Bertrandt*magazine*

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TURNING VISIONS INTO REALITY

Design Modelling and Rapid Technologies

MERCEDES-BENZ E-CLASS

Bertrandt Ehningen supports the model facelift

LIGHTING SYSTEM DEVELOPMENT FOR THE OPEL ADAM

Bertrandt Rüsselsheim provides lights and visibility for the small lifestyle car

CONNECTIVITY AS A CHALLENGE

“b.on” project – towards an interconnected vehicle

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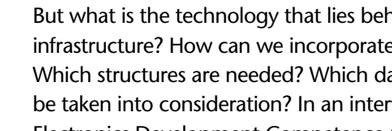
EDITORIAL

We live in a digital age. During the first decades of the new millennium, the internet and consumer electronics have opened up new means of communication, accessibility and networking in our professional and private lives. This digital revolution has already made a major impression on the automotive world. In future, cars will be interconnected with one another, as well as with the infrastructure around them and with the internet. Connectivity is a new trend among both manufacturers and system suppliers in the automotive industry. The precursors of this trend were information and entertainment functions in vehicles. Now, end consumers are demanding new comfort and safety features. Systems which warn of danger spots and automatically call the emergency services, making driving even safer, while information about traffic flows improves transport efficiency. But what is the technology that lies behind an intelligent transport infrastructure? How can we incorporate these services into vehicles? Which structures are needed? Which data protection regulations must be taken into consideration? In an interview, Klaus Härtl, head of the Electronics Development Competence Centre, gives an insight into automotive connectivity, the latest megatrend. As part of a customer project, Bertrandt engineers are supporting current research into all aspects of car-to-x Communication and, for example, equipping vehicles with research hardware.

As a development specialist, Bertrandt is also involved in a wide variety of projects in the automotive and aircraft engineering industries, together with the sectors of mechanical engineering and plant construction, energy, medical technology and electrical engineering. Discover the dynamic world of development! In our magazine, we will be presenting some of the key topics, such as model facelifts, light and visibility and vehicle safety. The central theme of this issue is our design modelling department.

At Bertrandt, our name for connectivity is “b.on”. And we are always switched “on” or, in other words, at the cutting edge of technology in all the other areas of the development process, which allows us to provide the best possible service for our customers. Take this opportunity to find out more!



Dietmar Bichler

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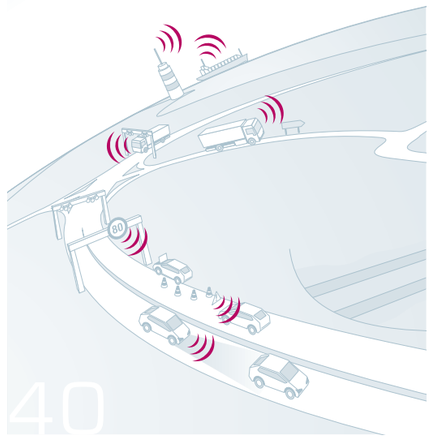


TESTING TOOLS

RUDDER PROPELLER

EXTRA

Supplement: "Bertrandt's development services at a glance"

SPOTLIGHT

Bertrandt Ingolstadt

HYDRAULIC TEST FACILITY FOR EVALUATING FATIGUE STRENGTH

The new test facility at Bertrandt Ingolstadt allows complex components in safety-related areas such as the chassis, engine and gearbox to be tested even more thoroughly and their shape, material properties and production processes to be optimised. The test facility provides services which range from interpreting the results of road tests through to analysing damage from component testing. The portfolio of services offered by Bertrandt Ingolstadt includes tests based on requirements specifications and regulations, together with individual solutions for specific customers. ■

Bertrandt Ingolstadt

ENTERPRISE MEASURED DATA MANAGEMENT

The process of developing complex products involves comprehensive, networked test sequences, in particular where there is a mass market with a low tolerance for faults. Measured data management or MDM is therefore growing in importance. Bertrandt supports the development of measured data management systems and has been an active member of the openMDM community for some time. openMDM guarantees that systems will be highly future-proof. In addition, during the measurement process the metadata are saved as well as the measured data, which enables the measured data to be managed effectively and informatively. openMDM systems can be used, for example, in vehicle testing, fatigue strength and acoustic tests, material analyses and driver assistance systems. ■

Bertrandt Ingolstadt

HIL TEST FACILITY IMPROVES CONTROL UNIT TEST PROCESSES

Evaluating electronic systems in hardware-in-the-loop (HiL) environments has been a permanent feature of testing in the automotive industry for several years. It involves connecting a control unit with a model of the virtual vehicle and simulating the control processes. Depending on the function and the number of control systems, the test environments range from simple table-top set-ups through to networked test benches with a variety of genuine parts, real-time processors and a complete vehicle simulation model capable of processing real-time data. This means that control unit tests can be moved from the road to the lab and can be run automatically on test benches, which reduces the time and the cost involved in the development process. ■

Bertrandt Cologne

CLIMATE-CONTROLLED TESTING

In two buildings the members of the Cologne testing team carry out tests in the fields of environmental simulation, vehicle safety, vehicle conversion, climate-controlled vibration and functional endurance. The electrodynamic shakers with combined climate chambers, which for their size are some of the most powerful in the Cologne area, have generated a great deal of interest. The climate chambers that can be added to the systems allow vibration tests to be carried out under extreme climatic conditions. The ability to combine vibration and climate tests enables components which are particularly sensitive to environmental conditions to be validated, such as electronic switches, wiring looms or complete seat modules. ■

Bertrandt Rüsselsheim

B.CONTROL FOR NOISE-FREE MEASUREMENT

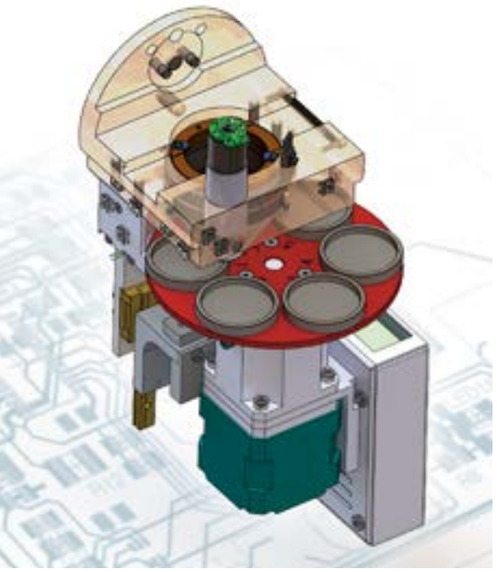
The growing importance of acoustics and acoustic design in the interior of vehicles is leading to more detailed investigations of noise emissions and improved methods of measuring noise. Bertrandt's innovative b.control solution ensures that the required pedal value, which corresponds to the characteristic curve of the accelerator pedal, can be reproduced electronically and, therefore, totally silently. The control system specially developed for this purpose consists of a remote control unit and a management module which communicate with one another via a serial interface. The module is used to operate analogue interfaces that replace the accelerator pedal sensor. It also gives access to the CAN bus in order to record the current engine speed. New functions, including a connection to the test bench and a Bluetooth interface, are currently being implemented. ■

SPOTLIGHT

Bertrandt Wolfsburg

ELECTRONIC TEST SYSTEM SIMULATES DRIVING CYCLES

The latest driver assistance systems, such as ABS, ASR and ESC, have made driving in poor weather conditions much safer. But where does the data used by these systems come from? Wheel speed sensors play an important role in providing it. Our electronics specialists have developed a test set-up, known as the wheel speed generator, which can represent a wide range of different driving situations. This makes it possible to simulate a complete driving cycle without the vehicle or the mechanical movements. It can also represent a vehicle that has almost reached its handling limits, which allows faults and risks to be prevented at an early stage using the driver assistance systems. ■



Bertrandt Services

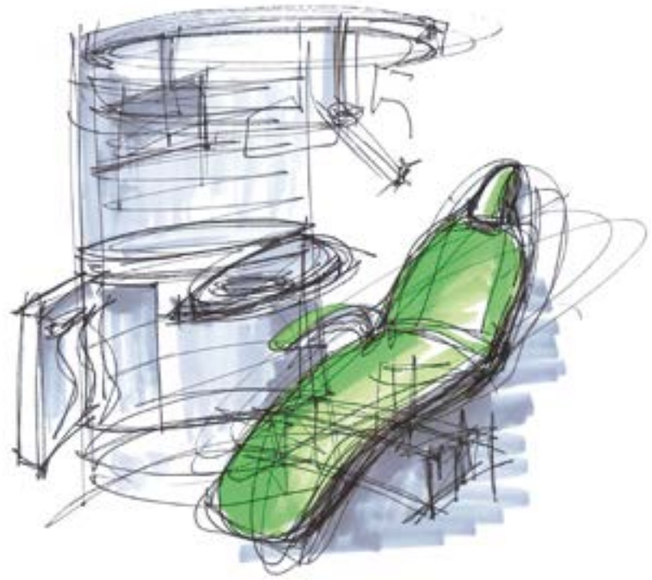
INNOVATIVE SAMPLE CHANGER FOR EASY USE IN A SPECTROMETER

An automated sample changer has been developed to allow several lab samples to be tested independently. Different substances are identified and analysed using X-ray diffraction. During this process, the position of the sample – its angle and height – must be reproducible to an accuracy of 15 micrometres. The challenge has been to combine the mechanical design with the development of electronic systems in such a way as to bring the maximum benefit for the customer. In order to achieve this, a mechatronic assembly was developed consisting of around 70 components. Stepper motors with an upstream gearbox were used, together with dual sealed groove ball bearings which were braced against one another. In addition, reference positions were defined for the plate rotation, sample lifting and sample rotation systems which could be set independently. The electronics side of the project included developing the wiring diagram and the PCBs, together with responsibility for all the software programming. ■

Bertrandt Services

DEVELOPING A DENTIST'S CHAIR – FROM THE IDEA TO THE PROTOTYPE

Pleasant lighting, a comfortable seat and a relaxing treatment position are the characteristic features of the new dental chair. The assignment was to develop three different concepts for a treatment chair which exceeded current market standards in terms of performance – comfort, flexibility and load-bearing capacity – and ergonomics. The development process included research into materials, design, investigations of installation space, CAD design of the moving and turning units and the couch, documentation and design-to-cost and provided wide-ranging support for the customer. The result was an elegant, an extravagant and a basic version of the chair, which have widely differing functions and designs. ■



Bertrandt

BERTRANDT WINS LÜNENDONK AWARD 2013 IN THE "PERFORMANCE" CATEGORY

In April 2013, a neutral jury composed of 14 editors-in-chief and business editors from the German media announced the winners of the 2013 Business-to-Business Service Award presented by Lünendonk GmbH in the categories Innovation, Performance and Lifetime Achievement. Bertrandt won the award in the "Performance" category. The jury said that its decision was based on the "company's manpower", its "innovations and development support for customers" and the accompanying growth of the company in 2011 and 2012. ■

TRADE FAIRS

BAIKA ANNUAL CONGRESS "ZULIEFERER INNOVATIV"

The eQuad developed in-house by Bertrandt gave rise to interesting technical discussions at this electronics congress in Ingolstadt.

INTERNATIONAL SUPPLIERS FAIR (IZB)

The highlight of the Bertrandt stand was a circular exhibit which showed the complete product development process for individual modules using the example of a rear light.

EUROCARBODY

Bertrandt specialists discussed the latest developments in production body design at this international gathering of bodywork engineers in Bad Nauheim.

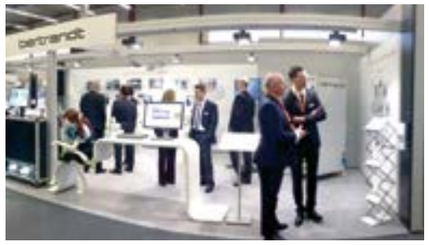
CONTINENTAL AUTOMOTIVE SUPPLIER INNOVATION DAY

Bertrandt exhibited at the supplier's day in Regensburg for the first time and presented developments such as the eQuad, the multibus test bench and "b.MOVE", a portable referencing system.

