Speakers on-site

PANEL DISCUSSION

Univ.-Prof. Dr.-Ing. Paul Ludwig Geiß / University of Kaiserslautern, Workgroup Materials and Surface Technologies

HOW MUCH CIRCULAR IS THE GREEN TRACK TO NET ZERO?

PRESENTATIONS

ARKEMA

Orlane Bouzard

IMPROVE THE SUSTAINABILITY AND PERFORMANCE OF YOUR REACTIVE SYSTEMS USING POLYAMIDE WAXES RHEOLOGY MODIFIERS

Abstract:
Rheology modifiers are key ingredients to reach the ever more demanding performance standards of many adhesives and sealants systems including ease of application combined with structure development. Such additives are helping adhesives & sealants manufacturers in meeting existing and future challenges in many areas. For example, the construction market is requiring higher load-bearing capacity with the rise of high tack systems. The importance of bio-based raw materials is not to be undermined either in today's world. This is why polyamide-based rheology modifiers are not only high-performance additives but also stand for sustainable additive solutions.

Polyamide rheology modifiers are established as leading additives for enhanced applicative control in Silylated Terminated Polymer (STP), compared to other technologies such as fumed silicas or precipitated calcium carbonates. Other reactive technologies can also benefit from their better structure control, for example: 2K-Epoxies, 2K-PU, acrylates.

After introducing the Polyamide Rheology Modifiers technology, their benefits in each relevant system will be described. This presentation will highlight the innovation in STP systems, adapting to the current challenges: shortening cycle times, enhancing tack. It will then demonstrate how such additives can be interesting in other reactive systems focusing on rheological behavior using different characterization methods. Finally, an overview of the sustainability aspect of these additives will be presented.

Dr. Berns Belinda

Subject matter expert Optical Bonding

OPTICAL BONDING - A WHOLE NEW INDUSTRY - INVISIBLE, BUT COMPLEX AND HIGHLY DEMANDING

Abstract:
This presentation is addressing one of the most common, but also most invisible bonding applications nowadays. Optical Bonding brings significant benefits to all kinds of display stack systems, from consumer electronics, industrial & appliance, medical, aerospace,

advertising industry, military and automotive multimedia systems for performance enhancement (optical) but also for long lifetime stability (protection function). Every company would like to benefit from optical bonding technology, but many have underestimated this highly divers and complex adhesives & applications area and have given up. The strongest and experienced ones established well in the market. This invisible technology requires understanding of the full stack with all components and possible interactions. Not comparable to “just a simple bonding”.
Today at in-Adhesives conference you will receive an insight into the different chemistries from acrylic to silicone. As well as different application and bonding processes.
This technology is not brand new and the synonym optical bonding is well known. Meanwhile it has established a whole new industry sector. Back in October 2013 attendees of the MKVS (Munich Adhesives and Finishing Symposium) could gain a very first insight already from me with an adhesives manufacturer perspective. As we know industry never is pausing, it is always developing further in terms of technologies and demands from industries and designs. For almost six years now I am working at an end user and would like to share some of my knowledge with you.

Bostik

Arnau Pejoan

NEW n-BUTYL CYANOACRYLATE BASED ADHESIVE TO COMBINE FLEXIBILITY, HUMIDITY RESISTANCE AND LOW CLP

Abstract:
Cyanoacrylate adhesives are massively used for quick assembly and repair applications, but they are rarely used for applications that require long term performance as they might have limited durability in tough environments.

Bostik has developed a new bi-component (2K) adhesive under Born2Bond™ brand that enable users to free themselves from those limitations.

The idea that drove this development is to get the benefits of instant adhesive in applications requiring at the same time a good humidity resistance and robust mechanical properties. Typically, it becomes now possible to get instant bonding on objects that will be used in wet environments and will not brake when falling.

One of the innovations that made these results possible is the use of n-Butyl cyanoacrylate (BuCa). We will present how this a hydrophobic monomer was formulated into an adhesive with significant plasticity (>100% elongation), good resistance to drop test, combined with a unique resistance to high humidity conditions (85 °C / 85 % RH).

BuCA monomer has no CLP label and is well known as the main component of many instant medical grade adhesives. However, until today its use in the industry markets was limited and barely used blended with other cyanoacrylate monomers in adhesive formulations. Though this monomer is becoming more readily available with companies like CMC proposing differentiated cyanoacrylates monomers at the industrial

This novel adhesive is designed to meet market needs in terms of Productivity (fast clamping, high performance in short period of time, bonding efficiency, automatic dispensing), Quality (precise dispensing, reliability) and Sustainability (low odor, low blooming, low CLP).

