

AUTOMOTIVE ENGINEERING EXPO 2015

CAR BODY PROCESS CHAIN FROM CONCEPT TO FINAL ASSEMBLY

NEWS

09 - 10 June 2015, Nuremberg

Supported by: Automotive Circle International



70 technology suppliers providing important stimuli for your work

„Flexible Multi-Material-Use across the entire process chain“ is the focus topic of AUTOMOTIVE ENGINEERING EXPO 2015. And these 70 suppliers present their top issues at the world's only trade fair for car body manufacturing, painting and assembly.

More AEE highlights are:

» During AUTOMOTIVE ENGINEERING EXPO showcase, the best car body concepts of EuroCarBody can be inspected by a wider audience.

» Guided tours through the exhibition area take you directly to the right answers and solutions of suppliers.

» The Innovation Alley runs like a thread through the entire exhibition area of the AUTOMOTIVE ENGINEERING EXPO. Here, exhibitors present their latest products and services – nominated by the International OEM Advisory Board.

More about the top supplier's issues in the inner section and here: <https://www.automotive-engineering-expo.com/en/highlights/hot-topics>.

HIGHLIGHTS CONGRESS



Potential and challenge of magnesium sheet for car body application

Daniel Couratin, Expert-Leader Metals Characteristics and Processing, Renault SAS

Magnesium is, in principle, the most efficient industrially viable lightweight design metal material, and has thus been promoted time and again for car body applications. It does pose significant challenges, though, in terms of its formability, it requires special attention in view of corrosion protection measures, and it is usually available only at relatively high raw material costs. In his presentation, Daniel Couratin analyses, where Renault still sees economic and technological opportunities for car body applications of magnesium, discusses most recent application examples, and how the challenges posed by the material can be mastered. «



Friction spot joining of lightweight metal/CFRP hybrid structures

Prof. Dr. Sergio Amancio, Helmholtz-Zentrum Geesthacht, DE

The new Friction Spot Joining technique offers a simple, fast and environmental friendly way to join automotive Al and Mg alloys to thermoplastic CFRP. It has shown potential to allow for the manufacture of future car generations with improved crash-resistant CFRP/metal structures, achieved through a knowledge-based material joining approach. The technology has been recognized through different innovation awards, including the German High Tech Champions in the category lightweight structures (BMBF) and the Georg-Sachs-Preis (DGM, German Materials Society). The presentation introduces the principles of the technology and investigates the influence of process parameters on microstructure and mechanical resistance (quasi-static and cyclic) of Al and Mg-CFRP joints. «



Self-pierce riveting without compromises

Dr. Matthias Wissling, Tucker GmbH/Stanley Engineered Fastening, DE

Typical intensive mixed material constructions contain a variety of different joints, which, ideally, should be implemented by means of a single system (pliers) in a process-secure fashion. In this presentation, Dr. Matthias Wissling presents new self-pierce riveting systems that allow for a variety of joining points to be set automatically, using a single pair of pliers, without compromising the joint quality. This is achieved, amongst other methods, through automated matrix changes, magazine solutions for various rivets and rivet guides in combination with corresponding process monitoring. In addition, new self-pierce rivets have been designed for dissimilar joints of aluminium with high- and ultrahigh-strength steels as well as rivets for small joint thicknesses. «

Lightweight construction with bionic load-bearing structure and outdoor fabric as a skin

“Light Cocoon” is the name of the 16th concept car by the engineering specialists EDAG Engineering GmbH (EDAG). It shows what can become possible with bionic design and additive manufacturing and presents a completely new aesthetic in automotive design.