HANNOVER MESSE

The technical presentations given by Bertrandt and Bertrandt Services were just as popular as the exhibits: a smartphone app which switches bulbs on and off or dims them as part of a smart home system, an automated sample changer for state-of-the-art laboratories and "b.remote", the modular platform developed by Bertrandt as the basis for digital radios and smartphone connectivity.

The International Suppliers Fair (IZB).



Continental Automotive Supplier Innovation Day.

ACOD in Leipzig.

Hannover Messe.

Aircraft Interiors Expo.

AACHEN COLLOQUIUM AUTOMOBILE AND ENGINE TECHNOLOGY

At Europe's largest congress for vehicle and engine development, Bertrandt presented "b.automized", a generic automation platform for system and component test benches.

VDI FOCUS ON VEHICLE ELECTRONICS

At this international electronics congress in Baden-Baden, Bertrandt demonstrated its "b.BEV" innovation project which involves all the development disciplines for vehicle electronics.

FMB SUPPLIER SHOW FOR MECHANICAL ENGINEERING

Bertrandt Services exhibited at the supplier show for mechanical engineering in Bad Salzuflen. The focus of the discussions at this event was the development of special machinery.

VDI "SIMVEC" CONGRESS

In Baden-Baden the simulation specialists discussed integrating virtual processes into vehicle testing workflows.

ACOD (AUTOMOTIVE CLUSTER OST-DEUTSCHLAND) – LEIPZIG

Bertrandt presented its "CityCar" concept, which combines lightweight design and an electric drive system, in order to illustrate its core competences in a range of different disciplines.

VDI – PLASTICS IN AUTOMOTIVE ENGINEERING

Innovative solutions in the field of materials development and plastics processing technology were on show in Mannheim. Bertrandt's exhibits included the bumpers, headlights and radiator grille of the new Golf 7.

VDA – TECHNICAL CONGRESS, MUNICH

The agenda of this event held at BMW Welt in Munich covered the environment, energy, electric cars, vehicle safety and electronics systems. Bertrandt, as a technology specialist, was able to demonstrate its expertise in all these areas.

AIRCRAFT INTERIORS EXPO

The Hamburg trade fair was a major success for Bertrandt's aviation specialists who had the opportunity to present their services in areas such as structures, stress and simulation, cabins, systems, manufacturing engineering, electrics, electronics and testing.

MIC AUTOMOBIL-FORUM

The specialists from Bertrandt's Engineering Services department were in demand for discussions on subjects such as production management, quality assurance and lean management at this annual gathering. The main theme was the future sustainability of the European automotive industry.

MERCEDES-BENZ E-CLASS

EFFICIENT ELEGANT EMOTIONAL

Bertrandt Ehningen supports model facelift

Mercedes-Benz has updated its core model, the E-Class. The result: elegant design combined with efficient and modern technology. The latest E-Class is a true representative of the car maker's new design idiom, with its flowing shape and sweeping lines. Bertrandt already supported Mercedes-Benz in the E-Class facelift in the early phase of series-production development.

One car, two faces.

Redesigned interior.

IN BRIEF

Mercedes-Benz E-Class, Facelift

Engineering Services

- *Installation space validation (packaging)*
- *Data management*
- *Digital process validation*

Digital Mock-Up (DMU)

The DMU makes it possible to perform three-dimensional simulation of various vehicle components with their corresponding functionalities on a digital basis. It uses CAD models supplemented by physical material characteristics. These provide a data pool with comprehensive information on all components in the vehicle. In this way, the DMU complements the relatively costly physical mock-ups and offers the advantage of being continuously updated. What is more, all variants can be simulated in their entirety.

The E-Class

The complete front end of the E-Class has been reworked in keeping with the updated Mercedes-Benz design language. Newly designed headlights and re-sculptured bumpers make the car look smoother, while the rear end is given a more harmonious design. Further improvements have been achieved by an even more high-quality interior, new fuel-efficient engines and intelligent assistance systems.

Support for the facelift

For the facelift of the new E-Class, Mercedes-Benz commissioned a large team of engineers at Bertrandt's Ehningen location to provide support for the complete vehicle design of the new car. The Bertrandt engineers were fully integrated into the product development process, enabling them to create a digital package model immediately after the initial design modification drafts were provided by Mercedes-Benz. The engineers were responsible for three zones: the front end, the middle and the rear end of the E-Class, including the exterior and interior areas.

Digital complete vehicle design

The digital mock-up (DMU) provided an essential database for the design of the components being redeveloped. In close cooperation with Mercedes-Benz, the Bertrandt engineers had the task of bringing together the new components of the E-Class in a digital form while constantly checking the space requirements and assemblability of the components. In meticulous precision work, the individual components were digitally positioned at their true distances from other components, the installation space was determined and the fitting accuracy of the packages into the complete vehicle was verified, both digitally and on the real vehicle itself. One of the challenges for the team in this facelift was the wide range of model variants involved. For the new E-Class, two further "faces" were developed in addition to the CLASSIC version: the AVANTGARDE line with a sports car grille and a large central star and the ELEGANCE line with a three-dimensional, three-louvre saloon car grille and a star on the bonnet. Both versions required corresponding redevelopment of the bumpers, headlights and interior equipment.

Conclusion

With huge commitment and enthusiasm for the new design of the E-Class, the Bertrandt project team played a key role in the successful facelift. We are proud to have contributed to the highly attractive appearance of the new E-Class and would like to thank Mercedes-Benz for their trust and cooperation. ■

Iris Peterci, Gennaro Placentino, Ehningen

LIGHTING SYSTEM DEVELOPMENT FOR THE OPEL ADAM

Bertrandt Rüsselsheim provides lights and visibility for the small lifestyle car

The attractive ADAM is the newest model in Opel's product range and the historic brand's latest offering in the growing small car segment. The main priority was tailoring this sporty car to meet the demands of a young and individualistic target group. Bertrandt was involved in creating its fresh, new image.

Significant feature: the headlamps of the OPEL ADAM.

Strong, youthful styling.

Intelligent solution: rear lights.

IN BRIEF

Opel ADAM

Light and visibility

- *Complete development of exterior lighting*
- *Headlamp development*
- *Rear light development*
- *Photometric simulation*
- *Project management – from the initial concept through to three months after start of production*
- *Supplier integration*

Bertrandt takes responsibility for light development

The ADAM, Opel's new sporty city car, has a no-holds-barred design aimed at customers who are young or young at heart. A central element of its new image is the lighting. The light and visibility specialists at Bertrandt's Rüsselsheim site took on responsibility for developing and integrating all the vehicle's exterior lights. Together with Opel and its suppliers Varroc and Hella, they put the ambitious ideas of the Opel designers into practice.

One car – a million possibilities

The focus during the development of the ADAM was on giving customers extensive freedom to design and personalise their own car. This concept extends to the lighting, with halogen and premium LED versions of the headlamps and rear lights available. Both lights convey the current Opel image, with a striking design that includes the boomerang-shaped "wings" of the daytime running lights and the rear lights. The LED variants in particular have an extremely homogeneous, high-quality appearance. The design reflects the strong, youthful styling of the body and highlights it with chrome elements and the external wings mentioned above.

Experiencing quality at first hand

The quality of the design was a further focal point of Bertrandt's development activities. In addition to the standard process of reducing the gaps between components, particular attention was paid to concealing bonded joints between the individual body panels, for example. The two-tone variant of the ADAM presented the development team with the task of hiding the transition from the roof colour to the body colour all around the vehicle. In the area of the rear lights, an elegant solution was found in the form of a large gutter cover. One challenge faced by the development team was to manage the tolerances effectively. The gutter cover was made up of two components with a flexible rubber lip which accommodates tolerances, conceals the gutter when the boot is open and gives the gap between the boot lid and the side panel a harmonious, uncluttered appearance.

All the services under one roof: from the concept through to start of production

During the development of this ambitious car concept, Bertrandt was given significant responsibility. Over the course of the three-year development process, project and design engineers worked on creating intelligent solutions. The lighting project was completed in its entirety on Bertrandt's premises, but was also fully integrated into Opel's processes.
The Bertrandt team followed all the stages of the classic development process for the Opel ADAM, which included creating the requirements specification, producing the initial package concepts, evaluating the styling guidelines using its own simulations, developing virtual prototypes by means of physically correct rendering, managing and monitoring suppliers and providing support for production start-up.
The development of the Opel ADAM enabled Bertrandt to demonstrate its ability to provide technology services in an innovative environment as part of a complex project. We would like to thank Opel for their partnership with us and look forward to becoming involved in future projects. ■

Dr. Holger Sprute, Rüsselsheim

TURNING VISIONS INTO REALITY

The Design Modelling and Rapid Technologies department can quickly transform data into models

Nowadays, success in business is more dependent than ever on innovation and rapid product design. Cost, quality and the scope of the development process all play a key role. Manufacturing processes such as rapid technologies accelerate prototype production significantly. This leads to a need for new working methods in the fields of design engineering, implementation and quality assurance. The services provided by the Design Modelling and Rapid Technologies department enable Bertrandt to support the design creation and functional evaluation processes even at the earliest stages of development.

Advanced portfolio

Our experienced specialists can supply the models and prototypes needed by the automotive and aviation industries and by a range of other sectors in the shortest possible time. You may not have realised that our services are in demand in the medical technology industry, for example. The focus of the modelling process is often on milling, which forms the basis for a number of other production technologies. In addition to heavy-duty milling machines, Bertrandt offers a wide spectrum of production procedures specific to modelling. We can provide our customers with models for design creation and functional evaluation purposes, as well as test cubes and fixtures. We also manufacture tools for plastic injection moulding, master models for electroforms and CRP and GRP lay-up tools, which enable top-quality, visible carbon components to be manufactured using the vacuum infusion process.

Producing high-quality components in a very short time.

Sophisticated designs

Design modelling and rapid prototyping involve a wide variety of challenges that range from concept creation, clay and hard modelling through to user experience models and show cars. In the design studios we turn our customers' ideas into reality in the form of three-dimensional models. The design of external forms and interior areas is playing an ever more crucial role in the process of developing vehicles and aircraft. Car manufacturers are increasingly using design elements and surface textures as important differentiating features. In this respect, design forms the bridge between emotion and function. By networking our expertise across the entire Bertrandt Group, we are able to produce concepts in the shortest possible time which can easily be implemented. Our expert services, which cover the entire process from the initial sketch to the final product, guarantee a high level of innovation and can be accurately costed. During the creation of designs for new car models, we use a range of different working methods and all the latest materials. For example, the highly effective system of line lights with an output of 1,500 to 3,000 lux in our design studios and our clean room painting booth allow us to add the finishing touches to high-quality standard and mirror surfaces. Our employees have the experience and the instinctive feel to create high-gloss finishes. >

CAD/CAM, milling, cubing technology and more

The wide-ranging and in-depth portfolio of services available from Bertrandt includes model making, cubing, plastic injection moulding, measurement technologies and many more. These are available as complete processes or individual functions. A variety of different CAD/CAM tools give us the necessary flexibility to process data in many different formats from the automotive sector and other industries. From the initial quotation stage through to the final inspection, our project managers in modelling and rapid technologies work closely with our customers in areas such as CATIA V5, Tebis, scan data processing, data feedback and preparation, and component definition. The highly productive and technically advanced process of milling, which represents our central resource, is the perfect means of meeting customers' requirements. For high-speed cutting (HSC), we have five-axis milling machines up to 6,000 x 3,300 x 2,000 mm in size.

Validated testing

Cubing technology enables all the interior and exterior components of a vehicle to be fully tested and measured within a very short time. Our testing facilities guarantee a reliable process and can be used both for initial inspections and monitoring mass production. >

Documentation with CNC measuring systems.