Cardolite Specialty Chemicals Europe

Tom Berckmans

NOVEL CASHEW NUT SHELL LIQUID BASED ISOCYANATE BLOCKING AGENT FOR LOWER DEBLOCKING TEMPERATURE

Abstract:
Cashew Nut Shell Liquid (CNSL) is a non-edible natural oil obtained as a by-product of the Cashew nut industry. CNSL is used as building block for materials used in epoxy coatings, adhesives, composites and PU Foam. Its unique chemical backbone improves chemical resistance, hydrophobicity, and thermal properties.
NX-2026™(3-pentadeca-dienyl-phenol) is a very high purity cardanol, derived from Cashew Nutshell Liquid. Once used in polyurethane prepolymers as an isocyanate blocking agent, it has demonstrated

favorable and easily tunable deblocking conditions. Cardolite has already introduced tools i.e. catalysts, deblocking agents, to optimize and lower deblocking temperature of NX-2026 blocked isocyanates in a previous presentation.

In this paper, a novel cardanol-based fully cycloaliphatic derivative, called CNSL-Oxime, will be presented, investigating its use as innovative isocyanate protective group with faster reactivity and lower deblocking temperatures than petro-derived benchmarks, without compromising shelf-life of blocked systems nor affecting mechanical and thermal properties of epoxy-PU hybrid systems.

Coatex (Arkema Group)
Dr. Catherine CORFIAS-ZUCCALLI

RHEOLOGICAL CHARACTERIZATION OF WATER-BASED THICK ADHESIVES

Abstract

How to ensure that a thick adhesive is easy to apply and holds up when bonding the substrates? What does it take for a correct adhesive application? The answer lies in optimizing rheological properties of systems to achieve the thickness and workability together with control of sag, hold up and creep of the wet adhesive. Control of its application is essential to ensure its final mechanical and adhesion properties.

The applicability of waterborne adhesives using a manual tool is very dependent on the ability of the adhesive to flow under stress. Thus, the rheological approach is relevant to physically describe the flow mode of these soft solid viscoelastic materials that need to be applied with a high, regular and homogeneous thickness on different substrates.

The objective is to identify the rheological parameters that best describe the applicability of these thick adhesives. We will compare various acrylic thickeners to illustrate these parameters.

These characterizations will be carried out in formulations comprising the essential ingredients to target the mechanical resistance of these thick adhesives, aiming at achieving correlations between viscoelastic behavior and application properties.

Dynasol Group
Jesus Eduardo Ibarra

NEW SEBS FOR HOT MELT ADHESIVES WITH LOW MELT VISCOSITY FOR INDUSTRIAL AND MEDICAL APPLICATIONS

Abstract

The incursion of SEBS hydrogenated copolymers in the adhesive market, until now has marked a trend in the market segments of sealants or translucent labels, this due to its excellent resistance to UV light, to the effects of the environment and its good resistance ozone and high temperature.

New SEBS hydrogenated copolymers have been developed, with the ability to give the Hot Melt adhesive an excellent low temperature processability, maintaining stability in adhesion properties at low temperature (≈-5°C) and at temperatures above room temperature (≈60°C); allowing the adhesive to obtain low peeling strength for applications where it is imperative not to leave a residue on the substrate or not damage it, when the label, tape or film is removed, as is the case with labels or tapes for medical use with direct or indirect contact with the skin, as well as the protective paint films that are placed on new vehicles.
The design and structure of these SEBS make them feasible to be formulated with hydrogenated hydrocarbon resins, which by their nature have no color or odor, this being one of the main requirements in adhesives, with special applications that are in direct or indirectly contact with the skin, food or medicine.

The objective of this work is to show to adhesives market the feasibility of using these new SEBS with their operational and performance advantages.

Fitech

Patrik Thoma

AUTOMATION OF MIXING PROCESSES FOR SEALANTS AND ADHESIVES

Abstract

Profitability, on time delivery and flexibility are three important goals in the production of sealants and adhesives. These three goals of a production are opposed to each other, the demands for on time delivery and flexibility are opposed to the demand for profitability. Is it possible to improve different demands of a production at the same time by using process automation and clever mixing technology? If so, what degree of process automation does make sense?

