

Interesting facts from the field of Tooling & Composites



Sika ... everything from a single source!

“Ideas take shape” is the slogan of Sika

Reliable materials, Biresin® and SikaBlock® – from the model, via the mould to the composite part

Model making
 Many roads lead to Rome and the same goes for model making. Whether model makers make their models directly from model boards or use modern paste systems depends on each individual case and, of course, economic points of view.



ensures that the pores are closed completely. Brief finishing work with fine abrasive paper produces a very smooth, high-quality surface. If a seamless closed surface needs to be created for your model, Sika paste systems are another alternative. Today, this method is usually used to make large models, for example for the rotor blades of wind power installations or for the hulls of boats and yachts. Due to the seamless surface, an absolute vacuum seal is achieved which ensures a very high level of process reliability for the second step: creation of the mould made of fibre-reinforced plastic with the vacuum-infusion method. The low-cost SikaBlock® M80 is also suitable for the sub-structure of the paste systems. As an intermediate layer for

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If it is a one-off model, model boards with a density of 0.08 kg/dm³ is especially suitable, e.g. SikaBlock® M80. This board is very easy to machine and, considering its low density, has good surface qualities and produces only a small amount of dust when worked. Furthermore this board doesn't show the unpleasant sanding effect at contact with surface. For models which need to be considerably more stable and pressure resistant, SikaBlock® M450 and SikaBlock® M610 are recommended.

These model boards are easy to mill and generate only a very small amount of dust. Highly complex models can be made with maximum precision with numerically controlled milling machines and modern CAD/CAM methods.

These models are highly suitable for painting and the mould out of SikaBlock® M450 has to be sealed with a generally available 2-component spray filler. A DD lacquer can be used for sealing the master model made of SikaBlock® M610. This

Sika – everything from a single source



Model – Mould – Part



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Dear Reader,

Our main topic for this issue is entitled: Sika – Everything from a single source.

Sika is a specialist for polyurethane and epoxy resin systems. In this particular area, over 700 developers in our company are involved in creating the best products and solutions for many areas of industry. Our objective is to enable our customers to profit from this in their work. The tasks change continually so that new products are always needed. Many



things which were manufactured with steel some years ago, for example, are now made of plastic. You know all about this, of course, from your everyday work and our aim is to support you with service and products.

Model making

In model making, we see a clear trend towards high-quality block materials with a low density. Design studies in the form of real models which can be looked at continue to be necessary in spite of constantly improving computer technology. The models should be light, easy to machine and have an excellent surface quality. During machining, the well-being of the employee is also very important, which means that dust and noise produced during milling should be avoided. These requirements and higher ones are met by our SikaBlock® M80, for which we now have a matching foam adhesive, one of our latest new products.

Mould making

In order to manufacture parts, moulds are needed. In this respect, our SikaBlock® M940 is a new tooling board for more demanding requirements. During development, we concentrated on its use in the foundry pattern making. Apart from this, SikaBlock® M940 is highly suitable for RIM moulds and metal sheet forming tools, thanks to the surface quality, rigidity and resistance to temperature fluctuation. In a separate article, we will report on experience gained with this product.

Composites

We have always possessed competence in epoxy systems for laminating. Given that more and more metal parts are being replaced with composite parts in our every-day life, we have also considerably strengthened this area of our business. A range of special composite resin systems has been created and extra specialists have been added to the team. A wide range of SikaBlock® and Biresin® products from Sika is thus available to you for model making, mould making and composites. Everything from a single source with the usual quality and service. We look forward to working with you successfully.

Yours truly

Dr. Robert Mattmer
Head of Sales Tooling & Composites

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better adhesion of the paste systems on the substructure, a layer of glass fabric (grammes per square metre approx. 200 g/m²) is laminated on with epoxy resin. Biresin® standard laminating resins are suitable for this.

