



BASICS OF ADHESIVE BONDING TECHNOLOGY

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SIKA S.A.U. / TARGET MARKET INDUSTRY

BUILDING TRUST



TABLE OF CONTENTS

INTRODUCTION
TERMS

ELASTIC
BONDING

RIGID
BONDING

ADHESIVE
SELECTION

SURFACE
TREATMENT

APPLICATION

WORKPLACE

QUALITY
ASSURANCE

INTRODUCTION, TERMS



ADHESIVE AND BONDING

Adhesive

(DIN EN 923)

- Non-metallic material that can join parts by surface adhesion and internal strength

Bonding technology

(DIN EN ISO 9000)

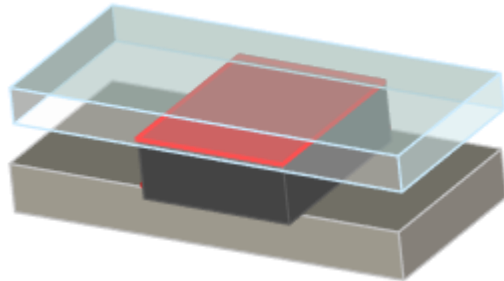
- Special process
- Implementation only by qualified personnel

ADHESIVE AND BONDING

ADHESION AND COHESION

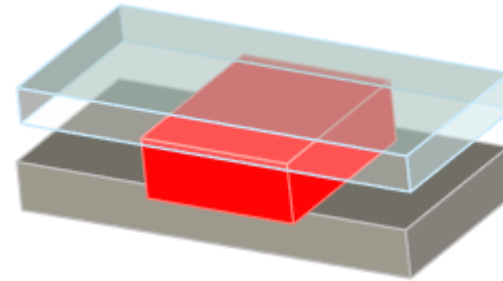
Adhesion

- Connection between adhesive and joined part due to chemical and physical bonding as well as mechanical anchoring
- Boundary layer (a few nm)



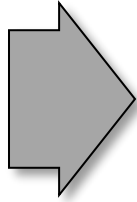
Cohesion

- Internal strength of the adhesive or part to be joined
- Whole material



ADHESIVE AND BONDING

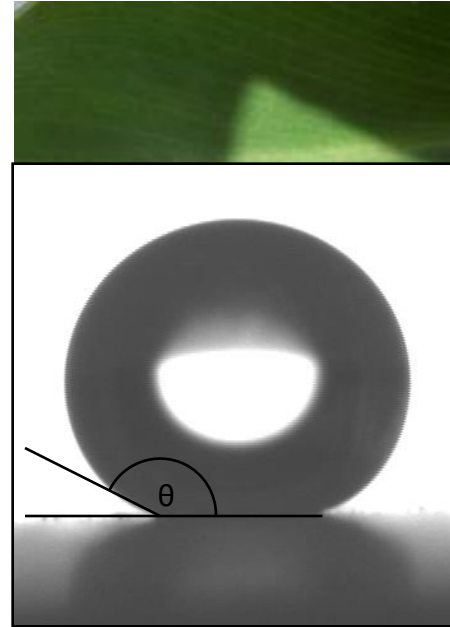
WETTING



Without wetting
no adhesion

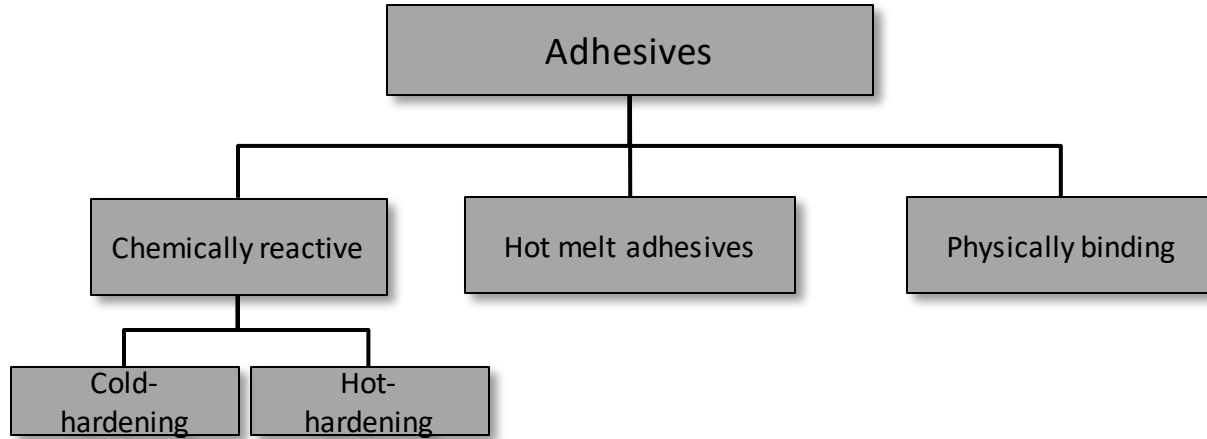
Obstruction of wetting by..

