperation with Binz confirmed the many years of strategic partnership based on mutual trust and orientation towards common goals. In spite of many challenges in details, the manner of cooperation was always positive."

Project discussion at Bertrandt (from l. to r.):
Volker Blumenstein (Construction), Ingo Schulz (Project Leader), Gerhard Kurr (Binz) and Volker Sieber (Design).

H211/2

Hearses

By tradition, hearses have been defined as a "place of light". For that reason, transparency and light were the determining attributes both for the design and for the structural development of the vehicle.
The H211/2 hearse is designed specially for the German market. It must be able to transport two coffins side by side in the coffin space. If one coffin is carried in the middle, the central area of the loading platform can be lowered. This makes space available for placing wreaths on the coffin.
The H211/4, on the other hand, was developed for the British market. Due to the very different funeral culture there, the hearse has to fulfil different requirements. For example, as the only vehicles of their type in Europe, these hearses are delivered without a separating wall and offer space for up to four accompanying persons. For other countries, these vehicles can be supplied with or without a separating wall as an option.

H211/4

Aviation Test Stand

Bertrandt Bièvres develops a test bed for Snecma Moteurs

Task: pilot study and evaluation of solutions

In March 2000, Bertrandt Bièvres received an enquiry from Snecma Moteurs, one of the largest manufacturers of engines for the civil and military

aerospace industry. Bertrandt's task was to develop solutions that would significantly reduce the time needed to carry out vibration fatigue tests on blades. The detailed objective of the project was to be able to set up the test beds within half a day instead of a week. In addition, the precision with which the siren (a high-frequency airflow generator) could be positioned was to be improved. It was also essential for Snecma Moteurs to have the option of adjusting the position of the siren quickly during the tests, with the guarantee that the position could be reproduced in the case of tests on several identical blades.
The Bertrandt team suggested the following approach: drawing up a specification document followed by a functional analysis, demonstrating the technical solutions and making comparisons between them. Snecma Moteurs accepted the bid from Bertrandt Bièvres in the middle of 2000.

Result: three proposed solutions

Bertrandt presented a total of three solutions. Snecma Moteurs chose the solution that offered the highest degree of automation – a signal bridge with three motorised and two manual axes. Using this test bed, the siren could be positioned in such a way that the control unit was located on the test bed itself, or at some distance away from it in the test area.

Preliminary design: overall cost estimate

At the request of the development department of Snecma Moteurs, Bertrandt Bièvres produced a preliminary design of the solution that had been chosen. The purpose was to define in more detail the proposed technical solutions and to specify the costs and the timeframe involved in this option.

Project management: from concept study to installation

Bertrandt Bièvres received the go-ahead to start developing and manufacturing the test bed in May 2002. The scope of the project involved Bertrandt Bièvres acting as general contractor and taking responsibility for the project management, the concept study, the manufacturing, assembly, installation and adjustment at the Snecma Moteurs

> **At Bertrandt in Bièvres a team of specialists is developing machines and test beds for the aerospace industry.**

site. Bertrandt Bièvres collaborated with partners on the electronics system and on the production of the test bed.
The test bed was ready for delivery on schedule in October 2002. It weighed 1.4 tonnes in total, 800 kg of which was made up by the moving parts.
At the request of Snecma Moteurs, the delivery was planned for 2003. The decision to delay delivery followed a joint initial acceptance procedure, which involved demonstrating the functional compliance of the test bed.
The test bed was delivered, installed and commissioned in February 2003, a process that took two days. After this, the machine was presented to the Snecma Moteurs team in order to allow them to become familiar with its operation.
After Snecma Moteurs had tested the test bed for a month, Bertrandt carried out the final acceptance procedure. At the end of the project, Snecma Moteurs was full of praise for the entire team and the results of their work.

Future prospects

As a result of the successful implementation of the project, Bertrandt Bièvres was awarded additional follow-up projects. Bertrandt very much appreciates Snecma Moteurs' confidence in its competence and flexibility and looks forward to future collaboration in the field of test bed engineering. Thanks go to all those who have contributed to this positive development and to the success of this intriguing engineering project. ■

Francisco Ferreira, the team leader of aerospace design at Bertrandt Bièvres, will be happy to provide you with further information
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or e-mail:
francisco.ferreira@fr.bertrandt.com

Snecma Moteurs' range of services. Bertrandt developed and constructed a flexible test bed for engine components that can carry out a large number of tests within a short period of time.

Starting point: Technical background

In order to ensure that the vibration fatigue tests are representative, the blades to be tested are fixed at the blade root, which corresponds to the way in which they are mounted on the engine. The blades are then activated by a high frequency airflow produced by a fan and generated by a "siren" weighing 80 kg.

The tests are carried out manually on a board. The blades and the siren are set up in a standard system of angled frames and flanges. One of the difficulties is to adjust the siren in such a way that the airflow hits the blade at the correct point in order to produce the best possible activation effect. Using this method around a week is needed to set up and adjust the testing equipment.

Scope of the* test bed *project in brief:

Aircraft Construction/Component Testing:
Pilot study including operational feasibility assessment
Full development of the test bed, acting as general contractor
Project management
Production, with external partners
Installation, commissioning and training

Greater project complexity increasingly calls for the ability to understand development as an entire process. To ensure that the desired aim is achieved at the end of the process chain, structures and processes must intermesh and be combined with many years of expertise in using state-of-the-art tools. This is also true of the process chain of body-in-white development, which culminates in the building of a finished prototype.

Development

On the basis of the first model data, Bertrandt's engineers develop the body structures and the outer skin of vehicle structural models up to series production readiness: in all body designs and from all materials, from high-strength and ultra-high-strength steel to aluminium, magnesium and plastics. At the same time, they are also fully familiar with the development of classic steel shell designs as well as spaceframe, modular and hybrid construction methods.

Parallel to the development process, benchmarks, studies, concepts and analyses are produced in order to coordinate the development of the components with regard to manufacturing and assembly.

Since the body-in-white development represents a precise mathematical definition of the body structure, further areas play a major role in proving a fault-free data structure. Operating strength, crash behaviour, material selection, manufacturability and joinability as well as weight, cost and many other aspects are taken into consideration here.

From the Drawing Board to the Prototype Body-in-white

Body-in-white development in the Bertrandt Engineering Network

A volcanic eruption? No, our cover picture actually shows prototype parts being welded during the vehicle construction process.

The interfaces to other specialist departments and interdisciplinary areas as well as to the customer require that all working steps be documented in detail in a number of different systems. Furthermore, a high level of analytical capability and well-organised lines of communication are vitally important to keep all those involved fully informed.

Sheet metal forming and toolmaking

As soon as the body-in-white engineers have achieved 50 to 70 percent of the development, their colleagues from the sheet metal specialists Zapadtka + Ritter (ZR) in Bretzfeld start with their work. In a continuous dialogue with the developers, the components are examined with regard to their manufacturability, always from the point of view of ensuring that they can be manufactured reliably in series production. The components pass through the first optimisation loops before toolmaking begins.