At the same time the “Light Cocoon” defines requirements for materials, manufacturing processes and plant concepts. It becomes obvious how important the networking of product and production development is now and will be in the future. Therefore, the decades of experience that EDAG Production Solutions GmbH & Co. KG (EDAG PS) has in networked engineering is surely a decisive advantage for the production development of the cars of today and tomorrow. Plant leaves, which only have material where they need it

for function, safety and stiffness, serve as a source of ideas and a model for the development of the “Light Cocoon” with its stable, branch-like load bearing structure. The result is a pared down structure resembling a spider’s web which provides a construct made from aluminum profiles of varying dimensions. In order to quantify and verify the lightweight construction potential of this bionically designed structure, EDAG applied this approach to the design of a hood for a production vehicle, as an example, and then calculated it. The calculation results not only confirmed the stability requirements but also revealed a weight saving of about 25% in the hood. For the implementation of this visionary concept, EDAG has built up a partnership with outdoor clothing specialists Jack Wolfskin and protects the “Light Cocoon” with the ext-

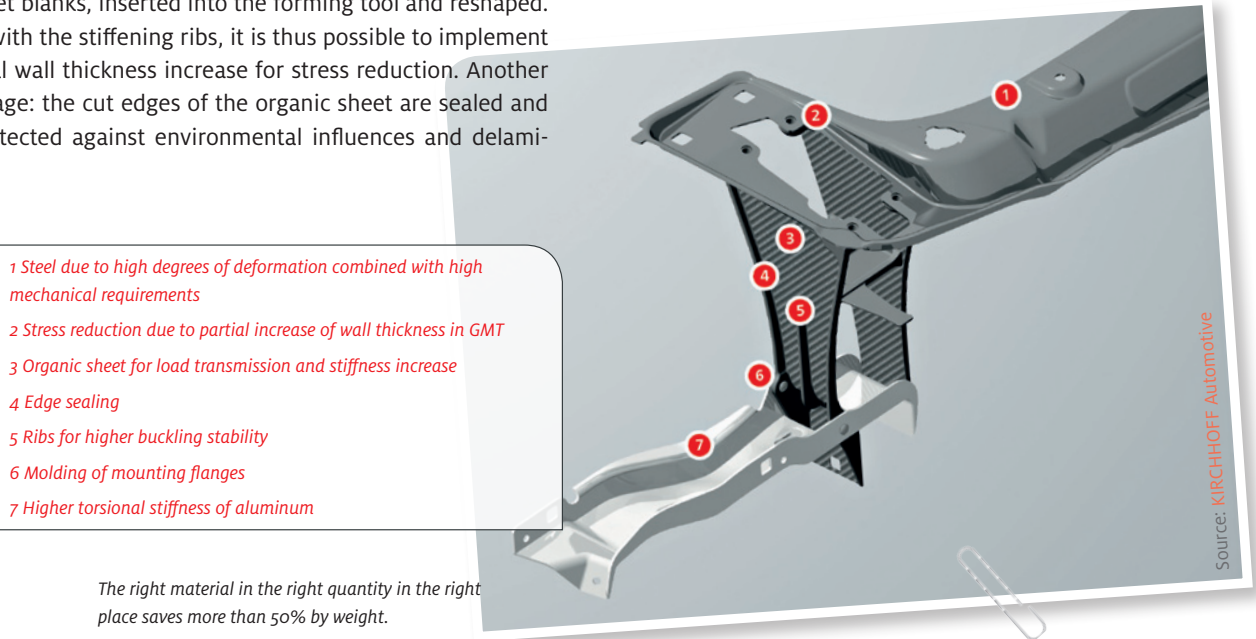
Multi-material construction: Prototypes demonstrate increase in performance at reduced weight

A frontend in multi-material construction is among the exhibits that KIRCHHOFF Automotive is presenting at the AUTOMOTIVE ENGINEERING EXPO. It was created as part of a pre-development project which investigates, among other things, the suitability of continuous-fiber-reinforced thermoplastics in combination with other materials. The innovative component consists of a material combination of steel, organic sheet and glass-mat-reinforced thermoplastics (GMT). Each material has been used in such a way that it makes the most of the advantages of its material-specific properties. The components of organic sheet, for example, are used such that the loads occur mainly uniaxially. Thus, it is possible to achieve a unidirectional fiber alignment and maximum material utilization. The integrally molded ribs of GMT provide additional stiffening. This plate material is heated simultaneously with organic sheet blanks, inserted into the forming tool and reshaped. Along with the stiffening ribs, it is thus possible to implement a partial wall thickness increase for stress reduction. Another advantage: the cut edges of the organic sheet are sealed and are protected against environmental influences and delami-

nation. The weight saving for these components alone is over 50% and is achieved using relatively inexpensive glass fibers. Alexander Günther, Product Predevelopment at KIRCHHOFF Automotive, says, “Initial tests on prototypes demonstrate an increase in performance at significantly reduced weight. This project thus highlights the relevance of multi-material construction for future developments.” «