Depending on product variety and manufacturing quantities, either manual or automated production is most suitable. However, process automation is not only required to reduce man costs. Reliable raw material and product handling increases reproducibility and manufacturing quality. At the same time, the environmental footprint of energy consumption, emissions and waste is reduced. Processes are stabilized and employee satisfaction is increased. When choosing the appropriate mixing technology, finished product quality as well as flexibility and profitability are crucial. Using practical examples, we present possibilities of process automation and mixing technology that can influence the innovation and development of adhesives.

Fracture Analytics

Dr. Martin Brandtner-Hafner

STRUCTURAL SAFETY EVALUATION OF ADHESIVE SEALANTS

Abstract

In the construction industry, adhesives and liquid sealants have become indispensable. The harsh conditions on-site often demand the highest performance from such products. Since adhesive applications and sealing solutions are often required in one product, so-called adhesive sealants are a tailored hybrid solution. The aim here is to combine the best of two worlds. However, information from the manufacturers' technical datasheets only provides a first rough overview of their lab performance. Likewise, missing key figures and a lack of empirical data often lead to confusion among practitioners and even end in faulty applications. The resulting damage often leads to financial if not legal problems. To avoid these, commercially available adhesive sealants were tested for their structural bonding suitability and compared with benchmarks from the industry. It was found that one chemical system is particularly highly suitable for both, bonding and sealing building materials, respectively. This gives the user the opportunity to select and optimally apply the ideal adhesive sealing system for his application.

Keywords:
Structural Safety Evaluation, Bonding Efficiency, Adhesive Sealants, Safety Zone, Sealant & Adhesive Factor.

Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM

Jonas Wirries

PROPERTIES AND RELAXATION BEHAVIOUR OF CURING STRUCTURAL ADHESIVES

Abstract

During the process of adhesive curing, volume shrinkage occurs due to the cross-linking of the polymer chains. In interaction with the adhesion between components and adhesive and the change of properties, such as the increase in Young's modulus and the decreasing relaxation capacity, the curing shrinkage leads to formation of residual stresses in bonded joints. The prediction of these residual stresses has so far been limited to application-specific models and cannot be used generally. To enable a more global prediction, better knowledge of the relaxation behaviour is needed.

Based upon experimental results of the thermoanalytical characterisation of structural adhesives during cure, input data for FEA are generated. In addition, the effects of shrinkage and residual stresses on simple geometries are determined during adhesive curing. Furthermore, a method is developed to determine curing shrinkage under different stiffnesses of the joining partners. These findings will be combined to

extend existing mechanical models to include relaxation behaviour and improve predictions of residual stresses.

Fraunhofer Institute for Structural Durability and System Reliability LBF

Julia Decker

DESIGN OF HYBRID ADHESIVE JOINTS UNDER THERMAL AND FATIGUE LOADING

Abstract

When it comes to lightweight design, hybrid adhesive joints of metal and composite parts offer several advantages regarding lightweight and load transmission compared to conventional mechanical joints. However, the reliable application of hybrid adhesive joints under significant thermal and fatigue loading faces several challenges such as the different thermal expansion of the adherents and the degradation of adhesive properties under high temperatures, due to their polymeric nature. In the current BMBF project “GOHybrid”, design solutions are investigated to meet these challenges. The project focuses on a hybrid automotive wheel application, in which an aluminum wheel center is adhesively bond to a composite rim well. The joint must endure significant fatigue loading during the 360° roll procedure at different load cases, as well as thermal loading due to the high temperatures of the breaks. This work presents the current state of the project, including the characterization of the adhesive under different temperatures and multi-axial loading, as well as the approach to developing an adhesive joint design, highlighting different design challenges.

Huntsman Advanced Materials

Simon Thering

ARALDITE® ADHESIVE MATERIAL MODELS TO ACHIEVE ACCURATE APPLICATION SIMULATIONS LEADING TO A SHORTER QUALIFICATION TIME OF ADHESIVE INNOVATIONS

Abstract

While numerical simulation is widely recognized as a robust tool to assist design of adhesively bonded structures, its applicability relies on realistic data combined in a material model based on solid experimental characterization. Huntsman just recently launched its new realistic adhesive material models that help adhesive users to achieve fast and accurate application simulations when qualifying adhesives. Based on solid experimental characterization, the adhesive material models provide a wealth of information about the physical, mechanical and thermal behaviour of the Huntsman adhesive core product range. The adhesive material model helps adhesive users to go to market faster and shorten qualification time by getting the data they need to predict the combined effect of design parameters and adhesive properties over the process and operational conditions of the customer`s project.