**Rapid technologies –
producing prototypes quickly**

Rapid prototyping and rapid tooling processes enable high-quality components to be made very quickly, in some cases using production materials. These display and installation models make it possible to evaluate at an early stage how prototype parts can be developed using these processes to produce the final production components. At the same time, the use of rapid tooling keeps to a minimum the risk of production tools needing costly modifications.
Our customers benefit from processes such as selective laser sintering (SLS) and stereolithography (SLA) which enable even highly complex parts to be manufactured and tested quickly and reliably within the space of a few hours. Bertrandt also offers 3-D print models, polyurethane prototypes made in silicone and RIM moulds, moulded parts in all shore hardnesses and colours, together with functioning and non-functioning lighting modules.

Low-pressure RIM systems: developing parts for simple function testing using non-production materials.

Using plastic injection moulding we can produce tools for prototypes rapidly and cost-effectively from a variety of materials for pre-production and small-scale production processes. Examples include tools made from steel, aluminium and epoxy resin.
These varied processes offer a number of clear benefits. Customers can choose the method which best meets their requirements from the wide range available. In addition, rapid prototyping and rapid tooling technologies have become increasingly flexible and varied in combination with the broad selection of materials on offer. Different methods can be combined or used in succession as part of a larger process to create individual modules for the complete system. The new generation of sPro laser sintering machines enables Bertrandt to provide its customers with highly advanced development services. The new version can process a larger volume of data, which allows it to be populated with data more efficiently. The state-of-the-art DMU 105 milling machine has been in operation since September 2012. Because of its extreme rigidity and stability, it enables steel tools to be milled with high precision.

Milling injection moulding tools using state-of-the-art equipment: the DMU 105.

In the context of the growing demand for the production of light modules, a large amount of milling is needed to create the individual components of the initial samples in particular. A new development in this area is that our customers are requesting not only non-functioning display models, but also functioning lights which can even be tested in road trials. As well as producing a broad range of designs and prototypes, we also support the electronics and light and visibility departments via the Bertrandt network and cover the entire process right up to the start of production. Detailed requirements specifications from customers are the benchmark we use for the targeted planning and implementation of future investments. >

Top-quality guaranteed

Nowadays components have to meet high standards of quality and withstand intensive testing. Our dedicated measurement facilities, which include consistently air-conditioned cubing rooms, high-performance measuring machines and mobile laser trackers, enable us to ensure that components comply with all the necessary requirements.

Mobile measurement systems in use.

By combining all the services we provide, we can optimise the design creation process. Our premises and our multi-functional equipment enable us to use the entire range of design development services to evaluate designs. Our flexible facilities offer sufficient space for presentations. The focus is always on the vehicle and, if necessary, we can install floor coverings in the measuring areas in our cubing room to prevent unwanted reflections. The adjacent quality assurance area, equipped with state-of-the-art measuring systems, provides additional support for the design validation process.

CRP/GRP composites

Another area in the modelling department has been specifically equipped for manufacturing fibre composite parts. Using the vacuum infusion process, high-gloss surfaces can be produced on the visible areas of components. This carbon fibre technology is also used in the cubing process, which allows the shape of components, modules or complete vehicles to be evaluated by means of functional models. This method is ideal for simulating sheet metal components, including entire vehicle bodies, with materials that have the same thickness and functionality as sheet metal.

Top-quality material: functional models made from CRP.

Confidentiality required

Our extended internal logistics area, which has secure loading and unloading facilities, guarantees confidentiality and ensures the efficiency of the processes.

Franz Jerg studied automotive engineering and manufacturing systems at Karlsruhe Technical University. In 1986 he began working at Daimler as a simulation engineer. He then became a production planning coordinator and, in 1994, prototyping team leader at the Stuttgart-Untertürkheim site. After this, he was appointed development project manager for a derivative of the A-Class, covering all aspects of vehicle development. Franz Jerg joined Bertrandt in 2006 and now heads the Design Modelling and Rapid Prototyping department in Ehningen. He enjoys all the challenges of the automotive engineering process and values the Bertrandt network, because he believes that the future lies in a joint approach. That also applies to his private life and his love for veteran Mercedes cars. One thing is certain: Franz Jerg has petrol in his veins …

Design Modelling – the ideal complement to engineering

Franz Jerg, head of Design Modelling and Rapid Technologies at the Technikum in Ehningen discusses current issues.

Franz Jerg, how did the modelling department develop at Bertrandt? What specific benefits does it offer our customers?

Modelling has a long tradition at Bertrandt. Rapid prototyping began in 1990 and since then the department has been systematically developed. This process has included the installation of large milling machines, for example. The modelling department has succeeded in moving away from its single focus and its small number of OEM customers and has opened up new areas of business. We have been in a much stronger position since 2007, following the acquisition of more customers and the move into the aviation industry.
Expanding our range of services has proved to be a very positive development and has produced good results. We have focused in greater depth on a number of areas, which means that we can now offer services ranging from the early stages of design creation through to cubing technology and also meet the requirements of the aviation industry. Our customers value the support that we provide for their design processes and our many years of experience and expertise. Important aspects of our work include our flexibility, strict adherence to deadlines and open communication channels. These are our key success factors. However, the most important consideration of all is that Bertrandt offers a very wide range of services. The interaction between design and prototyping is a very positive feature. We offer all the necessary services under one roof, which is a very important factor during the development phases. We describe time, meeting >

Attention to detail.

Lighting studio.

Fully functioning exhibit for the IAA 2011.

> We are Bertrandt's "Universal Studios".

The concept of design is frequently mentioned in the context of modelling. Design modelling is a key term. What role does design play in the modelling process?

We are Bertrandt's "Universal Studios". We have to present the models in perfect condition so that the development and design managers can make the final decision about the appearance of the car over the next seven to eight years. However, we do not use any of the materials from a production vehicle. We employ different materials and production processes to produce a model which looks like a real car. At the point when we create the model, the real car does not yet exist. The decisive factor is that our customers will only invest in the production facilities and tools needed to mass produce the real car once the model has been evaluated and approved on our site.

The design always comes from the customer. At Bertrandt we create a shell using the customer's data and the model makers represent this in a physical form. There are several ways of doing this. In the very early stages, we use inspection and proportional models, with the design being produced on a 1:1 scale for the first time. The customer decides on this basis whether work on the model should continue or whether it should be scrapped. Modelling offers customers a wide range of opportunities for reaching a decision about their products. Of course, we also provide support for the modelling phase, in which designers from

OEM come to our studios. We provide the employees who correct the models on the designers' instructions. This process takes place in parallel with soft modelling or creative work on the computer. During the development of the model, small changes are introduced, edges are sharpened and contours enhanced. In this phase several design proposals for one vehicle are often in competition with one another. Ultimately one is chosen and then refined to produce the final version. It is obvious that in many cases several approval cycles are needed.

Once the data has been approved, the modelling process begins again, providing testing services in the fields of gauge building and cubing. In the prototype phase, models are created which, in a similar way to the cubing process, are used to test pre-production parts and, in parallel with this, to ensure the reliability of future production processes. Designers and production specialists have to coordinate their requirements and any conflicts must be resolved.

While design models are all about surfaces and appearance, the important aspects of the cubing model are the fixing and bolting points for future production parts. We ensure that the future vehicle can be assembled without problems in the mass production process. This gives us the benefit of being involved not only during the early design phase but also in the subsequent production preparation phase. Our creative centre can offer our customers a range of services under one roof.

Your services have to comply with increasingly complex requirements and the costs of production need to be kept to a minimum. How do you overcome these challenges? Which technologies are helpful in this respect?

In recent years, the standards which vehicles have to meet have become ever more stringent and the requirements for future products >

Preparing parts for painting and ...

... the clean room painting booth.

The “wellness area”.

The perfect finish.

> Our models are becoming much more realistic.

will be even tougher. We are seeing significant developments in modelling technology and, in addition, our models are becoming much more realistic. We have headlamps that light up and we can present individual features in a lifelike way using electronic systems.
Only ten years ago there was a widespread belief that product approvals should be carried out solely on the basis of virtual reality presentations. Hardware was no longer so much in demand. However, our experience shows that models continue to make the decision-making process much easier for senior managers and technical department heads. Displays on the powerwall give rise to the first rough ideas, but it is ultimately the physical model which represents the future car and helps in making the final decision.
In all these areas, we are feeling the pressure on costs and we have to adapt what we do accordingly.

Do technological trends such as lightweight design, environmentally friendly transport solutions, comfort and safety have an influence on your department?

Very much so! And they even help us in some ways. One of our mottos is “Black and bright”, which means that we produce carbon fibre components with gloss surfaces and we are developing our lighting expertise in the field of rapid prototyping. Body-in-white components, such as doors, closures and other bodywork parts, can be manufactured in carbon fibre rather than pressed steel for the purposes of functional testing. Using these package and installation models, it is even possible to carry out tests for later mass production. Composite fibre components now play a major role in the modelling process.

What opportunities do you think there will be to develop design modelling in future? How will your department change over the next few years?

One major step will be to combine hardware models and electronic components to produce a complete model. These new modelling products will be added to our customer portfolio. Their realistic appearance and multifunctionality is arousing the interest of other departments within the group.
Our new “wellness area”, the spacious painting booth with modern lighting, is where the necessary high-end surfaces can be created. And most importantly, as well as working on the many different types of models, we are enjoying providing cosmetic styling services for the exterior and interior surfaces of real vehicles to give them the perfect finish.
By extending our capacity and our facilities, we can offer our customers an even wider variety of services. These include genuine measurement models or even high-end light modules, which we are developing in our electronic network. The demand from our customers shows that we are on the right track.
It is clear that our range of services provides the ideal support for the design process for future vehicles. Extending our services here on site and as part of the network has put us in a strong position. ■

Increased capacity: a model of the new building.

Modern design, indirect ambient lighting using LED, diffuse ventilation systems and other features were incorporated into a complete cockpit module by the Design Modelling department in Ehningen. At the request of automotive supplier Continental, the team worked closely from June to September 2012 on designing and developing a cockpit module for the future commercial vehicle market. On the basis of initial design sketches and a comprehensive list of technical features, the project team produced a high-quality complete solution for future commercial vehicles in the form of a cockpit exhibit.
The cockpit had its premiere at the IAA Commercial Vehicles motor show in Hannover in September 2012.

DEVELOPING A COCKPIT FOR COMMERCIAL VEHICLES

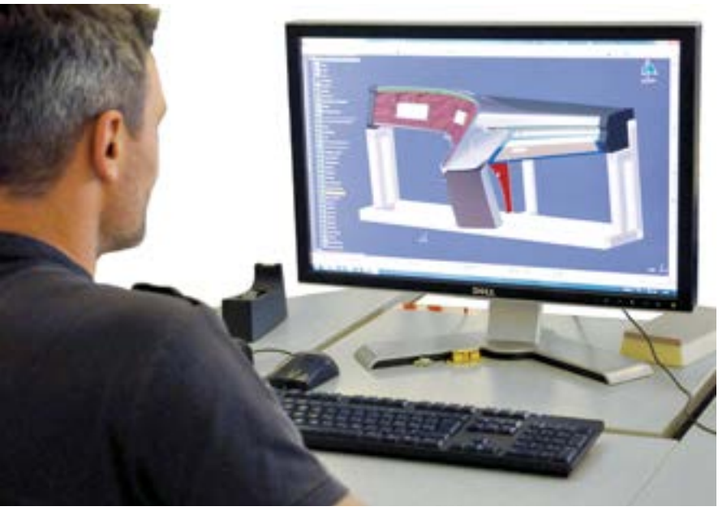
Bertrandt's design modelling department produces a new trade fair exhibit in collaboration with Continental and SAS Automotive

Developing a complete new product

Continental supplies assemblies such as instrument clusters, displays and electronic components for both cars and commercial vehicles, together with camera systems for trucks. In collaboration with its business partner SAS Automotive, which has more than 20 production sites for car cockpit modules throughout the world, Continental aimed to transfer this philosophy to the truck environment. This was the catalyst for the two global players to approach the design modelling department of the Bertrandt Technikum and commission a cockpit system, including design development services. Work began with a simple sketch which was enhanced and refined over the course of several weeks in close collaboration with the customer to produce a presentable product. A hardware version was then created by the modelling department on the basis of Bertrandt's CAD files.