Hall 7A, booth 413

KIRCHHOFF Automotive, Attendorn, Alexander Günther, Tel. +49 2722 696-551, a.guenther@kirchhoff-gruppe.de, www.kirchhoff-gruppe.de



The right material in the right quantity in the right place saves more than 50% by weight.

Flangeless joining technology: Simplifying workflows and reducing weight

Dr. Rüdiger Brockmann, Head of Sector and Product Management at TRUMPF Laser- und Systemtechnik, says, “We supply laser system technology and we develop solutions with our customers for using it in the best possible way.” This may be new joining techniques, for example, that are used in the multimaterial mix of lightweight construction concepts. The company, based in Ditzing, is presenting flangeless joining ideas at the AUTOMOTIVE ENGINEERING EXPO. Instead of sheets which are elaborately formed and fitted with flanges, the laser technology can be used to obtain special shapes that

are folded, fitted together like a 3D puzzle and then welded. The OEM benefits twice: they no longer need any specific deep-drawing dies and machines during production, for different versions they merely change the programming of the NC machine, and reduces the weight of the body – simply by omitting flanges and lap joints. The joining idea has been tried and tested ,on the road’ since 2013 in the StreetScooter, the electric car used by Deutsche Post DHL. Among the other innovations which TRUMPF is presenting in Nuremberg is a thermal joining method for plastic-metal compounds which are



The “Light Cocoon” shows that the potential of additive manufacturing opens up a previously unimaginable degree of freedom. Complex structures could be produced without tools and in one operation.

Source: EDAG PS

remely lightweight outdoor fabric “Texapore Softshell 02+”. The skeletal, organic vehicle structure is made visible by LED lighting technology installed behind the fabric outer skin and will perfectly showcase the independent, innovative look at the AUTOMOTIVE ENGINEERING EXPO. «

Hall 7A, booth 312

EDAG PS, Fulda, Rainer Wittich, Tel. +49 661 6000-6000-282, rainer.wittich@edag-ps.de, www.edag-ps.de

Looking into the future of automotive development and production

“Our focus is networked engineering,” explains Rainer Wittich, CEO, EDAG Production Solutions (EDAG PS). The company plans complete factories for all fields, including cross processes, and provides single-source support throughout the realization stage. At the AUTOMOTIVE ENGINEERING EXPO, EDAG PS will showcase its skills impressively with the “Panzerholz”, “Genesis” and “Light Cocoon” exhibits. “Panzerholz” represents sustainable and energy-efficient fixture construction, which is characterized by high reuse of standard parts over several project cycles, a low level of vertical integration, use of the latest manufacturing processes and recycling of non-reusable parts. “Genesis” is a vehicle sculpture based on the bionic patterns of a turtle. The basic design study shows the new freedoms opening up to designers and design engineers as a result of additive manufacturing processes, such as producing in a single manufacturing process, which 3D printing can already offer today. Rainer Wittich reports, “As a result, this makes it possible to come a big step closer to the design principles and strategies of nature. Everything is developed for a purpose and evolves