Mould making

For making moulds as well, there are numerous methods and systems from the product portfolio of Sika Tooling & Composites for the user. The design of the moulds and the selection of materials always depends on the requirements and the calculated quantity which is to be produced.



For composite prototypes and small series of composites, the model and tooling boards for making moulds are popular. Manufacturers of wind power installations and light-weight aircraft have made quantities of more than 100 parts in moulds made of SikaBlock® M610.

Due to the good price/performance ratio and the reasons mentioned above, SikaBlock® M610 is highly suitable for this application. If the mould is 500 mm x 500 mm or larger, use of a mould substructure is recommended. Usually, metal tubular frames are welded together and the mould segments then levelled out on top.

For large moulds and a corresponding temperature difference (ΔT), the moulds are no longer fixed firmly in place but rest floating on the substructure. The board is highly resistant to solvents. This facilitates mould cleaning and considerably improves resistance to different types of mould release agents. SikaBlock® M450 is also often used as the mould material for laminating tools, for example for constructing the aerofoils of glider planes. However, the extra effort needed for sealing due to the somewhat higher porosity compared to SikaBlock® M610 must be taken into account. The resulting lower mould weight, noticeable during handling of the moulds, is advantageous for model materials with densities of < 0.7 kg/dm³. For a laminating tool which has to be highly resistant to pressure and abrasion and must also have enormous edge stability and nevertheless be excellently millable, the newly developed and proven SikaBlock® M940 is to be recommended. This tooling board can be released with Sika® Trennmittel 815 Quick or Sika® Trennwachs 818 and can very quickly be used for the production process. It is also possible to get a smooth and polished surface with a best result. For all model and tooling boards, Sika has a suitable Biresin® adhesive and filler system in its program.

Of course Sika has for the model maker a wide range of products for the classical mould-making. If the customer needs Gelcoats and casting systems or laminating- and composite resins, the tooling & composite specialists are able to support and supply the customers with a cost-effective and correct solution.

Making composite parts

In the Tooling & Composites business unit, the area of resin systems for composite parts has been greatly strengthened. Sika has been developing, formulating and producing epoxy resin products for the manufacture of fibre-reinforced plastic parts for many years. It therefore has a great deal of experience in this area. Nevertheless, a decision was made to strengthen the team by taking on additional specialists in research and development as well as in sales. The company is confidently looking forward to a great future in the composites market. In this respect as well, the range of available products is large.



Composite resin systems with different glass transition temperatures (T_g's) and with different viscosities can currently be offered. The Biresin® CR80 systems are the least expensive epoxy resins from Sika. The glass transition temperature for this system is up to 80 °C after curing.

Biresin® CR80 is characterized by very low viscosity. As a result, it is excellently suitable for use in the injection method. Rapid infiltration of the dry fabric is thus guaranteed. Biresin® CR82 is mainly used in the hand lay-up method. Due to its outstanding mixed viscosity, good impregnation is achieved with a low tendency to bleed. This EP system is therefore also suitable for impregnating vertical laminates such as in the manufacture of boat hulls. The user does not have to fear that, during the hardening process, so-called resin lakes will be formed due to resin bleeding or that this will prevent correct fibre wetting in other areas of the laminate. This system is also used for pultrusion, filament winding and the mechanical impregnation of fibres and fabrics.

For applications at temperatures of less than 20 °C, Sika developed Biresin® CR81. This problem of low temperatures primarily occurs in container construction and shipbuilding where, due to size, suitable halls with appropriate temperatures are frequently unavailable or where heating of these buildings would incur enormous energy costs. This material is recommended for the temperature range 15-25 °C due to its low mixed viscosity for use in the infusion method.

If composite parts which require higher temperature resistance are to be made, Biresin® CR120 and Biresin® CR122 epoxy resins are the right choice. Here as well, Biresin® CR120 is especially suitable for the infiltration method due to its viscosity. Biresin® CR122 can be used for hand lay-up, pultrusion, filament winding and other mechanical impregnating procedures. Biresin® CR122 is also excellently suited for removal from the mould and for machining without previously being heated.