Different stages of development

Using the available sketches, the Bertrandt design team fine-tuned and optimised the surfaces to produce a high-end finish, while always taking the technical constraints into consideration. Together with Continental and SAS Automotive, Bertrandt created a concept consisting of several modules, including the glove compartment, for example, with different variants which could be exchanged as required. After the design data had been approved, the individual modules were produced by means of HSC milling and a variety of rapid technologies, and then assembled together with the electronic components, which included optical fibres with their control devices and the display modules and control units provided by Continental. After the basic model had been completed, the team turned its attention to the details. The instrument panel was decorated with leather-style seams and a wood-look finish was created >



Designing the cockpit with CAD software.

The exhibit for IAA Commercial Vehicles 2012.

Fitting the ambient lighting.

by a painter specialising in murals. A special painting process was also used to produce an aluminium effect. Following the completion and acceptance of the unit at the Bertrandt site, it was integrated into Continental's mobile exhibition stand in line with the Continental corporate identity. The unit will be presented at other roadshows in future.

Highlights of the exhibition presentation

One of the most striking new features of the interior of a high-end commercial vehicle is the diffuse, indirect ventilation for driver and passengers. The air is distributed evenly and pleasantly in the vehicle interior via ducts behind the instrument panel which have no visible air outlets. Another highlight of the new cockpit is the ambient lighting. State-of-the-art optical fibres have been incorporated into the dashboard. The two optical fibres are continuous and create no areas of shadow. In addition, their colour can be changed from the control panel. All the RGB shades are available and a remote control can be used to adjust the colour and light simulations, which range from flashing to constant effects.

Exhibited at the IAA Commercial Vehicles motor show

Continental presented the cockpit at the motor show with the aim of highlighting tomorrow's developments today. The response of the market to the new design and the innovative technical features was overwhelming. Many photos were taken of the cockpit and published in the technical press. At Continental's request, Bertrandt continued developing the commercial vehicle cockpit to the stage where it was ready for volume production.

Comprehensive service package from Bertrandt

The major benefit for customers of the design modelling department at Bertrandt in Ehningen is that it offers all the necessary services under one roof. Bertrandt provides a complete package ranging from design surfaces and colour and trim requirements through to implementation. "Our key advantage is that we can network all the assemblies and provide the necessary coordination and implementation services to meet our customers' requirements. It is unusual to find all of this in one place," explains Franz Jerg, Head of Design Modelling and Rapid Technologies in Ehningen.

The cockpit lives on

Continental plans to continue developing the cockpit module in order to showcase future visual and technical features at exhibitions and roadshows. ■

Christoph Weber, Ehningen

COMMERCIAL VEHICLE DEVELOPMENT EXPANDED AT BERTRANDT

Tailor-made services close to the customer

A further focus: Bertrandt has expanded its commercial vehicle development activities. The technology experts cover the entire range of services – from body and interior development, electronics integration and validation to vehicle construction and complete vehicle testing. Key parameters include technical feasibility, functionality and maximum quality.

1 Vehicle body and interior development

2 Electronics development

3 Testing

4 Engineering services

To achieve this, Bertrandt never considers only individual components but always takes the complete vehicle into account. Issues such as quality and project management round off our vehicle development activities. We provide the entire range of services for the development process, thus enabling our customers to choose services either individually or as a complete package.
To ensure that we can respond to our customers' requirements comprehensively and sustainably, we have restructured our commercial vehicle development process.

Vehicle body and interior development: development partner and system integrator

Our range of services in the vehicle body and interior development process extends from design creation and model validation to series-production development. Within this process, Bertrandt supports its customers as an idea provider, solution finder and implementer along the entire process chain.
A parallel process to vehicle body and interior development is electronics development.

Electronics development: interdisciplinary integration role

Even today, software and electric/electronic components make up a high proportion of value creation in vehicle development. The reason for this is the key role played by electronics with regard to functionality, safety and mobility. The commercial vehicle of the future will be packed with even more technology and innovation, and even more electrics and electronics than ever before. It is a challenge that calls for networked thinking.
In electronics development, Bertrandt focuses primarily on the system development and integration of different hardware and software components. We support our customers in validation processes on both the component and system level – from the creation of test specifications and the implementation of test cases to the execution of tests. Electronics development is followed by vehicle construction and the testing of components and complete vehicles.

Complete vehicle development: more quality, safety and comfort

At Bertrandt, vehicle testing is part of a key value creation process in vehicle development. We provide our customers with comprehensive support, from the planning and execution of tests to final homologation. We concentrate our experience and expertise, making targeted use of synergies and setting new standards. Our clear aim is to provide all-embracing support for our customers with our know-how and quality – from the initial concept to complete vehicle testing. Reproducible and accurate testing is a guarantee for cost-effectiveness and a long service life. In addition to testing, prototype building is a central component of our range of services. Our portfolio is rounded off by services such as documentation and workshop support. The result: a safe and reliable commercial vehicle.

Engineering services: managing interfaces

Increasing quality requirements and high process reliability play a major role at commercial vehicle manufacturers. Bertrandt's Engineering Services are designed to meet precisely these challenges. We support our customers by managing the interfaces outside the pure development process. Our range of services is divided into four main areas of expertise: project management, quality management, process validation and logistics.

Bertrandt commercial vehicles – we get things moving … ■

Daniel Binder, Ingo Schulz, Christoph Schelhammer, Ehningen

Development locations for commercial vehicles in the Bertrandt Network

Vehicle body development
- Design / modelling
- Body-in-white structure / chassis
- Exterior / interior
- Installation space concepts
- Calculation and simulation
- Technical documentation

Electronics development
- Requirements engineering
- System integration
- Hardware / software development
- HiL testing
- Measuring technology
- System testing

Complete vehicle development
- Test planning
- Vehicle construction and conversion
- Complete vehicle commissioning
- Complete vehicle testing
- Homologation tests
- Workshop support

CONNECTIVITY
AS A CHALLENGE

Electronic intelligence has now become a more important part of every vehicle than ever before. The added requirements of electronic stability control systems, infotainment, navigation and assistance systems in addition to the conventional electronics used to operate the car mean that the challenges facing car makers are becoming increasingly complex. And in our digital age, communication is required not only within the car itself but also with the entire vehicle infrastructure, as well as from car to car and with the internet. Bertrandt has developed the "b.on" project with the aim of promoting automotive connectivity based on its own experience.

Klaus Härtl,
Head of the Electronics Development Competence Centre,
on the subject of the connected car

Klaus Härtl, the specialised press is constantly reporting about more and more electronics in the car. Infotainment and multimedia systems are now increasingly finding their way into the passenger compartment. What is your view on the development of consumer electronics in the car?

Information services are a very clear trend that we have taken up at Bertrandt. We have given this trend the name "b.on". It describes a phenomenon in our society in which we can access information everywhere and at all times, in which we can have access to others and are accessible ourselves. Communication into the vehicle and around the vehicle represents a new task for us. For example, the infrastructure has to function in a completely different way and new services – such as provider services – need to be made available. OEM themselves are faced with very special challenges. They are no longer merely selling cars, they also have to provide information services as part of this new infrastructure, including such things as back-end servers and so on. IT issues that need to be addressed and resolved by OEM are having an increasingly strong influence. It is a subject full of challenges.

What requirements does this result in for your field of work?

We develop scenarios and create access to this technology. For example, cloud computing is not only relevant to the classical computer sector, it also plays a key role in the development of communication in the vehicle. For the Electronics Development Competence Centre, the main focus is on data communication and data streaming, as well as infrastructure development to provide vehicle information and functions. In electric vehicles, for instance, it can be used to provide information on the battery's state of charge, the driving range or the driver's personal schedule planning.

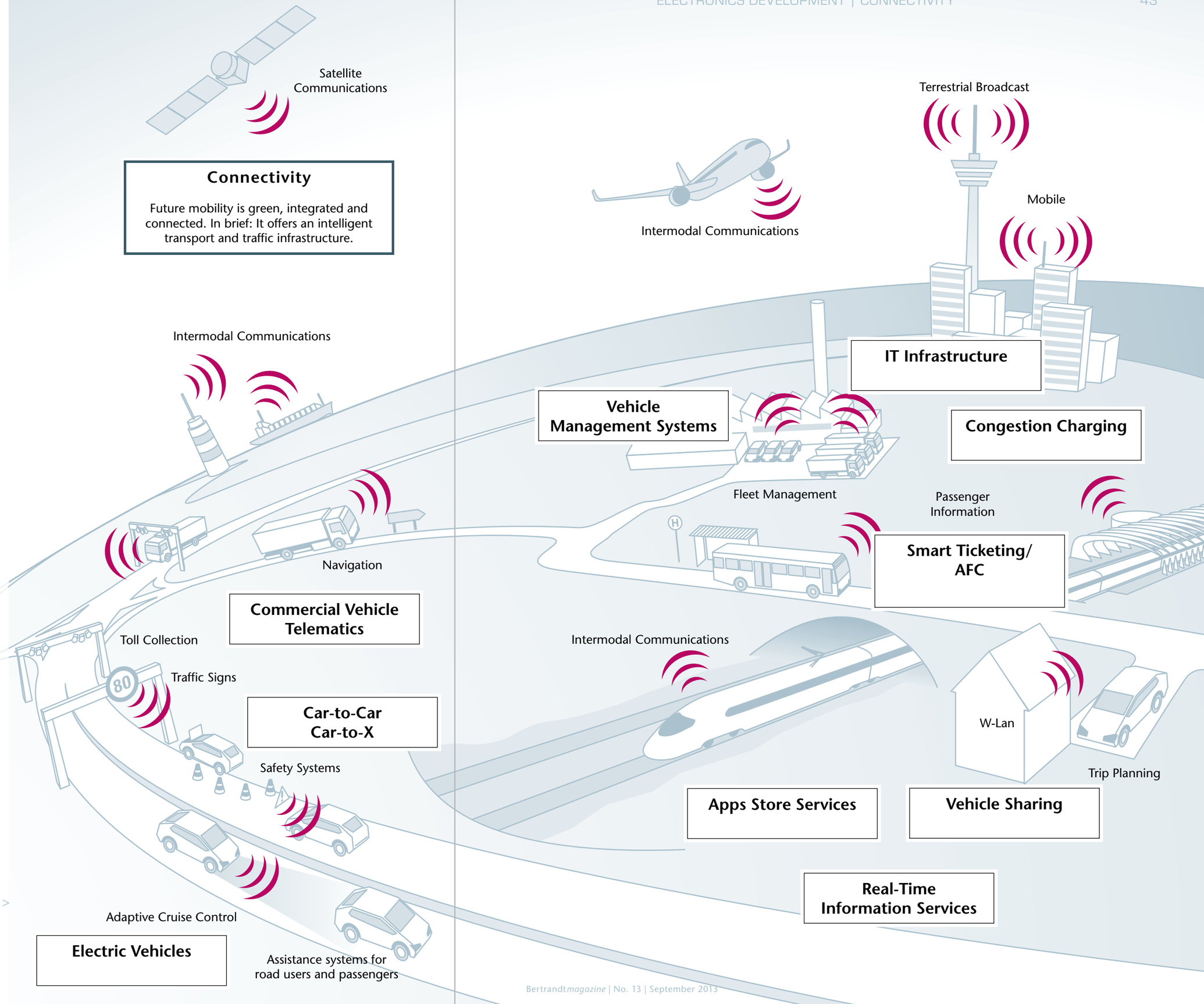
How has the subject of automotive connectivity developed? Which areas does connectivity precisely cover?