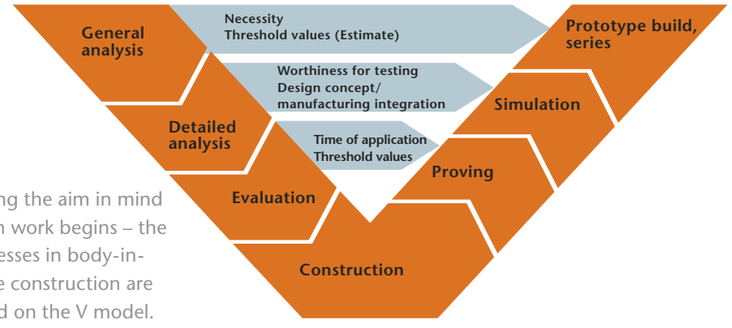
At the same time, the colleagues at ZR start selecting the best method for manufacturing the prototype parts, after having consulted the customer on how close to series production the prototype should be. Following the successful simulation of the deep drawing process, they then design and cast the tools. Various materials are available depending on the customer's wishes and the requirements to be met: grey cast iron, steel, zinc alloy, plastic, Cerrotru or combinations of these. ZR machine the blanks on their own milling machines. The individual components are then assembled in the toolmaking department to form fully functional tools.

After a successful try-out, the tools are released by the internal quality assurance department. This is followed by the production of the pressed parts, which are supplied directly from the press to four laser cutting machines, where they are cut. There are now several options for forwarding the parts: to the quality assurance department to compile a measurement report, directly to the press shop for further processing or to the colleagues in the manual machining department. When the parts are finished, they are examined and released by the colleagues from BPG, who are responsible for the project management, and by the body-in-white development and vehicle construction departments. Immediately afterwards, ZR delivers the individual parts to the vehicle construction department of the Technikum in Ehningen.

Vehicle construction

Vehicle construction focuses on designing and building the jigs and fixtures as well as on assembling complete bodies-in-white. As soon as the data has been released from the body-in-white development, construction of the jigs and fixtures begins in accordance with the clamping and fixing concept. This development is performed by Bertrandt in cooperation with the customer or is provided by the customers themselves. Attention is paid to joining the parts according to the series production sequence in order to be able to draw conclusions about the subsequent series production process even during the prototype phase. Continuous feedback is maintained with those responsible for the parts in the body-in-white development department, in order to solve any discrepancies at an early stage. Where are additional clamping points necessary? How accessible is the fixture? In such cases, experience gained from previous projects plays a major role. As a result, knowledge is continuously further developed and optimised. Once the jigs and fixtures have been designed and built, they are released, with the involvement of the customer if so desired. Work on building the sub-assemblies and then the entire body-in-white can now begin. Here too, close cooperation with the parts manufacturer ZR and the colleagues from the body-in-white development is necessary. Further services include measuring and documentation of the bodies. The processes are documented both in words and in images and are made available to all those involved in the project.

Close cooperation between all those taking part in the project plays a major role in reducing development time. At the same time, continuous documentation and examination throughout the entire project ensure that the end product – the finished prototype – is of the highest quality. ■



Having the aim in mind when work begins – the processes in body-in-white construction are based on the V model.

Close cooperation in the Bertrandt Engineering Network (from l. to r.: Achim Theurer, Mathias Mangliers, Andreas Meyer-Eggers and Markus Grass).

Achim Theurer,
Body-in-white development:
"The age of the extended workbench is over. Today, we integrate ourselves into the product development process and take responsibility."

Mathias Mangliers,
Sheet metal forming and toolmaking:
"The production of prototype parts is an exciting business. The constantly changing framework conditions require a lot of ideas and a great deal of pragmatism. There is no such thing as routine for us. But the objective is always the same: in the end, we all want to do just one thing – build prototypes."

Andreas Meyer-Eggers,
Project Management:
"The complexity of development projects calls for professional project management. Fixing responsibilities, establishing interfaces and constant progress controlling are just some of the aspects involved in executing an order to the complete satisfaction of the customer."

Markus Grass,
Vehicle construction:
"Our aim is to produce a large number of close-to-series, high-quality prototypes within a short period of time."

Bretzfeld

Ehningen

Garching

Hamburg

Ingolstadt

Cologne

Munich

Neckarsulm

Rüsselsheim

Wolfsburg

Paris

Sochaux

Strasbourg

Dunton

Leamington Spa

Barcelona

Göteborg

Trollhättan

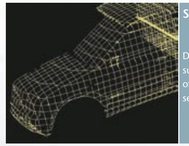
Detroit

Successfully controlling complex projects

Project Management

- Project Planning
- Project Supervision
- Project Scheduling
- Project Documentation
- Change Management
- Approval Release Management
- Project Controlling
- Risk Management
- Interface Management
- Launch Support
- Project Reviews ('Lessons learned')

Project management requires interdisciplinary thinking, standardised processes and the use of modern technologies. The binding and clearly defined structuring of the development process from the very first sketch to the start of series production, as well as intensive contact with the customer and commercial feasibility are important prerequisites for successfully functioning project management. As an ongoing process, project management ensures that the prevailing conditions are constantly examined, analysed and further developed.
Bertrandt Projektgesellschaft mbH (BPG) constitutes a central control unit at the company's headquarters in Ehningen, where it coordinates and controls complex projects. This concentration of expertise in project management guarantees an efficient use of resources and a very high level of process stability.



Sketch:

Dividing up the surface on the basis of geometrical sections.

Construction:

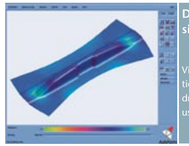
Constructing the components, tools and fixtures through to the complete body-in-white.

DMU:

Virtual design of a vehicle for the early simulation of its characteristics.

Computation:

Making statements on safety, stiffness and vibration at an early stage in the development.



Deep drawing simulation:

Virtual examination of the deep drawing process using Autoform.

Press shop:

Forming parts from sheet steel – to a precision of just a few millimetres.

Laser centre:

Three-dimensional laser cutting – from the drawn part to the individual part.

Manufacturing by hand:

Unique models and show cars are e.g. hand-made.

Fixture design:

Designing the fixtures according to the clamping and fixing concepts.

Fixture building:

Building the manufacturing fixtures for assembly. Measuring and recording the fixture building.

Body-in-white:

Assembling the sub-assemblies right up to the complete body-in-white.

Measuring:

Quality assurance and documentation.

Hardware in the Loop

Testing embedded electronic systems

Technikum Ehningen,
Bertrandt Ingolstadt

Increasingly complex systems now need to be developed in ever shorter periods of time. In this process, it is vitally important that any errors are detected and corrected in the early phases of development. One approach is to use Hardware in the Loop (HiL) test rigs. HiL allows an existing control unit to be tested within a model of its subsequent environment. This makes it possible to carry out an analysis of the device at an early stage.