- Surface tension of the part to be joined is too low
- Surface roughness of the part to be joined is too high
- Too little adhesive



ADHESIVE AND BONDING

CLASSIFICATION OF ADHESIVES



Source: Habenicht

ADHESIVE AND BONDING

CURING MECHANISMS

Chemical reaction

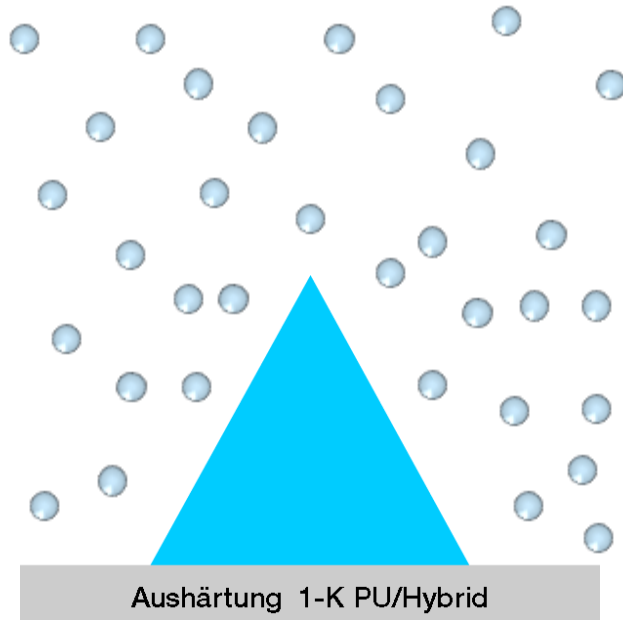
- 1-C moisture reactive
- 1-C Sika Booster
- 2-C systems

Physical setting

- Stiffen in the body (hot melt adhesives)
- evaporation, diffusion

ADHESIVE AND BONDING

CURING 1-C MOISTURE-REACTIVE



Advantages

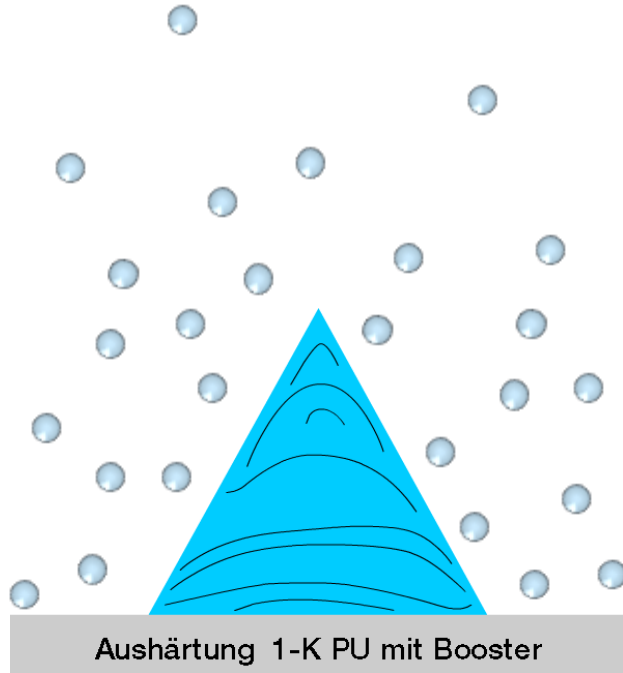
- Easy to dose
- Can be processed with simple equipment
- No mixing necessary
- Long open time

Disadvantages

- Curing (days)
- Dependent on humidity
- Limited joint dimension

ADHESIVE AND BONDING

CURING 1-C PUR / STP BOOSTER



Advantages

- Relatively fast curing (hours)
- Unlimited joint dimension
- Easy to change between application with and without booster (direct glazing)

Disadvantages

- Booster paste must be dosed and mixed
- Only applicable for selected products
- Relatively short open time

ADHESIVE AND BONDING

CURING 2-C PUR



Advantages

- Independent of humidity
- Large selection of products
- Curing (minutes)
- Independent joint geometry

Disadvantages

- A- and B- components must be dosed and mixed
- Open time versus curing time not independently adjustable
- Partly purging or cleaning effort in case of work interruption

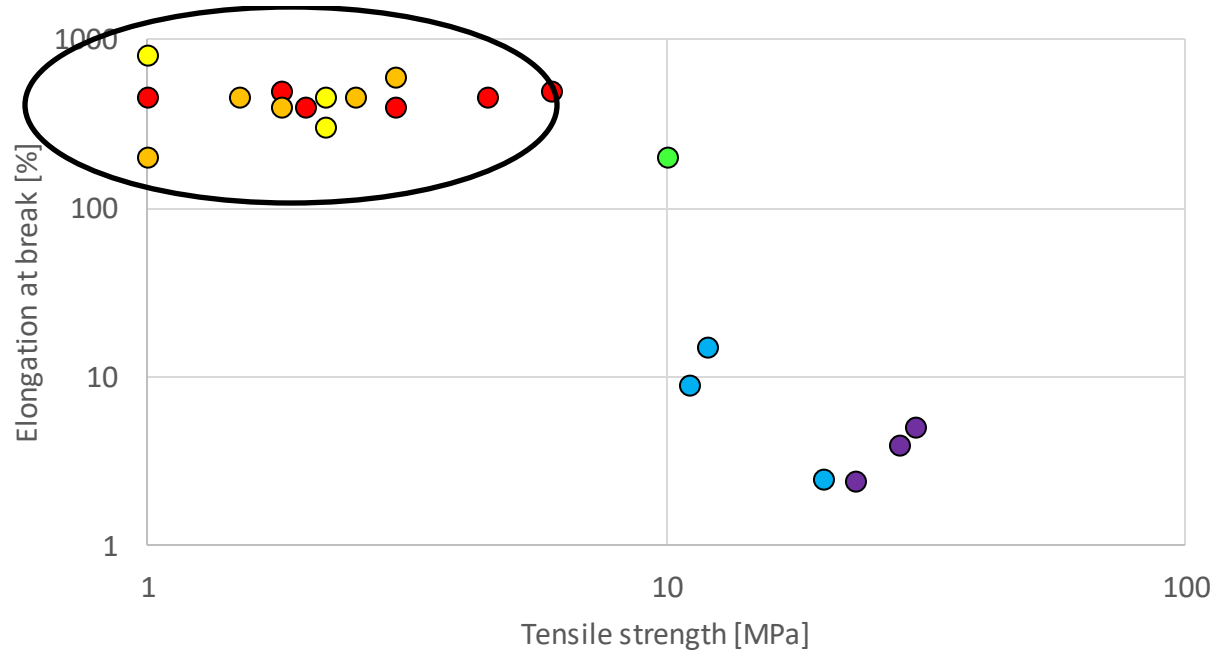
ELASTIC BONDING



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ELASTIC BONDING PRODUCTS AT A GLANCE