Connectivity is a very broad topic, and primarily involves connecting various systems together. We at Bertrandt began our activities in the field of infotainment and multimedia systems directly in the vehicle after >

being increasingly asked to integrate mobile phones into the vehicle environments. What is more, there are many different manufacturers, and customers do not necessarily choose their car according to their mobile phone. The challenge lies in offering a large number of adaptable devices such as mobile phones, MP3 players or hard disks. With regard to connectivity, we refer to both wired and wireless connections, such as the already established Bluetooth technology or further developed WLAN hotspots, for the purpose of offering other multimedia and internet applications. Both for the driver and for other passengers in the vehicle. Just think of VIP chauffeur services, for example. A second aspect in addition to the world inside the vehicle is the question of how the vehicle is connected with the outside world. This includes the applications that I just mentioned, such as the internet. How do data services get into the vehicle? These are the first steps that Bertrandt has already supported as an iterative process. And today, we are precisely at the decisive point. How will the whole issue of connectivity develop? How can these possibilities be used to provide comprehensive connectivity not only between cars but also with the outside world in the form of infrastructure?

What will the future developments in automotive connectivity look like at Bertrandt?

As I mentioned, we are facing a major challenge in bringing together the different worlds. The world of consumer electronics has very short life cycles, regarding both development and product cycles. New products very quickly replace existing ones. This is not yet completely compatible with the development cycles of vehicles, although in the meantime these are also becoming shorter and more efficient. Generally speaking, the aim is to develop standards that enable a large number of devices to be used. >



Klaus Härtl, we already mentioned briefly that you are working on the standardisation of processes in electronics development in order to make complex subjects more manageable. How does this become apparent with regard to connectivity?

Standardisation in connectivity is an iterative process that is not yet so established because vehicle manufacturers are only now taking steps into these worlds in order to connect more information services into their vehicles and to offer these services. For that reason, we are carrying out internal innovation projects in which we are collecting additional experience. For example, we have chosen a university as a partner, in cooperation with them we have analysed what is the state-of-the-art technology, what is usable for us and which strategy our customers should pursue. The aim is to achieve portability and expandability. “b.on” provides us precisely with the challenge of developing standards and managing processes on the basis of our own experience.

The first vehicle fleets have already been equipped with car-to-car communication or car-to-x systems and are already undergoing trials on public roads. The first systems are expected to be launched on the market within five years. What challenges will that mean for manufacturers? Is Bertrandt also providing support in this field?

Road traffic involves motion, and the more such systems are used that also allow vehicles to drive autonomously, the greater the challenges become, because road traffic is always a dangerous situation and can be a matter of life or death. The more intensively we become involved in connectivity with an increasing transfer of information, the greater is the risk that systems can be manipulated externally. The challenge clearly lies in data security and infrastructure. The need to be available everywhere and at all times coupled with driver assistance systems or safety-critical functions means that we require redundant systems and a high level of stability and reliability – combined with safety and security from the IT applications.

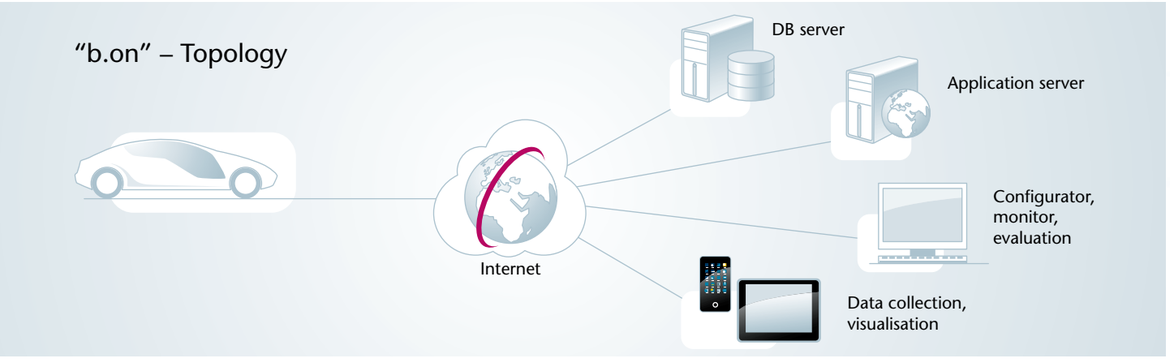
Which long-term objectives do you see for the connected vehicle?

> It won’t be long before a car can look for a parking space itself.

I see a clear trend towards driver assistance systems such as Adaptive Cruise Control (ACC) – in other words, assistance systems that are predictive – and even today we already have systems that help the driver to keep in lane, to maintain the right distance from the vehicle ahead and to observe speed limits. Taking this fusion of systems a step further in order to offer even more comfort and, above all, more safety standards and functions will be the decisive objective. In the medium term, it will not only involve generating information from one’s own vehicle but also making use of information from the infrastructure and, if required, including the infrastructure of other road users and vehicles. For example, think of traffic flow management. The gap is closing: the more information and redundancies are available, the more valid they are and the better we can use them to “feed” systems and derive functions or reactions. By the way, autonomous driving is currently being tested in the passenger car sector. In other sectors, autonomous driving is already well-established, for example at commercial vehicle manufacturers. In agricultural engineering, it is certainly possible to connect several driverless tractors together and to move and influence them from a control vehicle. Of course, this is less critical as such actions usually take place away from public roads and at lower speeds. In normal road traffic, this is much more difficult and requires other mechanisms. However, many vehicle manufacturers are already carrying out such test scenarios, for example with automatic parking systems. When I take a look to the future, it will probably not be long before drivers can get out of their car at a hotel or an underground car park and the vehicle will look for a parking space automatically.

Safe, comfortable and efficient: connected vehicles are expected to offer their drivers a high level of comfort and at the same time warn them of risks or avoid accidents. Could you sketch a scenario for safe driving for us?

We already mentioned that supportive and accident-preventing measures will be derived from such functions as ACC and pre-crash systems. We already have the Lane Departure Warning, Lane Change Assistant or Blind Spot Detection systems that close safety gaps. The Lane Change Assistant prevents collisions with other vehicles when they are in the blind spot. Traffic Sign Recognition systems are also available, although they do not yet directly influence the driving process. The liability issue in the event of malfunctions has not been sufficiently resolved to enable these systems to be used by the masses.
If we look to the future, we expect vehicles to become genuinely interconnected and to communicate with each other. Vehicles held up in a traffic jam will have detectors that can warn following vehicles and can also assist in traffic flow control. In electric vehicles, information such as route data or environmental information can be used predictably for speed control, fleet operation or emissions control. >



We have given the topic of connectivity the name “b.on”. It describes a phenomenon in our society in which we can access information everywhere and at all times, in which we can have access to others and are accessible ourselves.

The European Parliament is calling for all new passenger cars in the EU to be equipped with the eCall system from 2015 – a system that automatically activates an emergency call and provides information on the vehicle’s location. What do you think of this requirement?

The EU is pushing this legislation through because it has recognised its fundamental benefit for road traffic and the individual driver. The system’s complexity has increased to such an extent that we can detect via eCall when a corresponding emergency call needs to be sent. That is the decisive factor. Crash sensors and rollover sensors are also included in this. It must be unambiguously clear when a critical accident situation exists and the vehicle occupants require assistance. Not only must the emergency call actually be sent automatically, it must also be possible for the control centre to make contact with the vehicle in order to determine the seriousness of the accident. Such functions can be further extended in the medium term.

How important is data security in the connected car?

Data security is the most essential point in the connected car. For that reason, we must ensure that data are valid to prevent functions from being manipulated. Data security depends strongly on the architecture that has previously been chosen. The aim is to create authorisation possibilities or firewalls and to install security elements for the interaction between the driver, devices and the vehicle in order to defend against malicious software and viruses. This has a noticeable influence on the vehicle. Therefore, we must carefully consider which functions are offered in order to guarantee security.

> Data security is the most essential point in the connected car.

Within the vehicle, there is close interaction between connectivity and driver assistance systems. Could you please give us an example? How will this interaction develop?

Driver assistance systems are becoming increasingly important within the context of connectivity. The aim is to expand their possibilities and to make them more stable and more robust. Take Adaptive Cruise Control, for example, which has developed from a single-radar system that worked well but which was not yet homogeneous. Objects were not always reliably recognised on bends. The introduction of several systems, including environmental sensors and image processing, now makes the system much more robust in having a comprehensive influence on the driving situation.
If you consider today’s pre-crash functions that also activate haptic or visual signals, this is already the next iterative step. Whereas we previously focused on accident avoidance, we are now advancing the development process with eCall, which can transmit signals. When we think of the future development of autonomous functions or the perception of the vehicle’s surroundings, we have to combine all this information to be able to act more reliably in the vehicle and, in addition, to offer relevant safety functions. We refer to this as sensor fusion. Vehicle safety becomes combined with data, multimedia and online services – a challenge for car manufacturers. Also because they need to put the development teams together in such a way that all interfaces are covered. Functions are becoming much more complex with a higher proportion of interdisciplinary development. We notice this ourselves when we validate functions in the field of vehicle safety and find that interaction with electronics also plays a relevant role.

In the follow-up to the Detroit Motor Show, it could be heard from some vehicle manufacturers that automotive connectivity will become a key differentiating feature in the future. Good prospects for electronics development …

Definitely good prospects for electronics! Even today, it has a relatively high value-added proportion of 25 to 30 percent, and its scope and volume will, of course, significantly increase in the future with the implementation of connectivity.
But we must always keep in mind what is productive and supports the driver. The customer’s desire for individualisation and differentiation can be satisfied with software and connectivity. Freely programmable displays, separate frameworks or the opportunity to purchase software apps create many new possibilities.

How do you support OEM and system suppliers in electronics development in view of this technical challenge? What customer benefit does Bertrandt offer in the development of the connected car?

Our customers have always wanted a partner who speaks their language. This has been our strategy for many years and on many issues. We are now trying to meet the challenges from the internet and online services sector and the related functions and driver assistance systems. We are well familiar with the vehicle world through our electronics development activities and are also well established there. We have already become involved in consumer electronics with the wide range of functions and assistance systems. We are also familiar with the customer world, which we are integrated into through developments with OEMs, and we are aware of their demands and feedback from the field.
Our job is to close precisely that gap between these worlds, and that is also the challenge for OEM: How do we optimally combine functions? How do we make data services so compliant that they work reliably also from an IT perspective? We are able to cover this process completely. Our “b.on” project makes us a fully-fledged development partner for our customers – with complete sustainability in these innovative, challenging issues. ■

INNOVATIVE CAR-TO-CAR COMMUNICATION SYSTEMS

Bertrandt Cologne's contribution to safe and intelligent mobility solutions

Developing cars that help their drivers to overcome the daily challenges of life on the roads has long been a goal of the automotive industry. However, all the existing systems of this kind operate largely independently. For example, a car "sees" a road sign and informs or warns the driver or a car "notices" an unintentional lane change and prevents this from occurring. However, what if useful information or, even more importantly, a warning of a dangerous situation cannot be identified or generated by a car acting independently? What happens if another car has broken down over the brow of a hill or if a truck has lost its load 100 metres away?

The challenge: communication and cooperation between individual vehicles.

In these cases, we do not become aware of the danger until it is too late. It is almost impossible to manage these situations without the help of other road users. Cars cannot see over the brow of a hill or look inside steel truck bodies. Developers have been working on finding a solution to these problems for years and the keywords in this context are C2C (car-to-car) and C2X (car-to-X) communication. This is all about communication and cooperation between individual vehicles. However, as cars can communicate not only with one another, but also with other partners (such as traffic management centres, traffic light systems and functional nodes by the roadside), the term C2X is generally used instead of C2C, where X stands for all the possible communication partners.