The vehicle electrical system: a guarantee for voltage stability and functional reliability

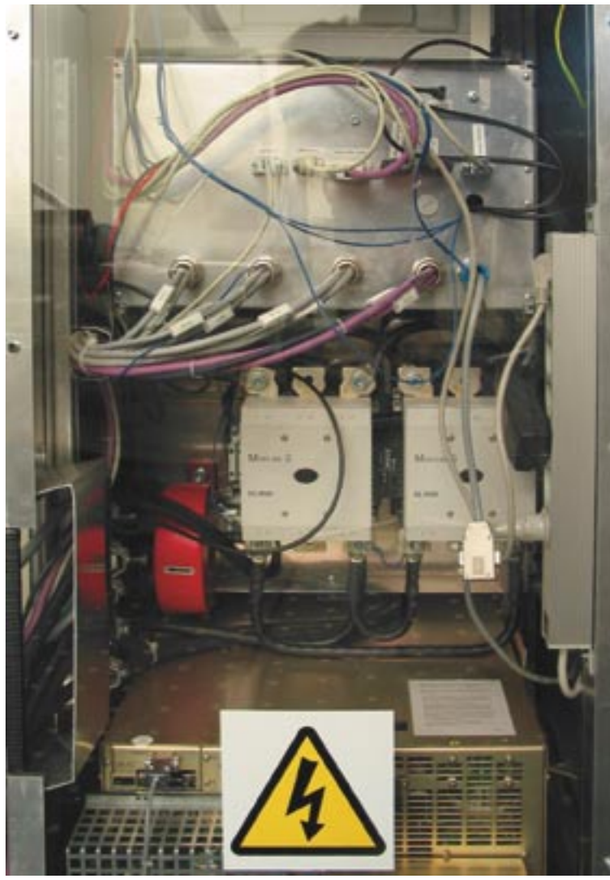
The main requirement to be met by a vehicle's onboard electrical system is that it provides a stable voltage and performs all the functions required. This includes the ability to start the vehicle and to provide a reliable source of power to the electrical components of safety-relevant systems as well as to those relating to comfort, for example.
In order to ensure that these requirements are fulfilled, modern vehicle electrical systems are equipped with energy management functionalities. Depending on the level of standard equipment in the vehicle, the functions provided by an energy management system range from simply stabilising the onboard voltage by raising the alternator's no-load voltage to predicting the battery's ability to start the vehicle at a future point in time by means of a predictive diagnosis of the battery's condition and state of charge. Therefore, the primary task of the energy management control unit is to determine the battery's performance capacity at any one time and to prioritise the electrical components accordingly.

HiL test rig project: testing the control unit functions of the energy management control unit

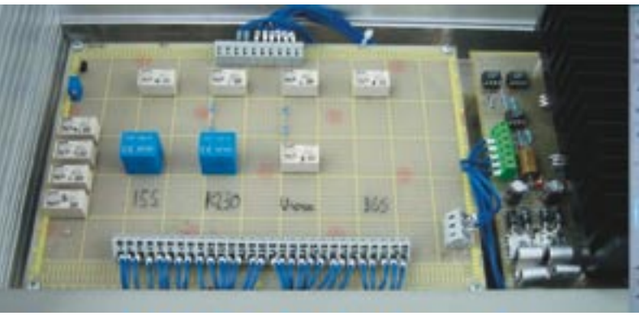
The task facing the engineers in the Automotive Electronics department at the Technikum Ehningen was to develop and build an HiL test rig that is able to automatically test the control unit functions of an onboard energy management control unit in accordance with a given test specification. The emphasis was on reducing testing time and ensuring the repeatability of the tests, while maintaining constant test conditions.
In the tests, the control unit is subjected to various stimuli via the CAN bus, such as voltage, current, temperature and the simulation of the residual bus. The reactions of the control unit are formulated as CAN messages and are recorded on the computer using CANape and CANoe, where they are compared with the specifications. This comparison and the values expected are used to decide whether the control unit is functioning correctly.
Once the hardware and software have been tested and put into operation, trials are performed and the results are documented.

The test rig concept: interaction between hardware and software

The test specifications for the control unit were provided by the customer. On the basis of these specifications, the project began by developing a concept for the hardware and software.
The hardware components were then put together and dimensioned in accordance with the special test specifications. The software test used two commercial tools from Vector: CANoe for the residual bus simulation and to record the CAN messages and CANape to record the control unit parameters.
Communication between CANoe and CANape was achieved via a gateway programmed in Visual Basic through a Microsoft COM interface.
From the test specifications, the individual testing steps were compiled in process chains and programmed and executed in LabView with the aid of a process control programme. In this context, the process control specifies the set values, determines the physical measured values and provides the documentation of the results. It consists of a large number of reusable individual modules – so-called functional blocks – that represent recurring test procedures. For example, they include plotting voltage curves over time, setting the voltage and current, waiting for



The heart of the test stand – the central junction box: high-current power unit with contactors and inductive current measurement.

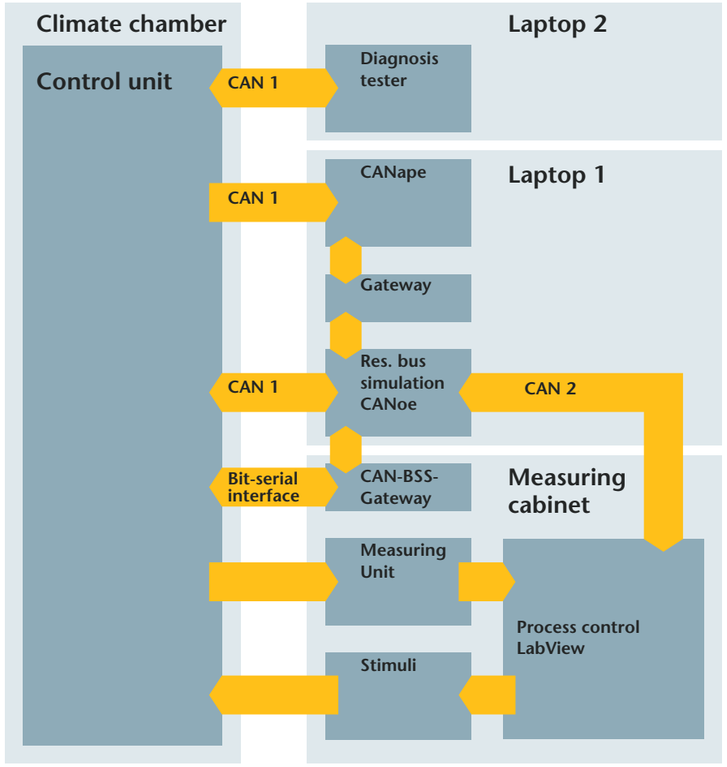


Signal distribution.

Screenshot of the graphical user interface.

Measuring cabinets for the HiL test rig.

results, controlling CANoe via the CAN bus or filing the data. Information on the process sequence is provided by the process chain.
The entire residual bus behaviour for the test object is simulated using CANoe. The sending and receiving of messages to and from the control unit is controlled by a measurement node programmed in CAPL (residual bus simulation).
This allows the requirements of the test specification on the CAN communication with the control unit (residual bus parameters, value specification, read out of values using CANape and the diagnosis function) to be represented.
In implementing this concept, the electronics engineers worked in close cooperation with their colleagues from the testing department, who contributed their experience in designing test rigs and programming LabView. Bertrandt engineers from Ingolstadt also supported the CAPL programming.



System representation of the HiL test rig.