- 1 C PUR (Sikaflex-2xx)
- 1 and 2 C STP (Sikaflex-5xx)
- 1 and 2 C silicone (Sikasil)

ELASTIC BONDING PRODUCT FEATURES

Features

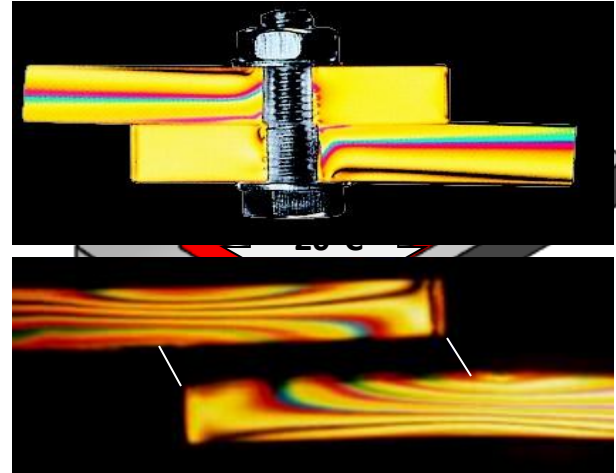
- Layer thickness > 3 mm (thick film adhesive)
- Large adhesive surface for the transmission of forces
- Mostly moisture-reactive 1 C products (PUR, STP, silicone)
- Application on metals, plastics, glass, coatings, etc.



ELASTIC BONDING ADVANTAGES

Advantages due to high elongation

- Good tolerance compensation
- Suitability for joining different materials (thermal expansion)
- Bonding and sealing in one operation
- Uniform stress distribution



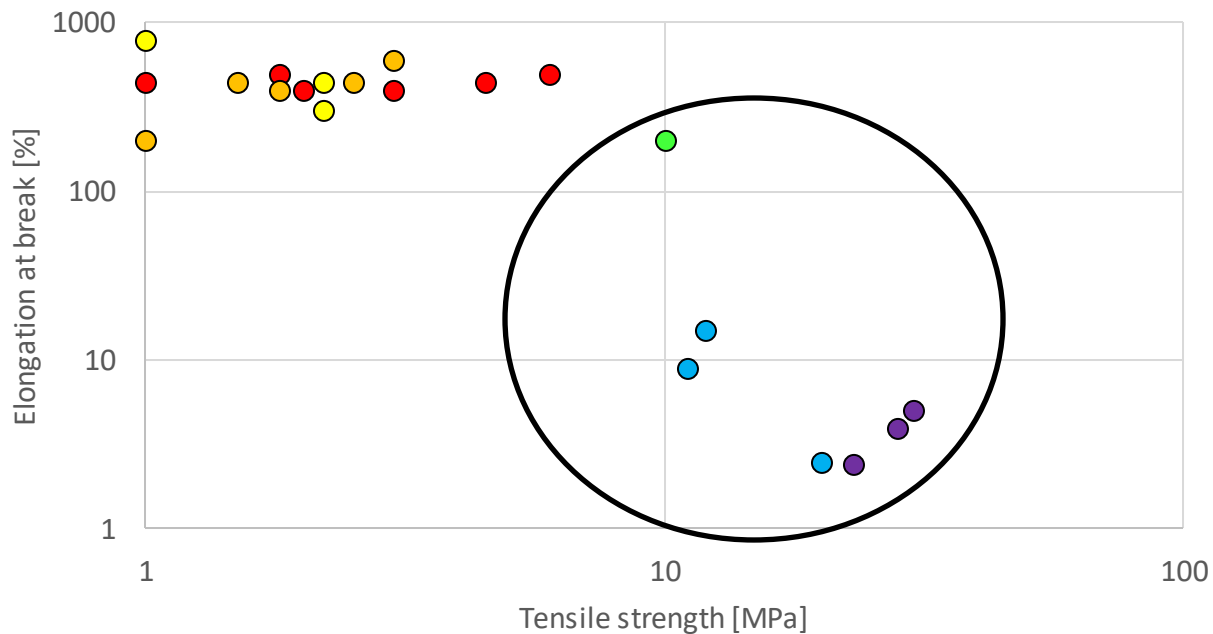
RIGID BONDING



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RIGID BONDING PRODUCTS AT A GLANCE



- 2-C acrylates (SikaFast)
- 2-C PUR (SikaForce)
- 1- and 2-C epoxy (SikaPower)

RIGID BONDING

PRODUCT FEATURES

Features

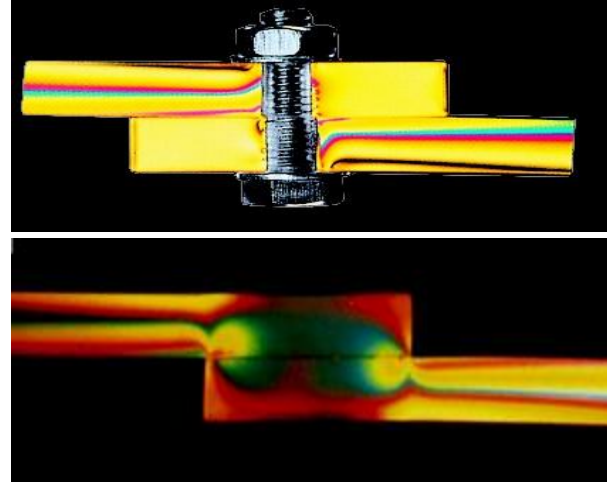
- Layer thicknesses < 3 mm (thin-film bonding)
- Small adhesive area for the transmission of forces
- Mostly 2-C products
- Application on metals, plastics, glass, coatings, etc.