Examples of use and potential solutions

Car manufacturers and universities have been running research projects in this area for several years. However, it is only recently that the technology has become sufficiently advanced to allow comprehensive research projects to be launched on the roads of European cities. A car which has broken down can now send a message to all the vehicles nearby to inform them about its problem and its precise position. A vehicle which has to perform an emergency braking manoeuvre can notify the vehicles around it. The information is analysed by the recipients and its relevance is evaluated. For example, an emergency stop is less relevant to the traffic travelling in the other direction on a motorway than it is to the cars behind. Information about a vehicle that has broken down in a side street is also not particularly important to a recipient of the message on the main road. However, a fog bank, heavy rain or snow are relevant, even if the message is sent by a vehicle in a side street.
Many other scenarios have been evaluated, including roadworks that inform traffic about their location, junctions which give drivers accurate information about their topology and the best strategies for crossing them and emergency vehicles that notify other road users in good time of their position, so that the other cars can let them through. The applications of this new technology are wide-ranging and its potential benefits are huge.

Current projects with Bertrandt involvement

In 2008, the “Sichere Intelligente Mobilität – Testfeld Deutschland (sim^{TD})” (Safe, intelligent mobility – test environment Germany) research initiative was launched. On a European level, the “ecoMove” and “DRIVE C2X” projects are evaluating the feasibility and scalability of C2X communication. The partners in these large-scale research projects include well-known German and European OEM, such as Daimler, Ford, Opel, Fiat, Volvo and DAF, universities and a number of associated companies, for example, Continental and Bosch. Another German research project “CoCarX”, which took place from 2009 to 2011, investigated the possibilities of using the mobile phone network for C2X communication. Members of the Electronics Development department in Bertrandt Cologne have been and, in some cases, are still involved in all four of these projects working on behalf of customers. It all began with Bertrandt providing development services for sim^{TD}, the largest of the four projects. Bertrandt Cologne took on a large part of the

responsibility for the hardware and software development on behalf of Ford, a partner in the project. This included interfaces between Ford cars and those of other manufacturers in the consortium and software which provided driver information, carried out risk analyses and identified traffic situations at an early stage. Bertrandt specialists monitored and optimised the entire route taken by the information from the initial reception via wireless communication to the final processing by end user software. The hardware performance was analysed and evaluated in detail. New technologies such as Long Term Evolution (LTE) in the mobile phone network were used and validated in realistic scenarios. Throughout the course of the entire project, engineers from Bertrandt and Ford took part regularly in joint development and evaluation workshops with representatives of other OEM, suppliers and subcontractors on testing grounds set aside for the project. Up to 20 vehicles were involved in each workshop and the team from Bertrandt Cologne played a role in optimising the systems. Other Bertrandt sites also took part in C2X. For example, Wolfsburg was responsible for planning, coordinating and evaluating approval tests on the testing ground and Ehningen equipped the entire test fleet of more than 100 vehicles with research hardware for field testing.

Project results

The largest and most comprehensive of the four projects referred to here was sim^{TD}. The project team was often faced with complex challenges and had to come up with completely new development solutions. The engineers, IT and communication specialists and psychologists overcame all the obstacles and brought the project to a successful conclusion. At the end of the development phase, 100 vehicles from various OEM were fitted with the software and hardware modules that had already been developed and tested. The cars then went out on the roads of Frankfurt am Main. During a complex evaluation process, the project teams gathered information about drivers’ reactions and behaviour in real-life situations with and without the support of the C2X system. Subsequently the results of the field tests were passed on to the teams at the universities involved for further evaluation and scientific analysis.
As an international provider of development services to the automotive industry, we are proud to be involved in scientific and technical advances of this kind and to contribute our experiences and in-depth knowledge to the development of new types of technologies. ■

Ewgenij Sokolovski, Cologne

Bertrandt equipped the entire sim^{TD} test fleet of more than 100 vehicles with research hardware ready for field testing.

ONLINE VISUALISATION OF THE AUDI

PRE CRASH BASIC

SAFETY SYSTEM ON TABLET PCS

Presenting vehicle safety functions in an intuitive way: a project involving cooperation between Bertrandt Ingolstadt, AUDI and Automotive Safety Technologies.

New and innovative vehicle functions help to prevent accidents and to reduce their negative effects. One of these functions developed by AUDI is Pre Crash Basic (PCB). While the vehicle is moving, PCB continuously evaluates the driving dynamics and intervenes to lessen the potential consequences of accidents, for example in the case of an emergency stop or a skid.

Intuitive visualisation improves testing

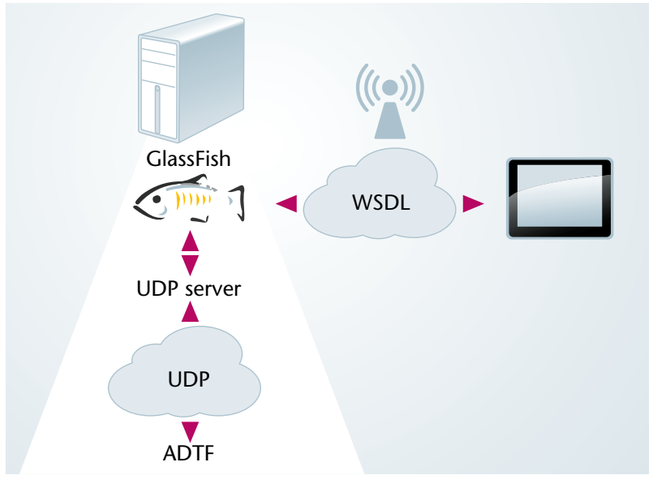
During the function and system development process, typical critical situations on the road are reconstructed on the testing ground so that the functions in question can be tested, applied and approved. In order to be able to reproduce and evaluate the behaviour of the function, the testing specialists must have a wide variety of information at their fingertips. This includes vehicle parameters and signals, such as the steering angle, speed and braking pressure, together with the function's internal parameters and trigger conditions, for example commands sent to the actuators. Using the standard tools for recording and visualising bus signals, it is generally only possible to carry out an in-depth evaluation of the function after the testing has been completed. The disadvantage of this is that the process of evaluating the function is disconnected from the actual driving situation and that valuable development time is wasted. To enable the testing specialists and decision-makers to assess sequences of signals during a test drive and to draw the necessary conclusions, it must be possible to visualise the relevant signals in an intuitive and practical way.

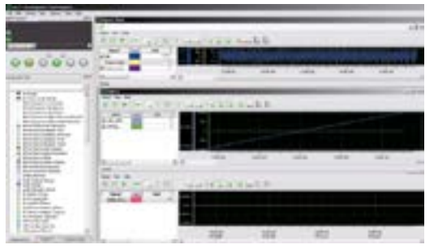
Solution based on tablet PCs

Bertrandt Ingolstadt developed a tablet PC-based application for the live visualisation of the PCB functions on behalf of AUDI AG. This involves sending vehicle data wirelessly and in real-time to the tablet and presenting it in a clear and intuitive way. In order to accommodate the highly dynamic situation during the test, the application offers the option of automatically freezing sequences of signals when certain events occur, so that the user can identify and evaluate the relevant signal values, for example after an emergency stop.

Technical implementation

ADTF, the AUDI software environment for applications and tools, supplies selected vehicle signals, the results from the PCB algorithm and the information relating to the triggering of the actuators. This data is transferred to a local server via a generic interface using ADTF plug-ins, known as filters. The server makes the information available as a web service. The client application in the form of an Android app accesses the information and displays it to the user in visual form. The server solution enables several tablets to be used at once, so that more than one occupant of the vehicle can follow the test sequence.



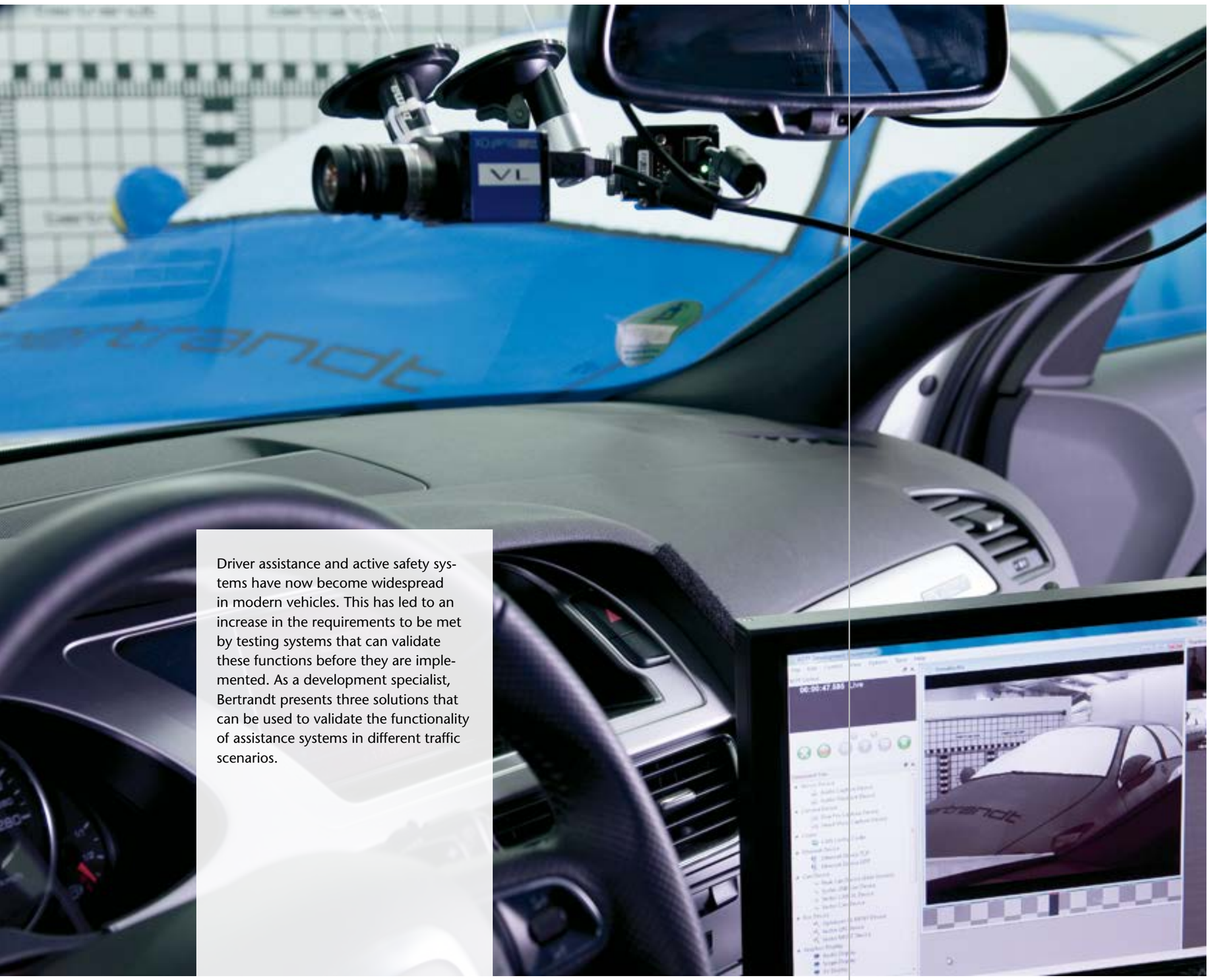


ADTF (Automotive Data and Time-Triggered Framework) example of signal presentation.

Summary

The live visualisation of the PCB function on a tablet PC is an impressive demonstration of the benefits of using tablet and smartphone apps in the development of complex vehicle functions. ■

Christian Bernhold, Manuela Woyke, Bertrandt Ingolstadt
Markus Erlacher, AUDI AG
Dr. Ernst Sikora, Automotive Safety Technologies



Driver assistance and active safety systems have now become widespread in modern vehicles. This has led to an increase in the requirements to be met by testing systems that can validate these functions before they are implemented. As a development specialist, Bertrandt presents three solutions that can be used to validate the functionality of assistance systems in different traffic scenarios.