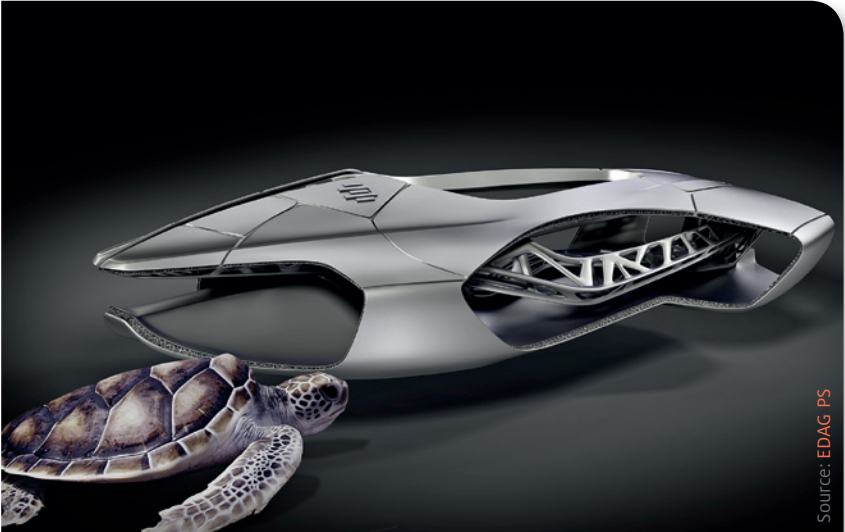
into optimized structures. And this is achieved tool-free, resource-efficiently and ecologically.” “Light Cocoon” is the evolution of the “Genesis”. Its body has a stable, branch-like load bearing structure which only provides material where it is actually needed.

EDAG PS is a Mecca of ideas for designers and design engineers and shows what is already possible in the here and

now and how this could be developed further. «

Hall 7A, booth 312

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The “Genesis” is based on the bionic patterns of a turtle whose shell provides protection, cushioning and insulation and is united with the motion skeleton.



With an innovative laser system it is possible to machine finished components of CFRP.

Source: TRUMPF

Hall 7A, booth 328

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HIGHLIGHTS CONGRESS



CFRP in automobile series production – lessons learned and future potential

Dr. Patrick Kim, Development Full Vehicle; VP, Structural Durability, Corrosion, Sustainability and Materials; BMW Group

The development and launch of the new electro-drive BMW i model series, especially the BMW i3 Megacity vehicle and the BMW i8 sports car, has established BMW’s leading edge in the industrial application of CFRP in structural car body parts. In his plenary presentation, Dr. Patrick Kim will provide congress participants with an overview on the technological progress the BMW Group has realised in this field, and outline the lessons learned from the development and production of the first i series cars, and how these lessons have been carried over also to the more conventional BMW models, for instance to the flagship of the group, the new BMW 7 Series. «



Hot forming of aluminium – Manufacturing of light and complex shaped high strength car body parts

Dr. Christian Koroschetz, AP&T, SE

Tightened CO2 regulations lead to an increasing trend of using different aluminium alloys (6xxx, 7xxx) for producing car body components. To be able to form complex shaped parts, to decrease spring back and to increase the material properties of the formed part, aluminium hot forming seems to be an adequate solution. Since this process has similarities to press hardening of boron steel, it is interesting to see what needs to be adopted in order to integrate this technology into the press shop. In this presentation, AP&T shows an example of how to set up an aluminium hot forming production line cost and energy efficient. «

MASTHEAD

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INTERVIEW

5 questions to Dr. Thomas Rudlaff

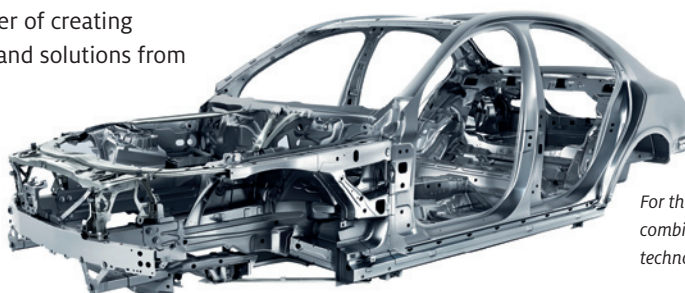


Dr. Thomas Rudlaff
Senior Manager Predevelopment Body-in-White
Concepts and Attachments, Daimler AG
OEM-Board Member Automotive Engineering
Expo, ACI-Board Spokesman Body Shell

- 1.** The OEM advisory board has preceded the Automotive Engineering Expo 2015 with the focus topic "Flexible use of multi-materials throughout the process chain". From your company's point of view, what are the greatest challenges at present to the body construction process chain?
- 2.** How are the developments in lightweight automotive construction changing overall vehicle concepts?
- 3.** What are your expectations of the suppliers of lightweight construction solutions?
- 4.** What does compliance with the entire process flow mean for suppliers from your point of view?
- 5.** Which skills will increasingly be in demand?