Developing and building the test rig: the junction box as the central hardware element

Following the joint concept development in the Bertrandt Engineering Network, the test rig was built in Ehningen. It consists of two measuring cabinets, a climate chamber and two laptop computers.
The first measuring cabinet houses an industrial PC, data acquisition cards from National Instruments and mains adapters with fixed voltages, as well as further programmable mains adapters (0 – 45 V, 0 – 70 A). The second measuring cabinet contains a high current constant for currents of up to 1,000 A and appropriately sized contactors for reversing the polarity of the voltage as well as the corresponding inductive high-current measurement unit. A bit-serial interface (BSS) provides information on the alternator current derived from the CAN bus data.
The BSS module forms the interface between the CAN bus and the serial line to the control unit. The hardware component CANstress is used to apply a physical disturbance to the CAN. A diagnosis tester is used to "flash" the control unit.
The junction box is the central hardware element of the control unit test rig and connects all the hardware components with one another. All voltage and current sources come together at this point and can be distributed to the control unit accordingly in a targeted manner.
Various currents and voltages as well as the temperature of the control unit are measured as output data. Furthermore, the various systems, such as the test routine control programme, the residual bus simulation and the diagnosis tester, are linked together.

Trials: control unit testing on the HiL test rig

Before the actual test is performed on the control unit, system integration has to be carried out. The purpose of this integration is to test how the various software modules interact with each other and with the hardware. The test rig is then ready to start the test.
The test specifications provided by the control unit developers are divided up into different test case groups, which place different emphasis on the various hardware, software and diagnosis functionalities. The test case groups are in turn divided into test cases and these are subdivided into single testing steps.
These testing steps are executed on the HiL test rig largely without manual intervention. The execution of a single test routine can take five minutes or several days, and for some special testing steps waiting periods of up to eleven hours are necessary in order to check the occurrence of specific events.
Testing usually takes place at a room temperature of +25 °C. Many of the testing steps are then repeated at temperatures of –40 °C and +70 °C. For this purpose, the control unit is placed in a climate chamber.
The automatically generated results are then plausibility checked and entered into the corresponding test specification to simplify evaluation.

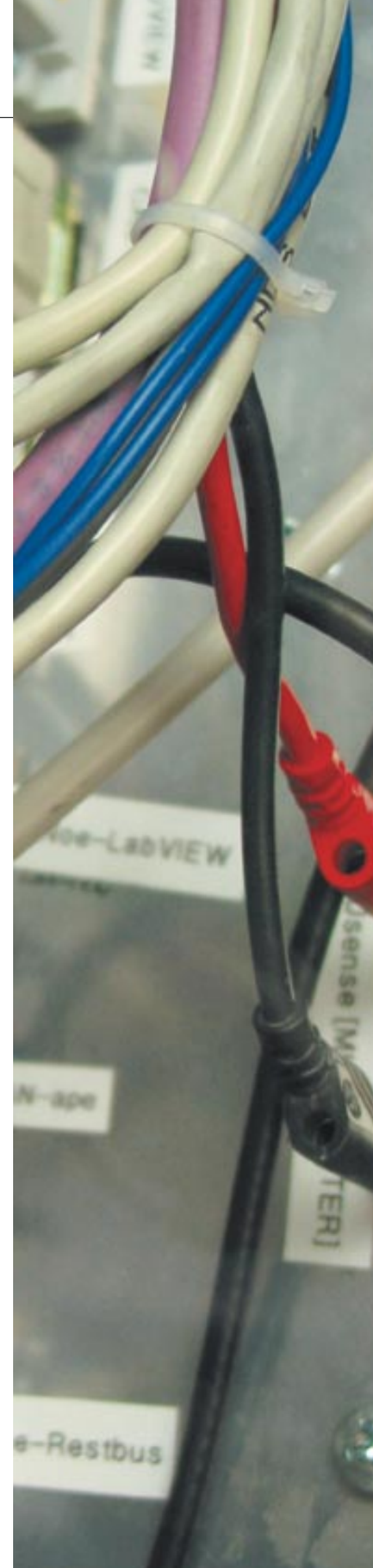
Conclusion

The HiL test rig developed in cooperation with various company branches allows Bertrandt to carry out tests on energy management control units for vehicle electrical systems. Depending on the test case group in question, measurement can achieve a degree of automation of up to 100 %. Manual intervention is necessary only in certain cases, for example for "flashing" the control unit.
The scope of testing can be extended at the customer's request by adapting the CAPL programmes and by programming additional LabView modules. ■

HiL test rig *in brief:*

Electronics:
Concept development
Test rig design
Measured data recording
Measured data processing

Component testing:
Control unit testing
Residual bus simulation
Process control
CAPL programmes



Reliability Tests for Electronic Vehicle Components and Systems

Bertrandt Engineering Network

In order to ensure that individual electronic assemblies and components and complete systems are functioning correctly and that they will work reliably throughout the lifetime of the vehicle, they must be tested at an early stage of development using comprehensive test scenarios and intelligent system tests.

Bertrandt, which specialises in development services, provides support for the automotive and supply industries in this respect. As part of the specialist electronics services offered by the company, its engineers carry out reliability and functionality tests on individual components and complete vehicles on the basis of test concepts that have been predefined or developed by the engineers themselves. A variety of different methodologies and tools are used depending on the development phase in question.

Test bed for vehicle electrical systems, used to evaluate system functions.

Virtual testing: development-related simulation along the entire process chain

Virtual tools are used in the early phases of development when specifications for the system functions are being drawn up, in order to obtain initial information about the feasibility of the requirements. In the context of a tried-and-tested, consistent process chain, Bertrandt provides support for the development process right through to the production of a functional prototype, using the resources and potential of the Bertrandt Engineering Network.

HiL test environment: dynamic tests in static testing conditions

The increasing complexity and size of the network of control units and sensors demands a correspondingly complex and extensive test environment.

In the early stages of development, it is often the case that not all of the components of a system are available for integrated testing. It may be that testing in a real environment on a functional basis (e.g. vehicle electronics systems) is risky or is only possible at a late stage because vehicles are not available. In these situations, the Bertrandt engineers replace the missing components with cluster simulations or devices they have developed themselves. They also construct comprehensive test environments (hardware-in-the-loop). This allows "quasi-dynamic" tests to be carried out in "static" laboratory test environments.

Bertrandt develops and implements complex automatic test scenarios on the basis of the specification documents. In the testing of electronic systems, a high level of creativity and initiative is needed to produce carefully designed test solutions for integral functionality.