RIGID BONDING ADVANTAGES

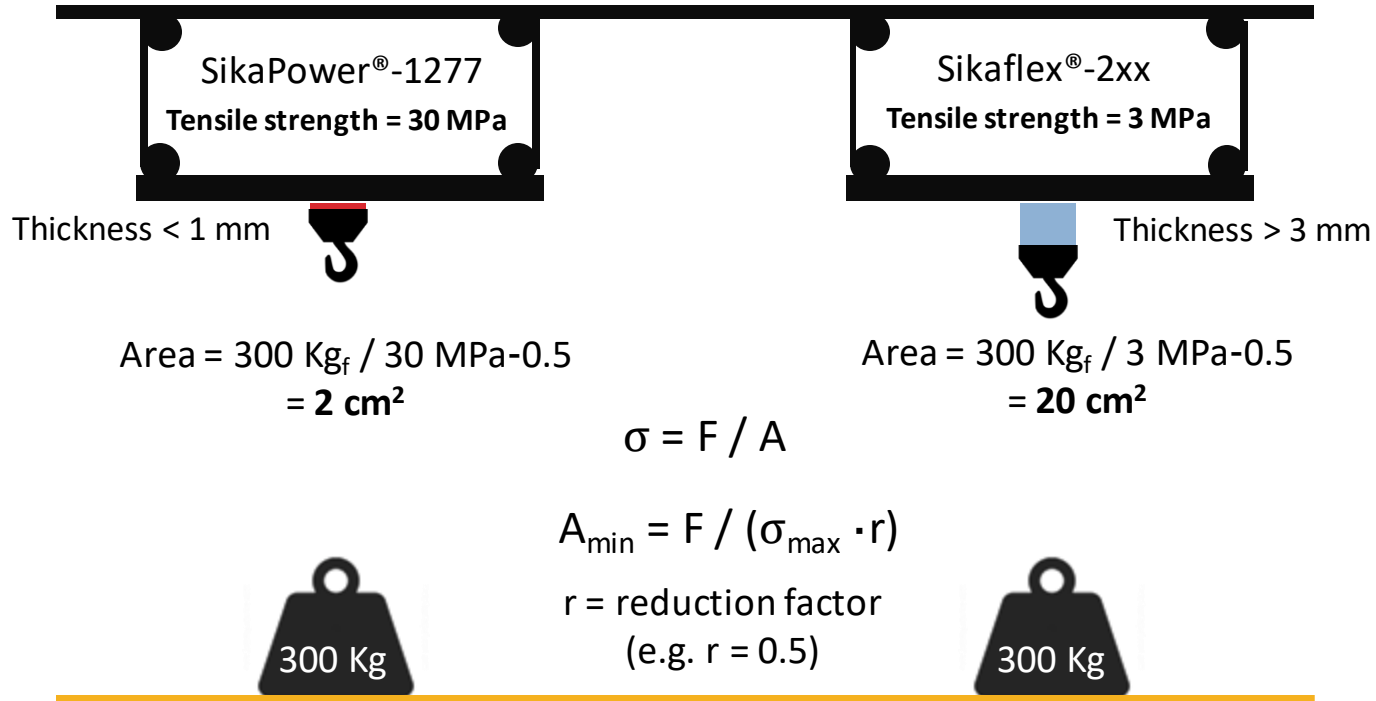
Advantages through ...

- No penetration of the parts to be joined
- Weight saving thanks to less material used
- Higher stiffness in the component



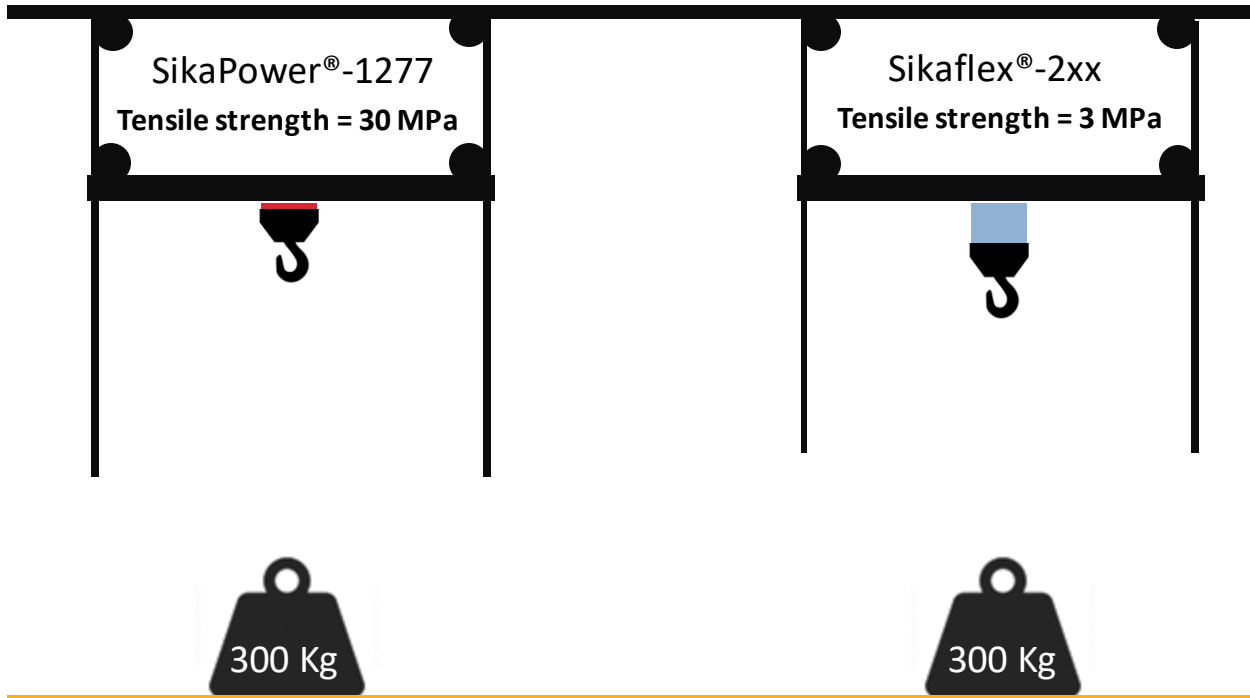
COMPARISON OF TENSILE STRENGTHS

- How large must the adhesive area be to lift the weight?