"It may be necessary to link or even extend existing range of topics"

- 1.** One of the biggest challenges is handling the various material properties and combinations with regard to joining technology and manufacturing joints in production, as well as the presence of digital property descriptions for functional simulation on the product and production.
- 2.** The trend towards cost-optimized multimaterial scenarios is clearly visible.
- 3.** The expectation is that not just one specific component or one specific assembly will be optimized but rather that the entire process sequence will also attract the OEM's interest.
- 4.** Here, it's a matter of creating entire process chains and solutions from individual building blocks. To do this, it may be necessary to link or even extend each existing range of topics, possibly by means of cooperation.
- 5.** We increasingly need suppliers who are familiar with combined manufacturing and joining technology, supported by functional simulation and interpretation of the relevant results. We will continue in future to ask for assemblies that are designed to be more fully functional.



For the C-class follow-up models, Mercedes-Benz needs especially combined knowledge with regard to manufacturing and joining technology.
Quelle: Mercedes-Benz

Crash elements made from fiber-reinforced thermoplastics and innovative B-pillar reinforcement

Lightweight construction is one of the most important driving forces in automotive engineering. CFRPs with their mainly thermosetting matrix are experiencing unprecedented hype but, due to high material and processing costs, they are used mostly in the high-end segments. Organic sheets, which are woven or laid fabrics impregnated with a thermoplastic matrix, have a very high potential for lightweight construction at an acceptable price. Their advantage lies in low-cost processing and good recycling options due to the meltability of thermoplastics. Fiber-glass fabrics also have excellent strength and stiffness properties. Michael Hibben, Manager Product Development, reveals, "Stadco is working on a crash box made from organic sheet." As proven by simulations and real crash tests, the energy absorption is excel-

lent and better than that of metals. It's also possible to achieve 30 to 60% savings in weight compared to aluminum or steel. As with all fiber-reinforced composites, however, the disadvantage is the poorer structural integrity of the components under highly dynamic loads. The aim is to secure this integrity with a new approach. Stadco is working on introducing thin steel fiber laid or woven fabrics into the organic sheet. At the AUTOMOTIVE ENGINEERING EXPO, the company will present the results of the crashbox development – which took first place at the AVK Innovation Awards in the products/applications category – and the effect of steel fibers on component behavior.

Another highlight at the exhibition will be B-pillar reinforcement using a bionic approach. By using a bionically inspired reinforcement (inlay), Stadco has

managed to reduce the overall weight by up to 35% while crash performance remains the same. "

Hall 7A, booth 315

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Diatoms, minute algae, were used as the model for the B-pillar inlay. The overall weight is reduced by up to 35% while crash performance remains the same.



Source: Stadco

Reducing weight with innovative adhesives

The use of high-strength steels, light metal alloys and innovative multi-material structures will help to reduce weight in the car bodies of the future. They are based on appropriate joining technologies for which the chemical company Sika develops customized solutions. The company will introduce other innovations for saving weight at

the AUTOMOTIVE ENGINEERING EXPO: "Ultra High Modulus 1-K-PUR" for structural and crash-resistant bonding of different materials (e.g. CFRP/aluminum) and "Ultra-Low-E-Modul 1-K-PUR" for stiffening and damping of vehicle roofs. A high-performance adhesive is another innovation. According to the company, it enables a weight saving of 20 kg per vehicle, meets the highest safety requirements and is already being used in the e-Golf. "

Hall 7A, booth 326

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Sika is showcasing a high-performance adhesive which enables weight savings of 20 kg per vehicle and is used in the e-Golf.



Source: Sika Automotive AG

AT A GLANCE

AEE – AUTOMOTIVE ENGINEERING EXPO:
Messezentrum Nürnberg

Opening hours: 9 - 10 June 2015, 9 a.m - 6 p.m.

Fair tickets, incl. 19% VAT
Day ticket: 18,- EUR, season ticket: 35,- EUR

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