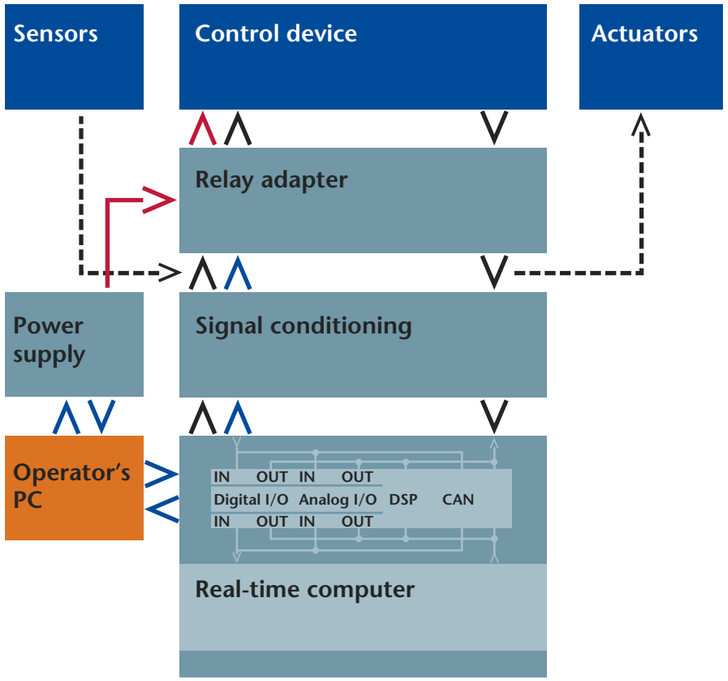


Diagram showing the structure of an HiL test environment.

Test beds: individual solutions for a wide range of test environments

In the development phase and during volume production, a variety of tests must be carried out on components and systems that require individual test environments. These include development test beds, which are used for benchmarking and for validating sample states during the development process, and test beds for quality testing as part of the volume production process.

Experienced Bertrandt employees work together with the customer to determine the requirements, produce specifications and plans, and manufacture and manage the systems, with an emphasis on functionality and reliability. They develop hardware and software-oriented solutions for universal and/or modular test environments to be used on customer sites.

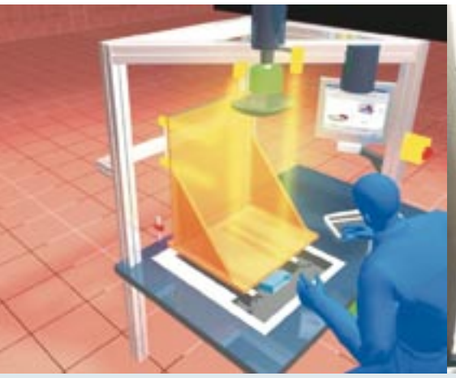
Reliability: testing and analysis at the component, assembly and system level

Depending on the status of the development process, the first tests of the real hardware can be carried out when the system prototypes are available. It is often necessary to create simulation environments to stimulate the functions of the components or systems. In addition, a wide range of electronic, and sometimes also mechanical, control, measurement and test devices must be used as a substitute for the peripheral system environment, which is generally not available at this stage.

Electronic components are tested using computer-based systems in a variety of conditions with an emphasis on high levels of reproducibility. Tried-and-tested software tools such as DIAdem and Labview and purpose-built hardware, sometimes developed by Bertrandt engineers themselves, are used to run the tests and analyses. The hardware and software is responsible for stimulating the components being tested as part of the test and measurement sequences. At the same time, all the relevant, predefined parameters and functions are monitored and recorded.

In order to produce results that are as realistic and useful as possible, the components are subjected to a wide range of factors that a vehicle could encounter during the course of its service life. These factors are brought into play in a kind of time-lapse sequence so that the components are deliberately subjected to stresses. Significant factors include different temperature ranges, moisture and vibration, together with a variety of electrical and mechanical tests such as overvoltage, undervoltage and the resistance of connectors to pressure.

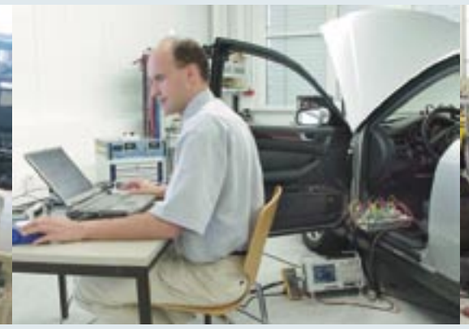
This allows the results to be reproduced in all types of circumstances, and any inconsistencies or malfunctions can be identified at an early stage as a result of the constant monitoring. All the tests



Test bed concept for seat occupation recognition used during monitoring of the volume manufacturing process.

Electric test structure for long-term system testing in a climatic test environment. Computer-based control and visualisation environment including constant monitoring and recording of data.

Developed and produced by Bertrandt: a Cartesian three-axis robot for testing mechatronic functions such as connector pressure resistance, operating forces (event-triggered) or wiring tensile strength.



System tests in a networked cluster (CAN, LIN, MOST) on a vehicle system simulator and on a LabCar.

and results are documented. Any necessary corrective measures are discussed with the customer and recorded in the form of a test/analysis report or a recommendation for release.
Bertrandt can offer both comprehensive test resources and employees with extensive testing and analysis experience, in order to meet the demanding requirements and standards involved in this type of test. It has also established quality assurance processes based on DIN ISO 9001 and VDA 6.2. It is an accredited test laboratory with DIN EN ISO/IEC 17025:2000 certification.

Testing in a networked cluster: the test environment corresponds to the real vehicle

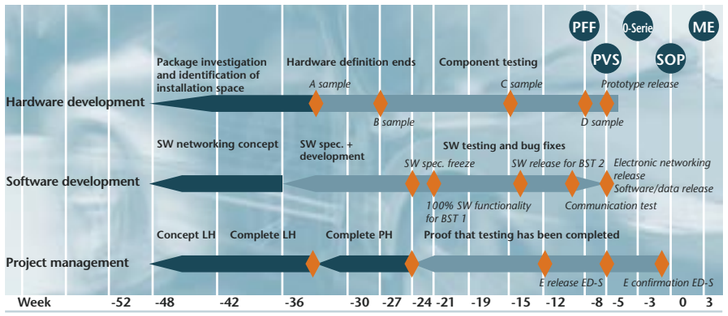
In order to test different components in direct relation to one another, test beds are used to create a test environment that is as perfect and complete as possible and which corresponds to the real environment in the vehicle. This can be, for example, a board-based structure and/or a LabCar, with the electronics from an entire vehicle reproduced in two or three dimensions. Using perforated plate, the entire electronics system of a vehicle is arranged geometrically and linked together. In this way, it is possible to test the functions of different components with a particular emphasis on the communication between them. For example, if a component malfunctions or inconsistencies occur in a communication message, it must be possible to ensure that other control units are not adversely affected.
This could include a control unit not shutting down when the vehicle ignition is switched off, which could result in other systems on the bus that interact with it also remaining active. This in turn could have an impact on the fuel consumption and the idle current of the entire vehicle. Finally, it would no longer be possible to guarantee that the vehicle would start.
Installation instructions have been produced on the basis of the wide range of test scenarios and analyses and their findings. These instructions guarantee the interactive functionality of all the electronic and mechatronic systems in the context of the hardware and software used.

Reference vehicle: testing system functions in the complete vehicle

The interaction of the vehicle's complete electronics system is constantly tested on vehicle technology carriers, prototypes and test vehicles throughout the development process, right through to the start of volume production. Does the status of the software and hardware correspond? Have all the installation instructions been followed? The various statuses are checked and integration and functional analyses of individual systems carried out with a focus on the complete vehicle system. Pre-defined and newly created test scenarios identify the last remaining faults, which are then analysed and corrected. Close cooperation with the development department of the OEM is of major benefit at this stage. Feedback can be used to identify quickly whether a fault is merely intermittent or is caused by a misunderstanding during the development process. If all the components interact correctly with one another, this clearly indicates the quality of the electronics system.