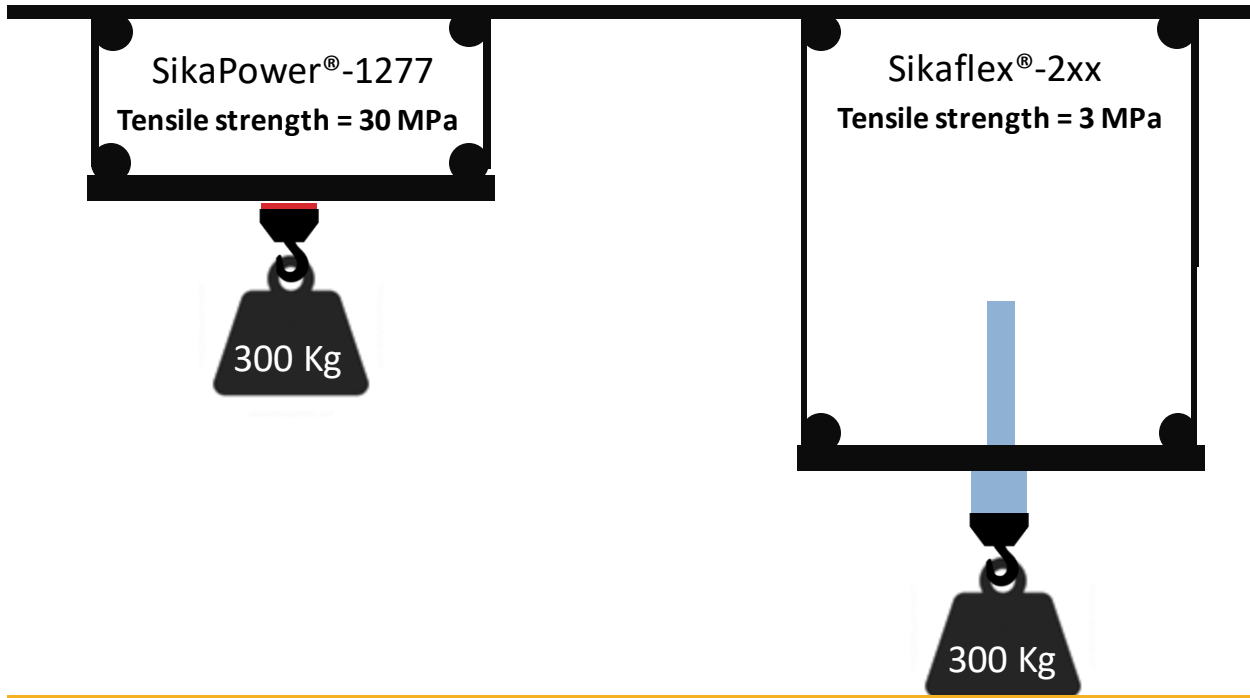
COMPARISON OF TENSILE STRENGTHS

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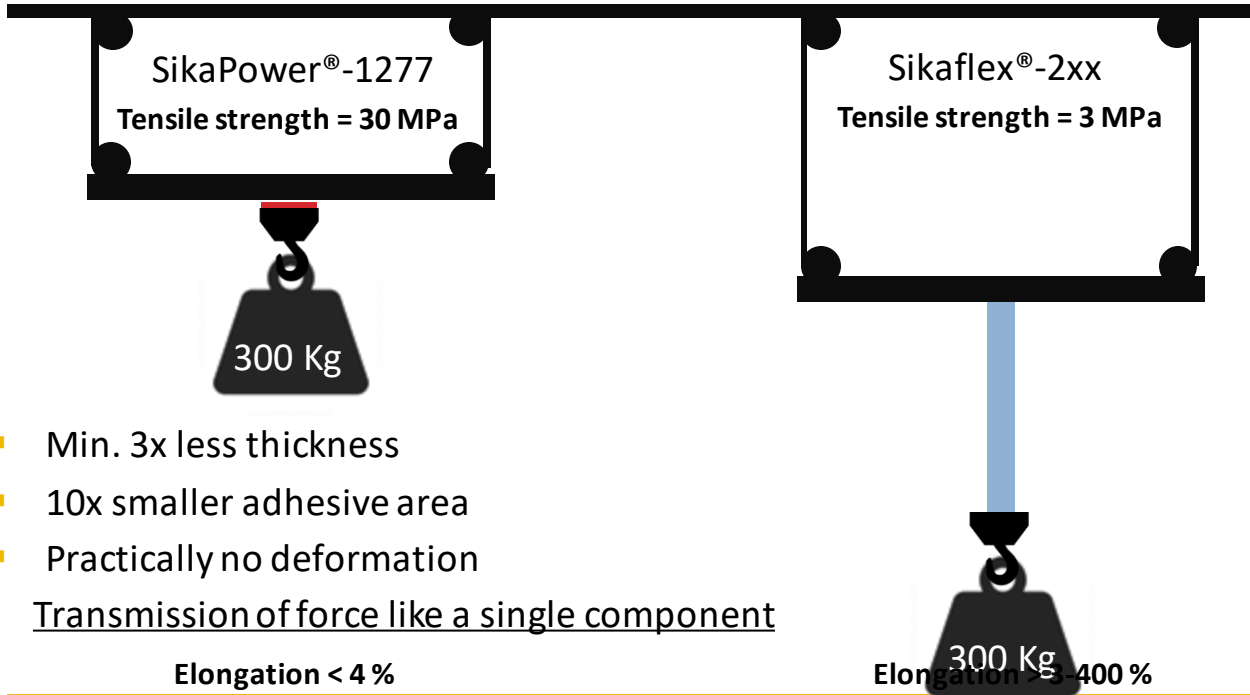
COMPARISON OF TENSILE STRENGTHS

- How large must the adhesive area be to lift the weight?