The fact that the numerical designation of the product is connected to the T_g value is the basis of the numbering system used for Sika Biresin® CR products. In the manufacture of its products, Sika also tries to avoid the use of toxic basic materials. This reduces the health risk of the user.

Convince yourself of the strengths and user-friendliness of our products. Or do you have a special application for which there is no solution at the moment? Our R&D team will be glad to help you with any specific wishes and requirements you may have.

Please get in touch with us.

Ms. Lucic (telephone: +49 (0) 7125 / 940-492 or by e-mail at: Lucic.Katharina@de.sika.com) will find just the right person for you to talk to.

Holger Giese, Market Development Manager
Composites ■■■■■

Hard glued joints for design boards with a low density – No thank you!

For perfect design models

Biresin® Foam Adhesive – For glued joints with a fine cellular foam structure

Manufacturers of design and styling models used to be faced with the unfortunate fact that the physical properties of glued joints, such as hardness, were considerably different from those of the basic material of which the selected hard foam board consists. The Shore hardness was sometimes so different that, after grinding, undesirable pitholes manifested themselves in the area of the glued joint. Moreover, the glued joints often had a very different appearance after painting.

Have we made you curious? Simply go in touch with us (Tel. No.: +49 (0) 7125 / 940-492). Biresin® Foam Adhesive is available in 0.75 l and 5 l containers.

Andreas Müller and Wolfgang Schmidtgen, Marketing
Tooling & Composites ■■■■■

Now, Sika can offer the perfect solution to this problem. The new Biresin® Foam Adhesive is a "single-component adhesive" based on PUR with good physiological properties. In this case, the "second" component is simple water or moisture.

Biresin® Foam Adhesive is applied with a brush on only one side. Very little is needed, approximately 100 g/m². The second gluing partner only has to be sprayed on in the form of water and to join within a quarter of an hour. The boards to be joined are then subjected to a small amount of compressive pressure. Due to the reaction with water, the foam in the joint expands slightly. Both optically and physically, the fine cellular foam glued joint matches the design boards SikaBlock® M80 und M160. After only 6 h, the glued boards can be machined. The resulting strength of the glued joint is so high that, when subjected to stress, the fracture always occurs to the side of the glued joint. The Biresin® Foam Adhesive is also suitable for SikaBlock® M300.

Please make a note!

Important dates in 2007/2008

Sika-Tooling & Composites

EUR MOLD

5. - 8. December 2007

Euromold – World Fair for Moldmaking and Tooling, Design and Application Development, Frankfurt a. M.
www.euromold.com



4. - 6. December 2007

European Offshore Wind – The Pan-European platform for offshore wind energy, Berlin
www.eow2007.info



1. - 3. April 2008

JEC Composites Show – World's leading exhibition for composites, Paris
www.jeccomposites.com

Biresin® Foam Adhesive

Application:

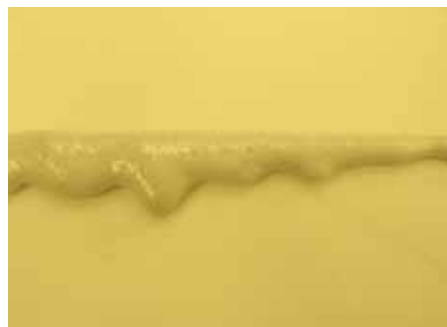
- Bonding of SikaBlock® M80, M160 and M300 boards

Description:

- Chemical basic: PUR
- One-component system, no mixing required
- one-sided application sufficient, opposite part only has to be moistened
- available in 0.75 l and 5 l packages

Main advantages:

- No rigid bonding line, but fine cellulare foam
- Optical and physical adapted to SikaBlock® M80 and M160
- Fast curing
- Favourable physiological properties