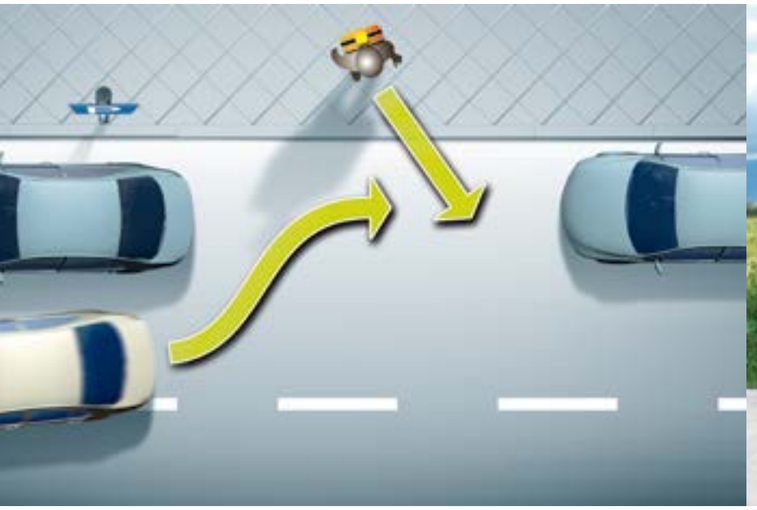
REPRODUCIBLE TESTING OF DRIVER ASSISTANCE SYSTEMS

Bertrandt Ingolstadt develops new testing tools

Background

Whereas legislation will make the use of modern safety systems mandatory across the board in commercial vehicles from as early as November 2013 – including such systems as the Advanced Emergency Braking System (AEBS) and the Lane Departure Warning System (LDWS) – consumer protection organisations in the passenger car sector are focusing on ensuring that the technology and functionalities involved fulfil high requirements. This is pushing the spread of today's commonly used systems in all vehicle classes. For this reason, there is also an increase in the requirements to be met by comparative and validating testing processes. One important requirement for testing systems is that they fulfil the criteria of objectivity and reproducibility, as these need to be achieved very precisely in everyday testing. However, the wide variety of functions incorporated in assistance systems also shows that there is still a long way to go before each function has its own standardised testing methodology. Until then, numerous individual development testing systems will be used in order to make vehicles safer.

Bertrandt is meeting these challenges. It has developed no less than three different solutions that can securely and reproducibly represent and measure a multitude of traffic scenarios and evaluate their data. >



Example of “b.move” in use.

Distance measurements under dynamic conditions, for example for cyclists.

b.move: Detecting and representing stationary and moving objects in three-dimensional space

b.move

The benefits of the system are its wide range of application and its high level of mobility. Combined with standard interfaces, it can very easily be integrated into existing test infrastructures.

Under the name “b.move”, we have developed a solution that can unambiguously detect and measure stationary objects such as traffic signs and bollards as well as moving objects such as pedestrians, joggers and cyclists in three-dimensional space and to represent their position with an accuracy of ± 2 centimetres. The system is based on a GNSS receiver with 72 channels for GPS and GLONASS. It has its own self-contained energy supply and is carried in a backpack. It is therefore ideally designed for use with pedestrians and pedestrian dummies in particular.
In order to communicate and exchange data with other systems, wireless interfaces for ASCOS, SATEL, WLAN and Bluetooth are integrated. The measured data are sampled and recorded at a sampling rate of 20 Hz in dGPS operation. In addition, the measuring system is contained in a housing with IP66 protection. It works without problems in a temperature range from -20 to +50 °C and is very robust for use in everyday testing.
A look at some of today’s fields of application shows the flexibility of “b.move”:

- Precise measurement of parking spaces (distance from the kerb, distance from the vehicles in front and behind)
- Determination of free spaces for defined scenarios (for example, driveway entrances)
- Distance measurements under dynamic conditions, such as for pedestrians, cyclists, motor cyclists, cars and commercial vehicles
- Trajectory recording of moving objects (for example, to check reproducibility)
- Measurement of lane widths and the course of the road on multi-lane roads
- Validation of light functions by determining the position of light sources ahead or oncoming.

b.target: High level of robustness and detail in tail-end collision scenarios

A look at the necessary targets quickly reveals the challenge for present-day assistance systems. Just a few years ago, simple foam blocks with a defined radar recognition capability were still sufficient in everyday testing to validate systems such as ACC or automatic braking systems. But as systems become increasingly interconnected and complex, which is being achieved by the use of various sensor systems, the requirements for realistic targets are increasing.
Currently, inflatable vehicle dummies in several designs have become established. Depending on the application case, there is an increase in both the visual and functional demands as well as the requirements for robustness to withstand the crash loads that result from a collision between the ego-vehicle and the target.
As far as the requirements for “robustness” combined with a high level of detail are concerned, Bertrandt has developed a method that can convert almost any vehicle contour into a test object. The exterior contour of the vehicle section required – for example, the rear third – is recorded and a corresponding shape is generated.
This shape can then be used by the testing engineers to produce the individual target. The special feature of this target is its material mix. It consists of a flexible carbon fibre composite that is stabilised using a foam. Mechanical robustness is increased by the carbon fibre content. At the same time, the required shape can be precisely reproduced. In its basic form, the target itself is very light. Depending on the size, it weighs around 10 kilograms.
Depending on the application, the target is mounted on a carrying frame and any required functions are added. For the typical “tail end of traffic jam” scenario, the target was mounted on the Bertrandt “b.rabbit” mobile carrying frame. This also integrates the “b.move” measuring system, which enables the position of the ego-vehicle and the target to be determined at any time. The advantages of such a system are mainly its high level of detail and its high robustness in everyday testing. After the impact, the target can be restored to its original shape.
The relatively low mass minimises the risk of damage to the ego-vehicle. Like “b.move”, it is also compatible with current testing systems and can be easily integrated into an existing infrastructure.
Currently, the focus of development is on dummy targets in the shape of pedestrians made of the same material. The aim is to generate robust and user-friendly solutions for routine testing.

Functional requirements such as radar reflectivity and recognition of laser- and camera-based systems can be implemented without problems.

b.target

“Tail end of traffic jam” scenario: test procedure with pre-formed target.

"b.wire"
mobile testing solution.

b.wire

b.wire:
Validating traffic coming from the side

The system is fully self-contained and can therefore be used on almost any test track.

For traffic coming from the side, the focus in future will increasingly be on testing systems that can safely and reproducibly represent road junction situations and turning processes in areas close to collisions. For this purpose, Bertrandt has developed a mobile testing solution that makes it possible to move targets with a mass of up to 10 kilograms independent of location and in a reproducibly linear manner. The "b.wire" testing system can transport various targets such as vehicle front ends or pedestrians on a platform and move them into a crash situation, in particular in situations with traffic coming from the side.
The platform is fixed to a circulating cable. It is guided on a rail and moved to the target point with the ego-vehicle. The acceleration processes can be freely regulated and the platform can be accelerated to defined velocities of up to 60 km/h. The distance between the start of acceleration and the target point can be varied between 30 and 160 metres. The system is fully self-contained and can therefore be used on almost any test track. Usage in cold and hot countries has also proven this capability impressively even under challenging climatic conditions.
Shortly before or at the moment of the possible impact, the target is separated from the platform, thus causing no damage to the testing equipment or – due to the low mass of the target – to the ego-vehicle either as a rule. Road junction situations from different angles can be represented precisely and reproducibly. The motion trajectory of the platform is recorded and is available for the evaluation of the driving scenario and the related functional assessment. The system can also be used for the application case with pedestrian dummies crossing the road. This makes it possible to use the system in the process required by EuroNCAP for evaluating emergency braking systems.

Summary and Conclusion

With its three mobile solutions "b.move", "b.target" and "b.wire" for routine testing in the development of driver assistance and active safety systems, Bertrandt is making a contribution towards meeting the requirements and challenges in the validation process and extending the functional safety of new systems. The development of these testing systems was focused on the attributes of mobile usability, robust operation and good reproducibility, and the result impressively exhibits these properties. This means that further tools for harsh routine testing are now available. ■

Kai Golowko, Dr. Dietmar Szolnoki, Ingolstadt

Roadmap:

Tools for the development of Active Safety.

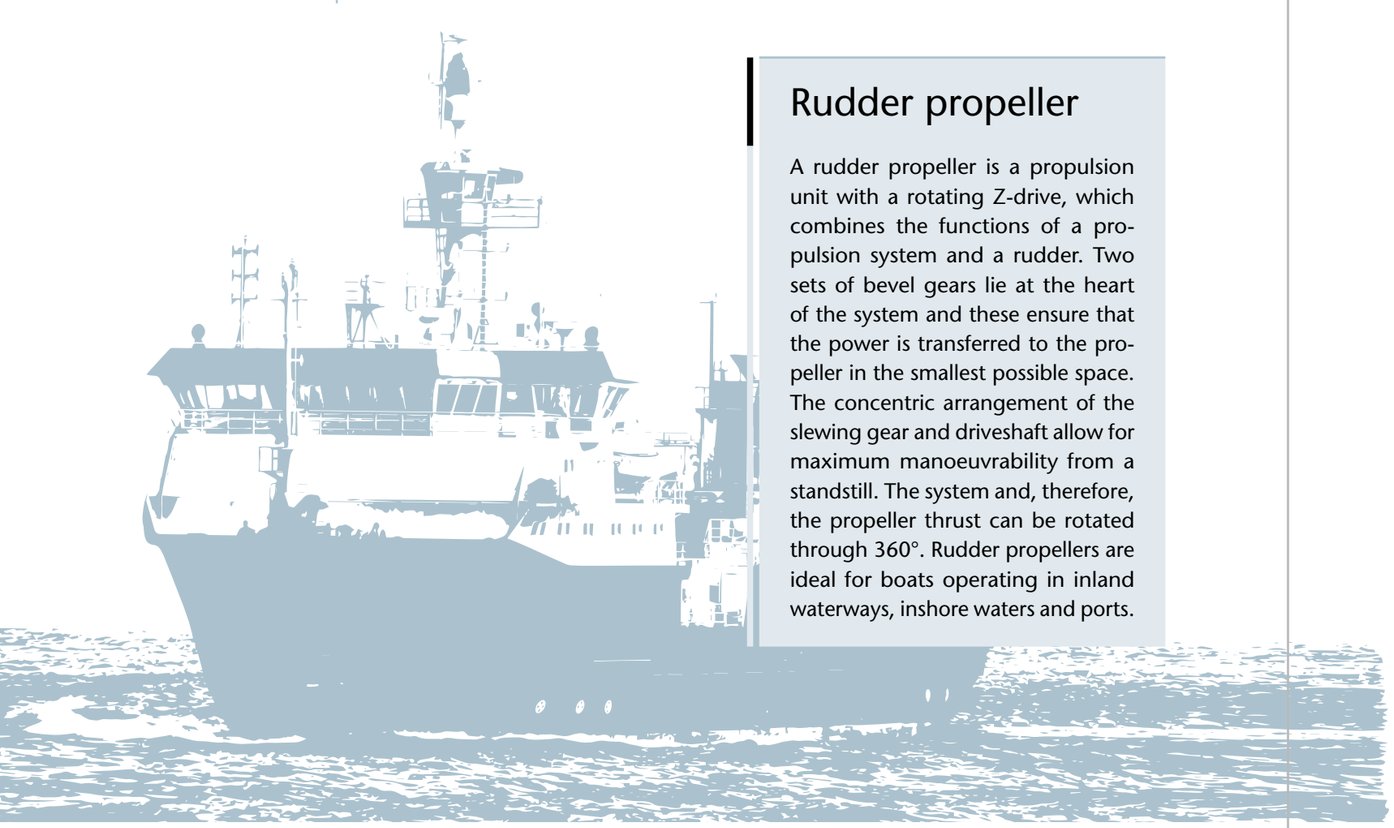
Active Safety

DEVELOPMENTS IN THE FIELD OF MARINE ENGINEERING

Bertrandt Services Hamburg provides support for a new generation of rudder propellers

For more than 100 years, Jastram GmbH & Co. KG has been a well-known name in the field of marine engineering, manufacturing ships' engines and manoeuvring and propulsion systems. These range from transverse thrusters and conventional rudders through to rudder propellers and are developed and constructed for use in robust work boats and commercial ships, as well as in mega yachts. In the autumn of 2009, work began on the development of a new generation of Jastram rudder propellers in cooperation with Bertrandt Services.