COMPARISON OF TENSILE STRENGTHS

- How large must the adhesive area be to lift the weight?



- Min. 3x less thickness
- 10x smaller adhesive area
- Practically no deformation

Transmission of force like a single component

ADHESIVE SELECTION

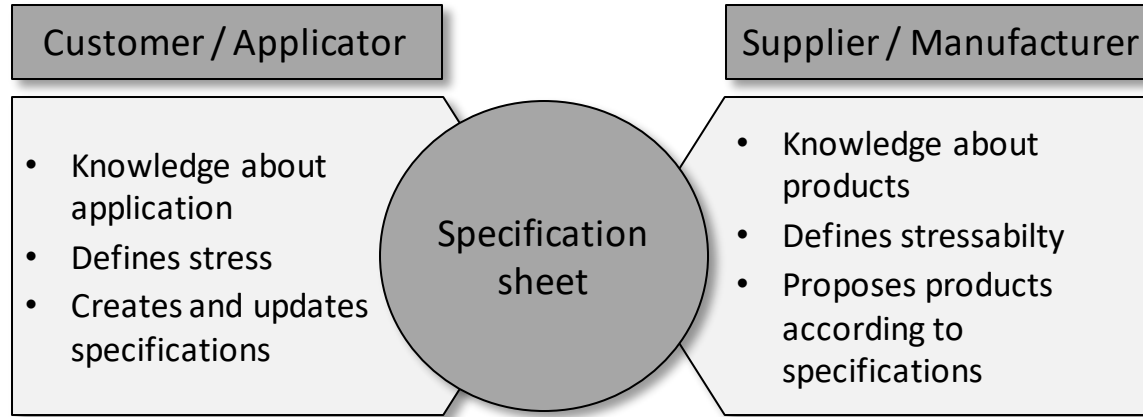


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ADHESIVE SELECTION

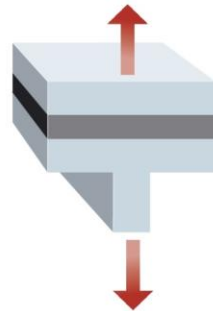
PROCEDURE OF PRODUCT SELECTION



ADHESIVE SELECTION

POSSIBLE CRITERIA FOR ADHESIVE SELECTION

Parts to be joined	Mechanics	Processing	Endurance
<ul style="list-style-type: none">• Material• Adhesive surfaces• Tolerances• Thermal expansion	<ul style="list-style-type: none">• Mechanical stress• Mechanical load-bearing capacity	<ul style="list-style-type: none">• Application equipment• Cycle times• Curing conditions• Curing speed	<ul style="list-style-type: none">• Temperature• UV radiation• Humidity• Chemicals• Fire behaviour



SURFACE TREATMENT



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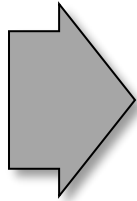
SURFACE TREATMENT

AIMS OF SURFACE TREATMENT

Improvement of..

- Adhesion
- Reproducibility
- Long-term resistance

Source: ifam Bremen

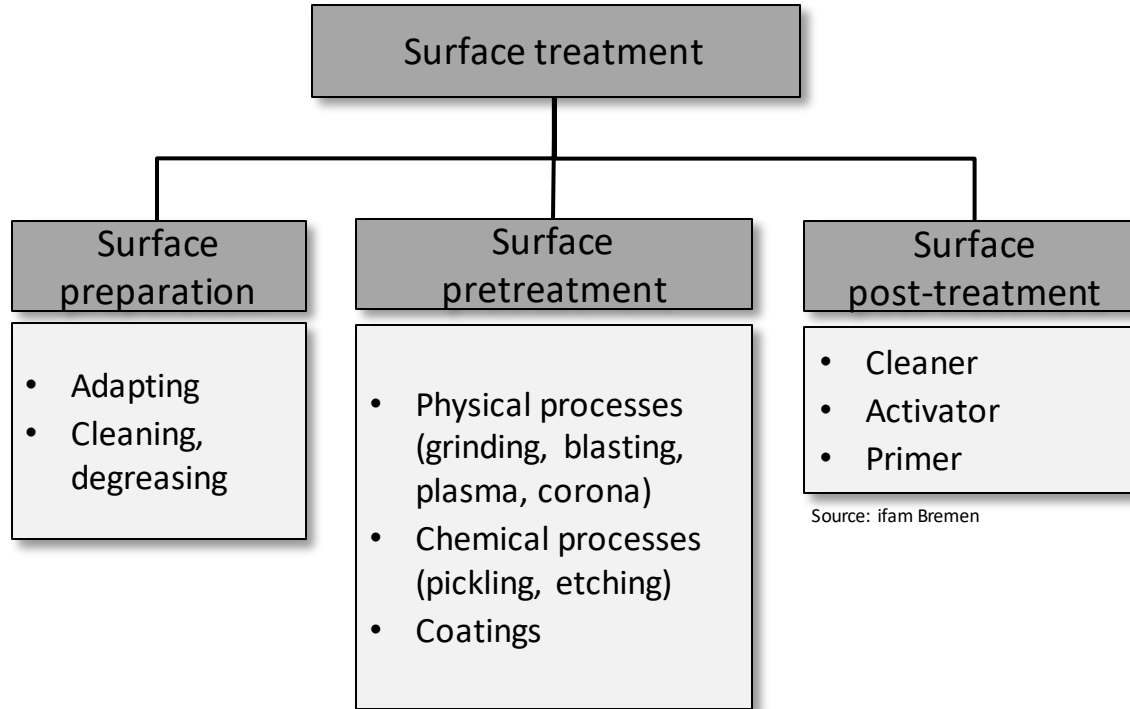


Avoid mistakes,
ensure security!