This presentation is about presenting the new material model, showing how a simulation can help to shorten the qualification time by defining the fitting adhesive fast. A case study about the latest launched ARALDITE® 2080 two-component acrylic adhesive, will highlight how important a simulation is to qualify especially new innovative adhesives faster. ARALDITE® 2080 adhesive solves customer`s issues that are related to currently used MMA or PU adhesives while being low odor, non-flammable, primer free and having good EHS values. Despite those, ARALDITE® 2080 adhesive provides high bond strength, elongation, flowability, and fast cure times.

INNOVENT

Dr. Andreas Pfuch

APPLICATION OF DIFFERENT PHYSICAL PRE-TREATMENTS FOR IMPROVED BONDING OF CARBON-FIBRE REINFORCED POLYMERS

Abstract:

With view on urgent subjects such as climate change and energy policy, the importance of fibre-reinforced plastics will certainly increase in the next years. In the fields of construction and especially joining of fibre-reinforced plastics, there is currently no way out of adhesive technologies. Pre-treatment methods like the use of suitable chemicals, a mechanical roughening

procedure or the use of peel ply are required for correspondingly stable bonds. So, the use of chemicals, most of which are hazardous to the environment, seems to be problematic in the future. The latter two processes in particular can damage the fibre-matrix structure. Following, alternative dry gas-phase-based pre-treatment methods such as the use of atmospheric plasmas or the use of various flame treatment techniques are promising alternatives. However, an overview of the efficiency of different pre-treatment methods in the field of bonding carbon fibre-reinforced plastics (CFRPs) has been rather difficult to find so far.

This contribution takes a closer look at the influence of different atmospheric plasmas and flames on the surface conditions of CFRP and on the given potential for increasing the bond strength of CFRP bondings.

Jowat

Dr. Hartmut Henneken

TRANSFORMATION TO A CIRCULAR ECONOMY: CHALLENGES AND APPROACHES FOR ADHESIVE MANUFACTURERS

Abstract:
The chemical industry is facing a huge structural change. Enormous efforts are needed to achieve the goal of fully sustainable production of raw materials and chemical products. Decarbonising the energy supply is one approach to significantly reduce the carbon footprint. However, this approach does not work for chemical products, as carbon is absolutely necessary as the molecular backbone of our products. Here, a path towards a circular economy must be taken in order to use as little new fossil carbon as possible (ideally, in the end, none at all). Approaches to this are the use of renewable or recyclate-based raw materials for certain products and/or an allocation of sustainable raw materials via the mass balance method. This presentation will give an overview, present the status quo from an adhesive manufacturer's point of view and show where the journey for a better sustainable future could (or should) lead.

Loparex and Wacker Chemie

Ian Grace and Dr. Thomas Gröer

THE FUTURE IS COLLABORATION
RELEASE LINERS AND HIGH-PERFORMANCE SILICONE ADHESIVES, A VIEW FROM BOTH SIDES

Abstract Loparex
Release Liner choice is most often the very last part of any product design, and rightly so.
It is not possible to select the correct Release Liner until the Adhesive & Process have been defined.

Selecting the correct Release Liner for a Health Care application can bring added complexity, especially when it involves compatibility with the latest generation of Silicone PSA's.

Knowing how a Pressure Sensitive Adhesive performs with a specific Release Liner can reduce development time and consequently, time to market.

With the development of new Silicone PSA systems, the need for collaboration with the Adhesive producer has never been more relevant. We would like to present to you the basics of Release Technology, the special requirements for Silicone PSA's and some market demands that have led to a unique collaboration.

Abstract Wacker:
Advanced wound care, as many other applications in the medical field, where reliable yet sensitive adhesion and painless removal of wound dressings or tapes are imperative, have generated an increasingly strong demand on the adhesive properties of silicone medical gels.

Increasing adhesion does also go together with the necessity for release liners, which assure protection of the adhesives layer as well as an easy and stainless release. Be it in-process or for the final good.

We present the results of a unique collaboration, showing release force measurements and long-term studies on the suitability of commonly used groups of liner materials with high-performance medical silicone adhesives.

nolax
Dr. Raphael Schaller

STORAGE-STABLE, FIBER-REINFORCED ADHESIVE FILMS FOR ULTRA-HIGH-PERFORMANCE SAILS: ENDURANCE TEST FROM LE HAVRE TO SALVADOR DE BAHIA

Abstract
nolax's latest technology of fiber-reinforced adhesive films will set new benchmarks in the composite field. These new films are impressive due to their simple processing into composite parts with ultra-high performance regarding stiffness, tensile strength, toughness, and remarkably low weight. This unique system results from a spiffy combination of different technologies: unidirectionally embedded high-performance fibers, special processing, and innovative adhesives.