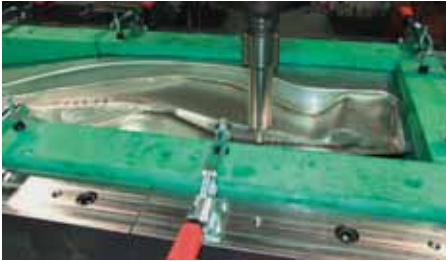
The adhesive expands very quickly and swells slightly at the sides



After machining – the glued joint is hardly visible

SikaBlock® M940 – The Allrounder

The new “Green” conquers additional market segments



Incremental forming of a gear-box console
(metal sheet made of DC04 with a thickness of 1.2 mm)



Low-pressure RIM mould made of SikaBlock® M940 and the associated
sillboard panel made of Biresin® RG53

Whereas foundry pattern making is and will remain the main area of use, SikaBlock® M940 is now proving itself in other applications. In the following short reports of experience gained with this product, it becomes clear why SikaBlock® M940 can now claim to be an allrounder due to its unique profile of characteristics.

Metal sheet forming

For almost ten years now, the Fraunhofer Institut für Umformtechnik (IWU = the Fraunhofer institute for metal forming) in Chemnitz has been a very important partner of Sika Tooling & Composites in the area of basic research on the use of tools made of synthetic materials for metal sheet forming.

The Fraunhofer IWU has a holistic approach to the forming process. Starting with the optimization of tool design, additional steps in development are implemented until the part is ready for series production. On the basis of extensive strip-drawing tests and the determined coefficients of friction, it was clearly determined that tools made of SikaBlock® M940 synthetic material have very good tribological properties even when not lubricated. The use of synthetic materials for prototype construction and series production promises a much shorter trial phase due to the possibility of make the tools very quickly from ready-to-use semi-finished goods. The possibility of rapid alteration also saves time and money.

The unfilled SikaBlock® M940 is characterised by its very high flexural strength of 90 MPa and an impact resistance of 35 kJ/m². Apart from the high compressive strength of 88 MPa, the good sliding behaviour of the M940 surface is highly advantageous during metal forming.

The two pictures above show successful use of a metal sheet forming tool made of SikaBlock® M940. The innovative method of incremental forming is used to make a metal plate (DC04) for a gear-box console with a wall thickness of 1.2 mm. Here, the upper half of the compression moulding die, together with guides and holding-down clamps, is replaced by the CNC-controlled movement of a simple, universally useable forming head. Because any 3-axis milling machine can be used for this in principle, the first metal parts, even those of more complex geometries, can be made quickly and cost-effectively.

Mould making, e.g. for low-pressure RIM

The Vogelgesang group of companies employs approx. 60 people working in the areas of CAD design and implementation of development projects for many well-known automobile manufacturers. A big role in this is played by the quick manufacture of initial prototypes, in addition to model and mould making. The quantities are up to several 100 parts, with which trial vehicles for field tests are fitted. With the mould made of SikaBlock® M940, approx. 200 sillboard panels have been made up to now with low-pressure RIM methods. The first positive feedback concerned the ability of the material to be milled quickly and with good results. In addition to this, there was a lot of enthusiasm about the good chip formation without static charging and without any annoying dust and odours. After milling, SikaBlock® M940 can also be polished without any problems. This makes it possible to manufacture glossy moulded parts. When RIM moulds are used over long periods, the chemical resistance to release and cleaning agents and the high resistance to abrasion ensure a long service life. When Biresin® Fast Adhesive green is used for gluing, it is notable that the glued joints are not noticeable during parts moulding, even after long use. The reason is that the physical properties of the adhesive are very close to those of the SikaBlock® M940 board.

Do you have a similar application in mind or even a special use for the product and are thinking about performing an initial test? Then, all you have to do is contact us. Ms. Lucic will find the right person for you to talk to (Tel. No.: +49 (0) 7125 / 940-492).

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