SURFACE TREATMENT

TYPES OF SURFACE TREATMENT



Source: ifam Bremen

SURFACE TREATMENT CLEANER

Features, properties

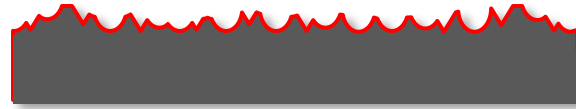
- Pre-treatment agent without reactive components
- Not film-forming
- Solvent, abrasive paste
- Application with wipe



SURFACE TREATMENT ACTIVATOR

Features, properties

- Reactive pre-treatment agent that forms a bond with the substrate, primer or adhesive
- Transparent
- Application with wipe



SURFACE TREATMENT PRIMER

Features, properties

- Reactive pre-treatment agent that forms a bond with Activator and adhesive
- Film-forming (10 - 20 μm)
- Black, yellowish, transparent
- Application with foam, wool felt applicator, brush



SURFACE TREATMENT SUMMARY

Key points

- Define suitable pre-treatment
- Keep surface quality constant
- Correct application method
- Observe flash-off times and temperature ranges
- Do not use third party products



APPLICATION



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APPLICATION WORKFLOW



APPLICATION ATTENTION

Attention!

- Adhesion promoters and primers that have not completely flashed off can block the curing mechanism of the PUR
- Flash-off times must be extended for absorbent, coarse-pored substrates and at temperatures below 10° C

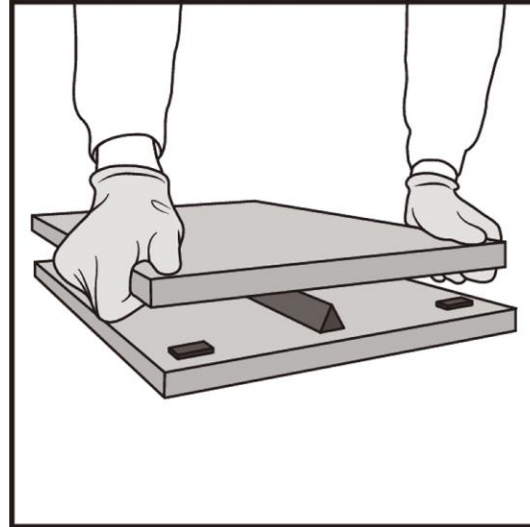


APPLICATION

BONDING

Bonding

- Join parts before skin formation / elapse of open time
- Immediately after joining, remove excess / tool the joint if necessary
- Ensure that the adhesive receives humidity (1-C Systems)



CLEANING

MECHANICAL
PRETREATMENT

CLEANING

ACTIVATOR

PRIMER

ADHESIVE

APPLICATION

DURING AND AFTER BONDING

During and after bonding

- Remove adhesive contaminations with Sika Remover-208
- Remove adhesive contaminations on hands with Sika Cleaner-350 H
- Remove masking tapes immediately after joining and remove of excess



CLEANING

MECHANICAL
PRETREATMENT

CLEANING

ACTIVATOR

PRIMER

ADHESIVE

WORKPLACE



WORKPLACE

THE WORKING AREA 1

Principles / Prerequisites

- Observe temperature and humidity and adjust if necessary (optimal 15° - 25°C / 50%)
- Separate bonding from other processes
- Equipment according to the requirements