Future prospects: further development of existing test methods for customer benefit

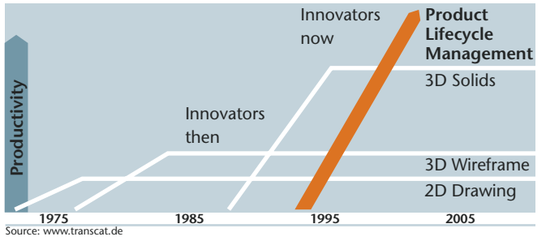
The methods used to test the reliability of electronic components and systems are becoming increasingly important because of the growing functional complexity and extensive networking of the components. These methods must be further developed in particular in the light of the reduction in the length of development processes and with regard to financial considerations.
Test scenarios are a step in this direction and form the basis for transferring existing modular components to new developments and platforms. Every fault that is found and corrected at an early stage reduces the need for changes during volume production. A major malfunction during the production phase could result in vehicles being recalled. The costs of this would far exceed the cost of a carefully managed test phase. Bertrandt's philosophy is to evaluate systems and components at an early stage on the basis of collaboration and constant dialogue with everyone involved in the development process, in order to demonstrate inconsistencies and malfunctions in a reproducible way and to implement corrective measures.
Bertrandt has been making use of this experience for many years in its own development projects (see BCE Project, Bertrandt*magazine* No. 2) and in the development of products on behalf of its customers, with the aim of constantly improving the quality of its work. ■



Bertrandt's planning and development support phases in the electronics development process chain.

CATIA V5 – Increasing the quality of development and product data

Studies have shown that, in the long term, only five or six car makers and around 1,000 automotive suppliers will survive in the worldwide market. The challenge is therefore to achieve shorter development periods with more model variants. Parallel developments that seem barely feasible using traditional methods will become vitally important.



Application of Product Lifecycle Management.

Fundamental extension of design methodology

Over the past ten years, a fundamental technology has become established in the field of computer-aided design (CAD) in automotive and mechanical engineering: parametric product modelling, which provides the CAD models with much more data than geometric representations.
Without fixing the final shape of the component, framework conditions for example can be set even at the draft stage. The geometry can be generated both with numerical precision and in the form of a sketch. Furthermore, the parametric method allows any constraints defined by the designer, such as parallel, tangential or right-angle relationships, to be included in the model. By using non-linear equations, the system can even simultaneously use complex parametric dependencies to achieve a result and integrate these into solving the design objective.

Introduction of CATIA V5 in the automotive industry

In order to remain competitive on the market, companies have to adapt the application of their design systems to the ever-increasing market requirements. For that reason, CATIA V5 is currently being implemented in the introductory phase in many companies in order to examine the economic benefits it can offer.
As a partner for the international automotive and supply industry, Bertrandt has quickly adapted to these requirements and has already been using CATIA V5 in various domains and projects for around three years now. The main focus is currently on the following areas:

- DMU to verify design data is a vital pillar in quality assurance and now forms part of virtually all design projects.
- Part Design was used, for example, as a design platform for a parametric associative plan for drive shafts in CATIA V5. The drive shafts are available in different dimensions and can easily be installed in various vehicle types without additional model-specific adaptation.
- GSD (Generative Shape Design) is the most recent area of application. Although still in its infancy, this method is already being used in several projects for surface design.

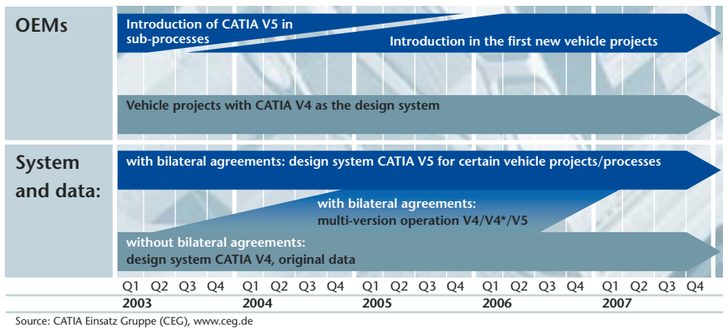
GSD as a basis for innovation

GSD in particular opens up a number of possibilities for innovation with regard to parametric associative design. Once the standardisation potentials for everyday design have been determined, the development of a basic model can be started using CATIA V5. The results speak for themselves:

- Even fifteen months ago, a complete parametric associative model of a window frame reinforcement was developed as part of a diploma thesis. This allowed statements to be made on the possible design methodology and the feasibility of such complex models.
- The productive application of a parametric associative standardisation module for validating the door gap of side doors was started back in October 2003.

Outlook

CATIA V5 will soon completely replace the predecessor version V4 in certain areas. Since all major car makers are gradually converting from CATIA V4 to V5, the supply industry is also changing over to this new software version.
Bertrandt has already initiated CATIA V5 projects in virtually all areas of vehicle development. Many customers are already benefiting from several years of experience with CATIA V5. ■



Introduction of CATIA V5 in the automotive industry.

Rally Legend Walter Röhrl Praises the Ergoseat

Safety and comfort are core issues in modern seat development. This is clearly demonstrated by the Ergoseat, an integrated seat system that provides a height-optimised sitting position for the vehicle's occupants by adjusting both the seat pan and the upper backrest. Top rally driver Walter Röhrl visited the Bertrandt stand at the 2003 Frankfurt Motor Show, and was able to try out for himself what the Ergoseat has to offer. His conclusion:

"I hope I can go on driving long enough to see the Ergoseat in series production."

Bertrandt: How did you first hear about the Ergoseat?

Walther Röhrl: It was at the Seat Forum conference in Stuttgart.
I was talking to Dirk Zimmer about the lecture "The Ergoseat – Innovation from a Service Provider". I was giving a lecture myself on "Racing Seats – Unhealthy Minimalism".
The Ergoseat addresses precisely this issue, as it is, in effect, an adjustable bucket seat. I found it very interesting and wanted to have a closer look at it in Frankfurt.

Bertrandt: What do you think of the Ergoseat in terms of comfort and safety?

Walther Röhrl: It's excellent. Comfort and safety are absolutely vital in driving. An uncomfortable seat causes the driver to lose concentration. And that can have serious consequences. What's more, it's very unpleasant when your back hurts because the seat is uncomfortable. Having driven some eight million kilometres in my life, I know what I'm talking about.

Bertrandt: What do you see as the innovation in this product?

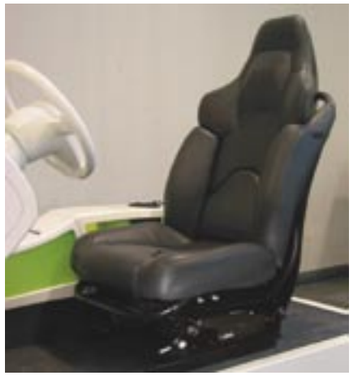
Walther Röhrl: The innovative aspect is definitely the adaptability of the seat adjustment. The problem with today's seats is that they don't take account of the fact that drivers' backs have different lengths. That means that the height of the seat can't be properly adjusted. It's important for the seat to be adjustable from the pelvis outwards – and that's exactly what the Ergoseat from Bertrandt offers.