Binders used to produce conventional unidirectional fiber-reinforced adhesive films typically contain solvents and have a relatively short pot life since a two-component system is often used. As a prepreg, such reactive systems must be stored at low temperatures to avoid crosslinking and thaw before further processing. nolax developed a new way to increase workplace safety and streamlining production by using only water-based, solvent-free adhesives to impregnate spread fibers. Furthermore, nolax uses latent-reactive adhesive systems, in which the cross-linker is encapsulated, offering a larger processing and storage window. After careful drying, even with a cross-linker present, these fiber-reinforced adhesive films can be stored at room temperature for an extended period (typically 12 months). With this technique, nolax has developed storage-stable, uniaxially fiber-reinforced adhesive films that combine toughness and high tensile strength (up to 1 GPa in tensile strength) with low weight (as low as 15 g/m^2) and outstanding flexibility and temperature resistance. Typical application areas of our fiber-reinforced adhesive films are, among other things, tension components in industrial belts, reinforcements in skis, and sail membranes.

With a specific example from the off-shore racing endurance test from Le Havre to Salvador de Bahia, we want to show how fiber-reinforced adhesive films are made and used for manufacturing ultra-high-performance sails. Moreover, we want to show which circumstances lead to the development of highly flexible, latent-reactive matrix systems for fiber-reinforced adhesive films.

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nolax
Heiko Jung

ROOM TEMPERATURE, FAST CURING TWO-COMPONENT POLYUREA ADHESIVES FOR HIGHLY ELASTIC STRUCTURAL BONDED JOINTS IN E-MOBILITY

Abstract
Electrification in the automotive industry requires fundamentally new components and joining processes - especially for batteries and their thermal management systems, where multi-material parts are bonded to structural and crash-relevant elements. For these applications, the nolax start-up Fastener has developed a two-component polyurea adhesive technology that enables curing within seconds, thus allowing rapid processing. Our latest generation of polyurea adhesive combines ultra-high curing speed with structural bonding performance and the highest elasticity.

Adhesives based on polyurea are two-component reactive systems. Component A contains bifunctional isocyanates of monomeric and prepolymer nature. Component B contains bi- and multifunctional amines. Polyureas are formed at ultra-fast crosslinking speeds even at room temperature as compared to polyurethanes. This is based on the amine's much stronger nucleophilic character, especially aliphatic amines, as against alcohol in the polyurethane reaction. The ultra-fast curing time allows immediate handling and subsequent converting of the bonded substrate after applying the adhesive. In this way, the short cycle times and the absence of additional energy input provide cost-effective productions.

With a specific example from our latest development, we want to show the properties and performance of highly elastic and fast curing two-component polyurea adhesive in multi-material bonding in e-mobility.

Plasmatreat

Klaus Kresser

PLASMAPLUS® - THE NEW TECHNOLOGY FOR SOLVENT FREE BONDING

Abstract

Why is it beneficial to dispense with solvents? Solvents are only auxiliary materials for processing coatings or adhesives. This means that for the actual function - such as adhesion, corrosion protection, etc. - they make no contribution. On the contrary, they make production processes more expensive, since useless material has to be transported, stored and processed. In addition, solvents often lead to tighter labeling of coatings or adhesives because they become harmful to health, hazardous to the environment or flammable.

Here, PlasmaPlus® coating simplifies the process. All different types of materials like plastic, glass, metal, aluminum, etc. can be coated with PlasmaPlus®. Plasma polymerization with the PlasmaPlus® process is already being used successfully for surface coating in a large number of different industrial applications. Herewith PT-Bond coatings assure long-term adhesion.

In the paper, the following topics will be introduced and discussed:

- Distinction between different plasma technologies: Activation of surfaces and coating of surfaces via PECVD (Plasma Enhanced Chemical Vapor Deposition.
- Examples of substrate/adhesive combinations, where PECVD can be used for the replacement of primers.
- State of the Art solutions for solvent and flash-off free bonding processes and their technical and chemical background.
- Examples of successful implementation and industrialization of green processes and new materials with PECVD technoly
- Examples Lean pre-treatment solutions for bonding are industrialized

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Schill+Seilacher "Struktol"

Sven Wiemer

FLAME RETARDANCY – CONCEPTS NOT ONLY FOR COMPOSITES

Abstract:

Flame retardance is already an integral part of many applications in the transportation sector, such as aviation, rail and marine. Primarily, requirements are placed on composite components or coatings, which must meet the relevant standards. The only sector that has just “discovered” flame retardant systems are the OEMs, i.e. vehicle manufacturers for passenger cars. The driving force behind this is the increasing demand for electromobility and the associated changing requirements for vehicle concepts. But especially in the protection of the now necessary batteries, whether for PHVs or EVs. The requirement is on the hand to nip thermal runaways from individual battery cells in the bud, so that neighboring cells do not also become thermal runaways. On the other hand to equip the battery housing with flame retardants, especially in the direction to the passenger cell, in order to give the occupants sufficient time to get out of the vehicle in an emergency.

There are different concepts for this: In the first case, the so-called gap fillers, which embed/ encapsulate the individual battery cells, can be made flame-retardant. In the second case, the aim is to make battery housings flame-retardant with a fiber composite component.

In both cases, however, the basis for integrating reactive, chemically active flame-retardant systems is the same. In the following, system based on organophosphorus compound DOPO will be presented, as they have been successfully used for years, but also new areas can always be developed. A possible further transfer form composites to adhesives is therefore obvious, since the battery enclosures also have to be joined and sealed by means of adhesives.

SKZ-German Plastics Center

N.N.

ELECTROMAGNETIC SHIELDING OF CARBON-FILLED SILICONES

Abstract:
New communication technologies (e. g. 5G), autonomous and electric driving as well as the internet of things and Smart Cities are just of few of the current technological trends. All these technologies have in common that their electronic components intentionally or unintentionally emit electromagnetic waves which might interfere with surrounding electronics. Furthermore, they are themselves susceptible to electromagnetic interferences (EMI) caused by their surroundings.

Thus, EMI shielding is necessary to ensure the proper operation of devices, which is especially important for applications with a high safety level (e. g. autonomous driving). Miniaturization (less space left for shielding) and lightweight construction (substitution of shielding metals with inherently non-shielding polymers) are making it harder to achieve the necessary shielding with common technologies and create a technological need to develop innovative materials to face these challenges.

Polymer composites with fillers that increase their EMI shielding might be one solution, which is evaluated in the currently running project carBONDshield (IGF-No. 21772 BG). The homogenous dispersing of these fillers into a polymeric matrix while maintaining the base material properties is one of the most substantial challenges.
The presentation will show how carbon-based fillers (e. g. carbon nanotubes, carbon black or carbon fibers) influence the EMI shielding performance as well as other material parameters (e. g. electrical conductivity, viscosity) of silicones.

Technical University of Braunschweig / Institute of Joining and Welding

Elisabeth Stammen

THE TRAIN HAS NOT YET LEFT THE STATION - NEW ADHESIVE BONDING TECHNIQUES FOR STRENGTHENING REFURBISHED STEEL CONSTRUCTIONS

Abstract
Steel bridges with orthotropic roadway decks are a common construction method for long-span bridges. The construction method was developed in the 1960s and especially the early structures show increasing crack damage. On the one hand due to construction errors, on the other hand due to massively increased traffic loads. The development of innovative techniques for the repair and reinforcement of such bridges is currently the most important challenge. These techniques should ensure not only the load bearing capacity but also the fatigue resistance and durability of the structure for the future, preferably over the lifetime of the entire bridge structure.

This requires low-cost and effective reinforcement concepts. Previous maintenance methods, such as repair welds, the drilling out of crack tips or the screwing on of pre-stressed steel plates, often have limitations in terms of fatigue strength, feasibility or traffic disruption. Since the traffic volume is not reduced, local crack repair usually only prolongs the service life for a short time and results in renewed crack growth.

Due to the high costs and the fact that in many cases new buildings cannot be constructed without problems, in most cases only a repair and upgrading of the structures is expedient. The need for renovation methods and procedures that extend the life of the structure even further is high. Here, rehabilitation methods with bonded steel patches using structural, cold-curing epoxy resin or polyurethane adhesives seem to be a method of choice, for which solutions are being developed in a German research project.

Results on adhesive selection and mechanical properties as well as on surface treatment with regard to the manufacturing process are presented here. Influences in the bonding process on a construction site as well as measures for fast construction progress are considered.

The research has not yet been completed, and a follow-up project is already close to being funded. However, it can already be said that it was possible to significantly increase the service life in relation to the notch cases investigated and to create a pre-dimensioning concept developed through numerical and analytical calculations.