WORKPLACE

THE WORKING AREA 2

Environment and safety

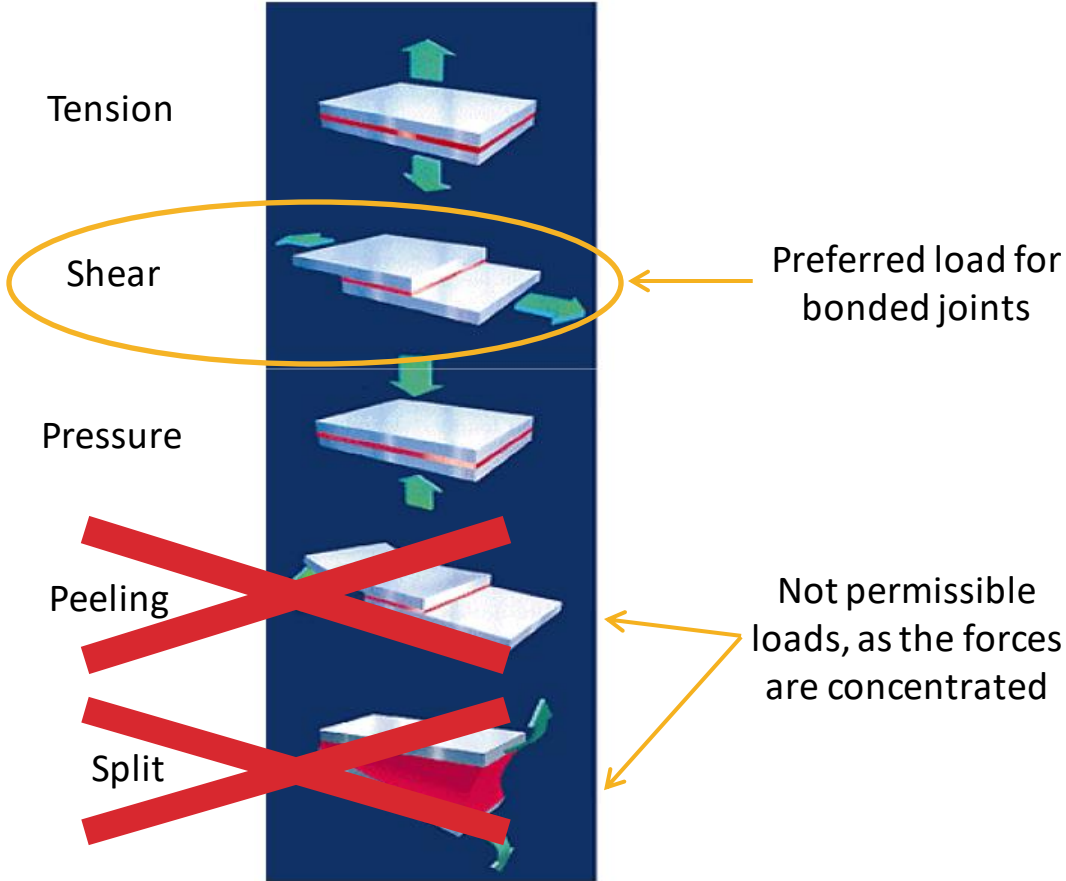
- Bonding = handling of chemical products
- Ensure good ventilation
- Wear protective gloves
- Wear safety goggles
- No smoking, no fire, no food
- Correct disposal of waste and residues
- Preparation for emergencies



QUALITY CONTROL

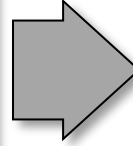


DIFFERENT TYPES OF LOADS



QUALITY CONTROL RESPONSIBILITIES

- Product quality
- Adhesion and compatibility tests
- Application guidelines
- Documents (PDB, SDB)

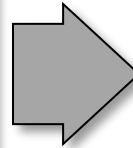


Specification

- Specifications
- Working instructions

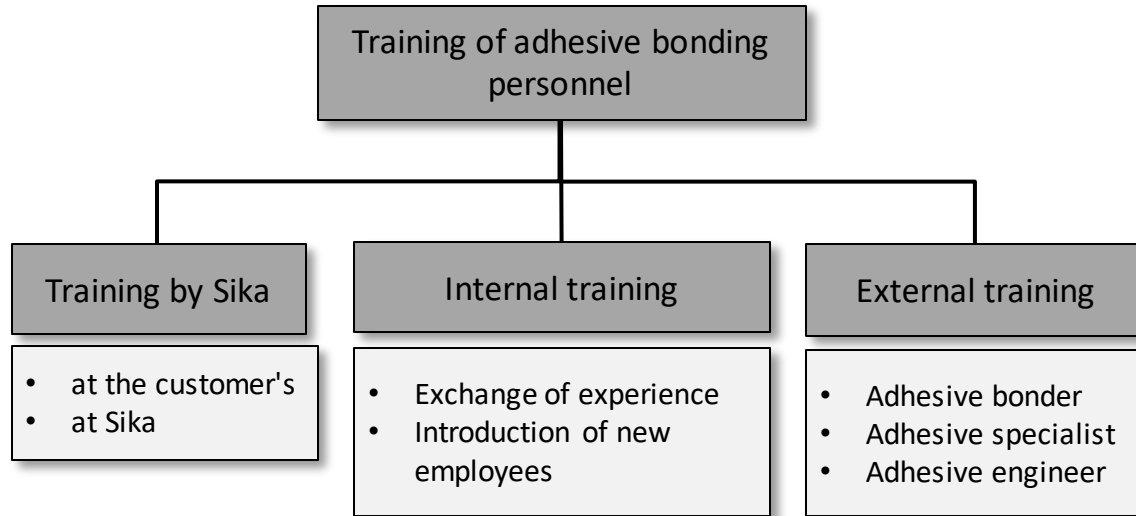
Application

- Substrate treatment
- Correct application
- Complete documentation
- Quality control on site



QUALITY CONTROL

TRAINING FOR ADHESIVE BONDING PERSONNEL



QUALITY CONTROL






DOCUMENTATION OF THE BONDING PROCESS

Working instructions

- Description of all work steps
- Definition of the materials to be used, aids

Adhesion protocol

- Confirmation of all work steps
- Documentation of materials used (batch numbers) and conditions

	Anschleifen der umlaufenden Versiegelung mit Schleifvlies - very fine . Entfernen des Schleifstaubes mit einem sauberen Reinigungs- oder Aktivierungsvlies, oder mit offener Druckluft.
 	Aktivieren der Klebestellen mit Sika Aktivator mit einem sauberen, Reinigungs- oder Aktivierungsvlies weiss. Reinigungs- oder Aktivierungsvlies bei Verschmutzung wechseln!
 	Abluftzeit ≥ 15°C minimal 10 Minuten Abluftzeit ≤ 15°C minimal 30 Minuten Abluftzeit maximal 2 Stunden.

herer Temp. Kürzere offene Zeit)		
40	%	
Pers.Nr.	Datum	Visum
1453	29.11.04	P. Weber
10939518	/	11/05
Glas	15	Min.
lackierter Oberfläche	15-20	Min.
10906171	/	26.14 06/05
Pers.Nr.	Datum	Visum
1453	29.11.04	P. Weber

QUALITY CONTROL

FURTHER DOCUMENTS

Documents from Sika

- Product data sheets
- Safety data sheets
- General guidelines
- Additional Product Information (API)
- Additional Technical Information (ATI)





THANK YOU FOR YOUR ATTENTION