The Jastram rudder propeller.

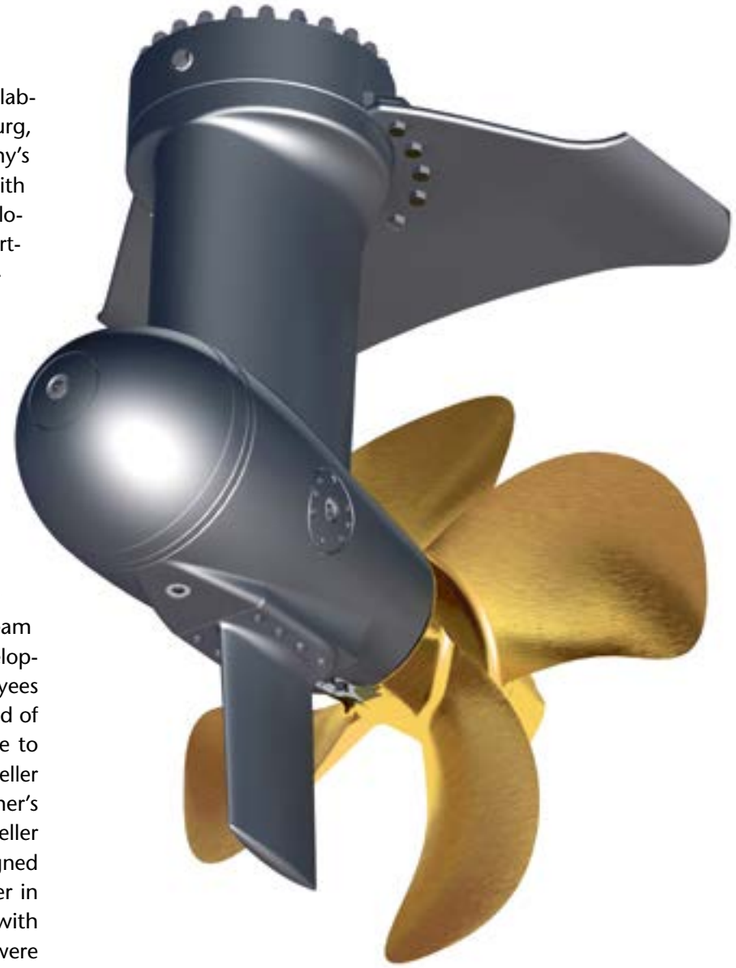


Rudder propeller

A rudder propeller is a propulsion unit with a rotating Z-drive, which combines the functions of a propulsion system and a rudder. Two sets of bevel gears lie at the heart of the system and these ensure that the power is transferred to the propeller in the smallest possible space. The concentric arrangement of the slewing gear and driveshaft allow for maximum manoeuvrability from a standstill. The system and, therefore, the propeller thrust can be rotated through 360°. Rudder propellers are ideal for boats operating in inland waterways, inshore waters and ports.

The project

The project began three years ago in collaboration with Bertrandt Services in Hamburg, with the aim of continuing the company's tradition of supplying reliable systems with a long service life using the latest technologies. The drive system development department was presented with a major challenge in the form of a completely new industry. The first phase of the project involved market research activities to investigate whether there was a demand for a state-of-the-art propulsion system of this kind. In addition, requirements and performance specifications were drawn up as the basis for the innovative development. The 3D CAD system SolidWorks was newly introduced for this project. As a result, the project team members, who consisted of Jastram development staff and Bertrandt Services employees from Hamburg with expertise in the field of maritime propulsion systems, were able to design and develop the new rudder propeller using the latest CAD tools. At the customer's request, a "large" RP-380 rudder propeller with a power output of 380 kW was designed in parallel with the first rudder propeller in the new range, the "small" RP-230 with an output of 230 kW. Additional staff were recruited to the team to enable the members to continue working in a focused way and producing professional results. The breakdown of the development and design engineering tasks into gear design and bearing, seal and casing development for the components which are immersed in water had a positive influence on the final outcome.



Reducing costs and improving quality

The first prototypes of the rudder propellers were created for testing purposes in the second half of 2011. They were produced and documented using computational fluid dynamics (CFD) analyses and practical tests in tanks at shipbuilding test facilities and university institutes. The results included findings which were valuable for the subsequent design and development activities and brought noticeable financial and performance benefits.

New features and improvements

The fact that the team members were in close proximity to one another and in constant communication made it possible to develop interesting new features of high-performance gear and seal systems and to improve their protection against external influences. The manufacturing of prototypes continued until spring 2012, when volume production started. ■

Stephan Lenk, Hamburg

SITES

Bertrandt Ingolstadt

REGENSBURG: FOCUS ON ELECTRONICS DEVELOPMENT

In February 2013, Bertrandt Ingolstadt opened new premises in Regensburg. The new development centre enables Bertrandt to move closer to specialists based in the area. The range of services offered at the Regensburg location is focused on software and electronics development. In addition to developing new systems and functions, Bertrandt is also taking responsibility for ongoing compatibility monitoring and series production support.

Bertrandt Wolfsburg

KASSEL: EVEN MORE TECHNOLOGY SERVICES

Bertrandt Wolfsburg has strongly expanded its range of services in recent months. Based on the principle of "From Kassel, for Kassel", the Kassel site is being expanded with the addition of project and design offices to meet all requirements relating to sustainable mobility.

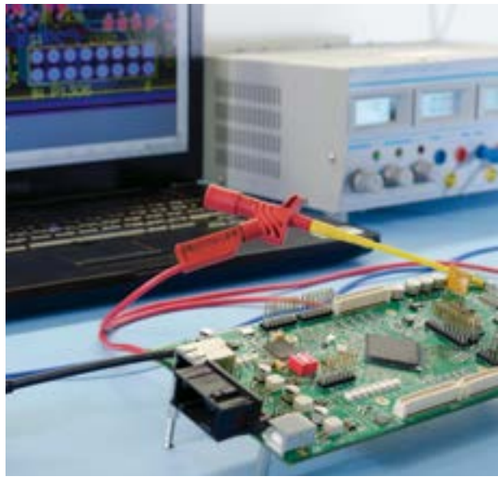
TAPPENBECK: STATE-OF-THE-ART ELECTRONICS CENTRE

And growth continues with a new electronics centre at the Bertrandt site in Tappenbeck. Covering more than 2,400 m², the development centre provides infrastructure for all disciplines of electrics/electronics development. With the new centre, Bertrandt Wolfsburg is expressly demonstrating its expertise as a development partner.

Bertrandt Neckarsulm

MANNHEIM: CAPACITIES INCREASED

The Neckarsulm site has opened new premises in Mannheim to provide services in the fields of electronics development and design as well as engineering services, project and requirements management and classical prototype development. Due to the positive response from local customers from the automotive industry, the range of services was expanded and a further 210 m² of office space was leased in November 2012. Since then, Bertrandt Neckarsulm has been able to offer an even wider variety of solutions for technical projects at the Mannheim site.



Bertrandt Turkey

ISTANBUL: EXPANDING FACILITIES

Bertrandt's site in Elmadağ/Istanbul was established in 2008 at the request of customers. In order to open up further potential on the Turkish market, the site and its range of services are to be expanded. The Istanbul team currently focuses primarily on electronics development, but in future it will also offer body development services for exteriors and interiors, together with quality management.

Bertrandt Technikum

MÖNSHEIM: NEW DEVELOPMENT CENTRE

The Bertrandt Technikum began a programme of expansion at the end of last year in order to be able to offer a wider range of technology services relating to environmentally friendly mobility, comfort, safety and connectivity in the automotive and aircraft engineering industry. Around 500 employees, primarily specialist engineers, developers and technicians, now work at the new development centre in Mönsheim, which has two office complexes and a total area of 5,715 m². Bertrandt is planning further growth. A third building with a further 250 employees could soon follow.

SITES

1

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4

Bertrandt Wolfsburg

NEW APPRENTICESHIP IN ELECTRONICS DEVELOPMENT

Bertrandt Wolfsburg commits to training the next generation of electronics specialists

The shortage of skilled employees is a subject which is increasingly under discussion in the media. In particular in the fast-growing field of electronics, there is lack of new trainees. Electronics specialists, including engineers, technicians, supervisors and other skilled staff, are very much in demand. In order to resolve this problem, Bertrandt Wolfsburg is offering a new apprenticeship for electronics technicians for devices and systems.

From the idea through to the fully operational training department

The new apprenticeship was launched at Bertrandt in Tappenbeck almost two years ago. The programme began with two trainees and one training manager. For the start of the new training year in August 2013, Bertrandt Wolfsburg has set itself the goal of training 20 electronics specialists.
Not only the size of the department but also the content of the apprenticeship have been gradually adapted to meet the site's needs. The course includes both the training material specified by the chamber of commerce and a grounding in basic aspects of the automotive industry. One particular factor taken into consideration during the preparation of the training plan was to ensure that the trainees were well integrated into the electronics development, testing and prototype departments. The young apprentices spent three months in each department, which gave them a broad overview of the world of electronics development.

Identifying and encouraging future electronics experts

From the very beginning, the training manager ensured that the young people were able to work on suitable projects. They gained practical experience of different aspects of the automotive industry such as project planning, scheduling, the product development process and the creation of vehicle electrical systems and acquired their first experiences as a result of their active involvement in the projects. In addition to acquiring the necessary knowledge, it was also important that the trainees were integrated into each project team. They needed to understand the ways in which they could help the project to be a success, their role in relation to the departments involved, the importance of a commitment to a deadline and the consequences of the quality of their work.

Experiences of the initial years of training

The young electronics specialists have learnt a great deal. They have helped with taking and documenting measurements, wired control cabinets under supervision and created wiring diagrams. In addition, they have designed and built electronics demonstrators and components, all of which required both an understanding of electronics and manual dexterity. It soon became clear that good results could be achieved if the work was fun, in particular because the trainees could very quickly put what they had learned into practice in the real world of automotive development.
We have taken the first step towards ensuring a future supply of trained employees and we are looking forward to helping our trainees to complete interesting tasks in the developing field of electronics.

Marcus Ganguin, Jürgen Schulz, Wolfsburg

1 Trainers and future electronics specialists with the test box they have developed.

2 3 In the training department.

4 Learning how to wire a control cabinet.






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CORPORATE CALENDAR

10.-22.09.2013	65th International Motor Show (IAA) Cars, hall 5.1, stand B20, Frankfurt
07.-09.10.2013	22nd Aachen Colloquium Automobile and Engine Technology, Aachen
16.-17.10.2013	VDI – Focus on Vehicle Electronics 2013, Baden-Baden
26.-27.11.2013	SIMVEC, Baden-Baden
12.12.2013	Annual report press conference, Stuttgart
19.02.2014	Annual General Meeting, Stadthalle Sindelfingen
02.-03.04.2014	VDI – Plastics in Automotive Engineering, Mannheim
07.-11.04.2014	Hannover Messe (Hannover Fair)
08.-10.04.2014	Aircraft Interiors Expo, Hamburg
May 2014	mic Automobile Forum, Stuttgart
June 2014	chassis.tech plus, Munich

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