Bertrandt: How do you assess its application potential in the vehicle?

Walther Röhrl: In my view, the Ergoseat is ideally suited for mid-range cars right up to the premium segment. I hope I can go on driving long enough to see the Ergoseat in series production.

Bertrandt: Mr. Röhrl, thank you for this interview. ■

The Ergoseat adapts to the different shapes of the human back: relative to the lower backrest (lumbar part), the seat pan can move downwards by 50 mm and the upper backrest upwards and forwards by 100 mm. The combined movement of the upper backrest ensures that the head restraint remains close to the head to provide optimum support in the event of a rear impact. The adjustable support for the shoulders and neck also offers comfort benefits that are not achieved by standard car seats.



Design and Model Build

Bertrandt Technikum's new Studio for Design and Model Build

In order to make their design and model build activities even more effective, the Bertrandt Technikum has expanded its existing infrastructure with the addition of a new studio. The focus of attention in the new design centre is on design development and clay modelling, as well as the production of show cars, seating bucks, full-scale mock-ups and transparent models. It also offers the possibility of generating data control models

1:3/1:4 clay model

1:1 clay model

Show car

Seating buck

Equipment model

Full-scale mock-up

Data control model

Test cubing

Measuring templates/gauges

The contact person for the design centre in Flacht is Jörg Rudolf,
Bertrandt Technikum GmbH.
Phone:
+49 7034 656-8059 or 0171 5657889
e-mail:
joerg.rudolf@de.bertrandt.com

Early entry into the design development phase with clay modelling

With these extended facilities, Bertrandt plans to enter the design development phase at an even earlier stage within the framework of its model build services. Using scale models, wind tunnel models and 1:1 models made of clay or PU-foam for the interior and exterior, the Bertrandt team implements its ideas together with the customer.

From a show car to an equipment model

The studio can produce fully functional and drivable show cars for fairs and press presentations. Once the data for the models has been obtained and surfacing has been performed, the model makers start to produce the first solid models or transparent models to evaluate the exterior as well as seating bucks and equipment models to assess the interior.

In contrast to the seating bucks, the equipment models are used not only to evaluate the general impression of space; the emphasis here is more on optics and haptics. This means that the interior has to be made as realistic as possible. In order to achieve this, the surfaces are covered with fabric or leather and the inserts and trim are finished in wood or aluminium.

Full-scale mock-up as a reference model for the series

A further step in the design phase is to bring together the interior and exterior design in the form of a full-scale mock-up. This is the reference model for the series and is made as realistic as possible, also with regard to its functions. For example, the function of the doors and closures as well as that of the seats – depending on the customer's wishes – are included in the model. All technologies for making the models, for example glass fibre/carbon fibre laminates, castings and laser-sintered parts, are employed in Ehningen and Flacht.

A new design studio has been in operation since 1st January 2004 in Flacht, just 25 kilometres from the parent company in Ehningen and in close proximity to the A8 Autobahn. The modern building offers a total floor space of around 1,100 square metres. The ground floor houses two large studios with floor-level measuring plates. In addition, there are three modelling rooms also equipped with measuring machines. The first floor has two conference rooms and a number of project offices to accommodate both the hardware required and the project teams. All rooms are fitted with independently activated access control systems to ensure maximum security, allowing up to four major projects to be worked on simultaneously without public access.

Data control models for verifying the CAD data

Once the data from the previous models has been entered into the design process, the data control models are generated. These are used to verify the CAD data. Depending on the customer, these are either combined or separate interior and exterior models. Bertrandt produces fully functional headlamps with clear glass optics especially for these models.

Cubes for first article inspection

For the purpose of first article inspection (FIA) and to check series parts during model making, partial area cubes and complete function cubes for exterior and interior areas are produced. These cubes represent the complete body-in-white of a vehicle in milled aluminium blocks or cast aluminium, with all the connection points for covers and panels. Individual parts and modules can be checked and measured using templates or gauges that have themselves been designed and produced in the model build department.

Tool and mould making

Tool and mould making round off the work of the model build department. The expertise of the design engineers lies in designing and manufacturing tools for injection moulding, laminating, deep drawing and stretch forming as well as compression moulding and hot dip galvanizing models. ■

Management by Shakespeare

A New Approach to Human Resources Development

"If you do not feel it, never will you find it"

Can theatre help you in your job? A new seminar concept believes that it can. "Management by Shakespeare" is an unconventional approach in which managers are asked to prove their skills on stage. A small group of Bertrandt executives spent two days exploring power games, hierarchies and relationships.

A practical approach for more sustainability

The location for this unusual event was a famous theatre, the Alte Schauspielhaus in Stuttgart. The theatre's director, Dr. Carl Philip von Maldeghem, presented the seminar participants with a fascinating insight into the world of the theatre and what it can offer. For the managers from Bertrandt, the focus of their – at times very strenuous – work on stage in this pilot project was primarily on promoting intensive teamwork and communication. Particularly important for the company was the practical approach that simply allowed the participants to experiment. Mistakes made in the various roles are not likely to be repeated in the company.

Positive echo in the press

Journalists who interviewed von Maldeghem on the second day in the Alte Schauspielhaus were also very impressed with the project. Detailed reports on the innovative seminar approach with executives from the development service provider Bertrandt went out on the radio stations NDR and WDR.

New motivation for achieving objectives

Bertrandt plans to continue supplementing its existing training programme with innovative approaches in human resources development. One idea, for example, would be to offer "Management by Shakespeare" as a training seminar for individual teams in order to promote creativity and to provide new motivation in dealing with everyday work situations. ■

Oracle Vice President Portals and Hosted Tools in Ehningen

Discussions on strategic collaboration

Ralph Jacoby and Marco Tilli in the smart crossblade (from left).

Within the framework of a two-week trip to Germany at the end of 2003, Marco Tilli, Vice President Portals and Hosted Tools at Oracle Corporation, visited the development service provider Bertrandt. One of the reasons for Tilli's visit was Bertrandt's Oracle-based homepage and their intranet bertPortal.

Road map for future business relations

Apart from holding talks on future business links between Oracle and Bertrandt, Marco Tilli took part in a guided tour of the 'Technikum', Bertrandt's research centre. He also took the opportunity to try out the smart crossblade, for which Bertrandt was the general contractor for development and production.

During his visit, Marco Tilli stressed the strategic importance of Bertrandt for Oracle. In response, Ralph Jacoby, director of finance and human resources, reported on the positive feedback from customers, analysts and media representatives with regard to Bertrandt's homepage.

Knowledge management

Board Member Ralph Jacoby sees the subject of knowledge management as a key challenge for the future. "It will be vitally important for Bertrandt's success in the future to fully exploit and network our internal knowledge. With bertPortal we have laid the foundation for efficient knowledge management." ■

Based on the Oracle Technology: The Bertrandt homepage www.bertrandt.com

Automotive Cluster

New Regional Communication Platform Created

Promoting better cooperation in the regional automotive industry (from left to right): Elisabeth Strasser (Industrial Development Office of the Groß-Gerau district), Chief Administrative Officer Enno Siehr, Volker Schier (Bertrandt GmbH) and Joachim Krahl (Darmstadt Chamber of Commerce).

Bertrandt Rüsselsheim is the co-initiator of the Automotive Cluster Südhessen (South Hesse). The aim of this initiative is to develop a tighter network and promote the exchange of information among regional automotive suppliers. More than 80 representatives from companies in the automotive and supply industries attended the opening event held at the offices of the development service provider Bertrandt in Ginsheim-Gustavsburg. They had been invited by the Darmstadt Chamber of Commerce, the Industrial Development Office of the Groß-Gerau district and Bertrandt Rüsselsheim.

Under the motto "Cluster Motive – We Mobilise Germany", the initiative aims at developing a tighter network among the regional automotive suppliers, according to the co-initiator and managing director of Bertrandt Rüsselsheim, Volker Schier. In future, such events will be held twice a year. ■

Project office

Bertrandt Engineering Network in Korea

Its project office in Bundang, South Korea, just 15 kilometres from Seoul, puts Bertrandt in close proximity to major Korean car makers like Hyundai, Kia and Daewoo.

The contact in Bundang is Sung-Hoon Kim. Before relocating to Bertrandt in Korea, the graduate automotive engineer worked for four years at the company's German headquarters in Ehningen. He returned to his native country in 2003 and since then has been directly providing local support for the Korean development centres. Furthermore, Sung-Hoon Kim is monitoring the Asian market with regard to the outsourcing behaviour of the Asian manufacturers. ■

Sung-Hoon Kim represents Bertrandt in Korea.

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Corporate calendar

04.05.-05.05.2004	Automobile Forum (mic), Stuttgart
04.05.-06.05.2004	University contact event: konaktiva Technical University of Darmstadt
05.05.2004	University contact event: Contact Fachhochschule Ingolstadt
06.05.2004	University contact event: Industry day, Technical University of Esslingen
06.05.-08.05.2004	Safety Expo, Aschaffenburg
11.05.2004	University contact event: Jülich Contact Exchange, Fachhochschule Jülich
11.05.2004	University contact event: meet@fh-koeln, Fachhochschule Cologne
Mai 2004	Quarterly Report: 31 March 2004
18.05.2004	Analysts' Conference in Frankfurt/Main
18.05.2004	University contact event: meet@fh-hannover, Fachhochschule Hanover
27.05.2004	VDI Conference, Seats, Fachhochschule Cologne
15.06.-16.06.2004	University contact event: Bonding Fair Erlangen, University of Erlangen-Nuremberg
15.06.-17.06.2004	Automotive Electronics (mic), Ludwigsburg and Bertrandt Technikum Ehningen
22.06.-23.06.2004	University contact event: Bonding fair Stuttgart, University of Stuttgart
01.07.2004	University contact event: IKOM Munich, Technical University of Munich, Garching Campus
07.07.2004	Suppliers Innovative ("Zulieferer Innovativ"), Ingolstadt
22.07.2004	Career day: Engineering, Haus der Wirtschaft, Stuttgart
August 2004	Quarterly Report: 30 June 2004
29.09.-30.09.2004	VDI Conference, Computation and Simulation, Würzburg

Bertrandt in brief

+++ Interior conference:
Within the framework of the 'Automotive Interior Conference' organised by the publishers moderne industrie (mic) in November 2003 in Ludwigsburg, Bertrandt informed participants at the Ehningen site about its range of services, illustrated by lectures and a factory tour. +++

+++ Students in Munich:
28 students of the University of Applied Science Hamburg, Department of Automotive Engineering, spent a day visiting Bertrandt's Munich plant. After a presentation of the company and lectures on the subject of vehicle safety, the perspectives for future support for students in writing diploma theses were also discussed. +++

+++ Electrics/Electronics Conference:
Bertrandt's experts aroused great interest at the presentation of their universal control unit platform 'Bertrandt Competence Electronic Project' at the annual VDI Conference on Electrics/Electronics in Baden-Baden. +++

+++ Training:
The trainers at Bertrandt in Tappenbeck invited the teachers of all the current trainees to visit the plant. The aim of the visit by the nine teachers was to maintain the process of continuous exchange between the company and vocational colleges as training partners. 70 trainees and students are currently attending the company's training academy. +++

+++ Donation:
At Christmas 2003, Bertrandt made a donation of € 12,500 to the SOS Children's Village charity in Battonya (Hungary) to enable them to buy a vehicle. +++

+++ Quarterly report:
After three months of the financial year 2003/04 (1.10.03 to 30.09.04), sales of the Bertrandt Group amounted to € 59.32 million. The operating result was € 1.5 million. +++

+++ General Meeting:
At the General Meeting in mid-February, the shareholders of Bertrandt AG authorised the payment of a dividend of € 0.15 per individual share carrying dividend rights. +++

Portrait

Patrick Signargout

Since 1st October 2002, Patrick Signargout has been Managing Director of Bertrandt's French branches in Bièvres, Etupes and Strasbourg, which have a total workforce of some 300 employees.

Even at an early age, Patrick Signargout inherited his passion for cars from his grandfather, an enthusiastic rally driver, and it was this passion that went on to determine the career of the now 42-year-old engineer.
He studied at two renowned French engineering colleges, the Ecole Polytechnique and the Ecole Nationale Supérieure du Pétrole et des Moteurs, from where, at the age of 22, he graduated as an engineer specialised in internal combustion engines.
Patrick Signargout began his career at Bosch, working on the application and system development of fuel injection and chassis systems. After moving to PSA Peugeot Citroën, where he expanded his expertise in engine development, he returned to Bosch six years later. He still has fond memories of the time he spent as an engineer working on interesting projects on all aspects of advanced technology – whether it was in developing emissions control systems with three-way catalytic converters and common rail diesel injection or in the field of active safety with the Electronic Stability Programme ESP.

He is quick to give an answer as to why he moved to the development service provider Bertrandt after spending eighteen years working for a manufacturer and supplier. What particularly attracted him, he says, was the dynamic way of working and the young team – and, of course, the fact that he can have a direct influence on decisions in a medium-sized company.
What is more, Patrick Signargout sees it as a personal challenge to position Bertrandt in France as a competent and full-service development partner for manufacturers and suppliers in the automotive industry. Not least through the Bertrandt Engineering Network, Bertrandt France offers its customers a great deal of potential, which they often do not even use to its full extent.
Patrick Signargout sees a further task in bringing together the cultural differences inherent in an international company to form fruitful cooperation. He benefits in this respect from his many years of experience gained in leading a number of Franco-German teams at Bosch between 1992 and 2002. He is also supported by the multi-cultural management team at Bertrandt France, which is made up of French and German colleagues and even one who has dual nationality. Initial successes, for example orders from German customers who are active in France, confirm that he is on the right track.
Patrick Signargout lives in Paris with his wife and four sons (13, 11, 8 and 6 years old). In spite of his motoring passion, he is an enthusiastic motorcyclist, claiming that apart from the Métro, this is the only fairly unproblematic way of travelling around the French capital. But the slowest, most uncomfortable and expensive way of travelling also has a charm of its own for him: every summer, he and his family love to spend at least two weeks sailing. ■

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