



# GUIDELINES “ADHESIVE BONDING – THE RIGHT WAY”

Adhesives are nowadays used for a wide variety of applications. Adhesive manufacturers are therefore not able to provide detailed information about the different and often very specific applications on data sheets. If users of adhesives do not have a good basic knowledge of the special aspects of adhesive bonding, the result is often failure of the bonded joint and product damage. To prevent this, the Center for Adhesive Bonding Technology of the Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM, Bremen, in collaboration with the Industrieverband Klebstoffe e. V. (IVK; German Adhesive Association) has prepared guidelines entitled “Adhesive bonding – the right way”.

Frequently the complexity of an adhesive bonding process is underestimated and simple basic rules go unheeded, such as:

- No knowledge about the fundamental mechanism of adhesion.
- When selecting the adhesive, only the substrate material is considered.
- The ban on silicones and silicone oils being used in production areas where adhesive bonding work is undertaken is often ignored.
- Users are familiar with assembly adhesives, universal adhesives, glues, and superglues, but not the differences in properties between these and other adhesives.

As adhesive users work from their subjective point of view to the best of their knowledge and so believe they are doing everything correctly, the cause of any failure of bonded joints is often put down to the adhesive or bonding technology. Age-old and false prejudices such as “it was only bonded”, “adhesive bonds cannot hold for long”, and “had it been welded/screwed/bolted” are often heard.

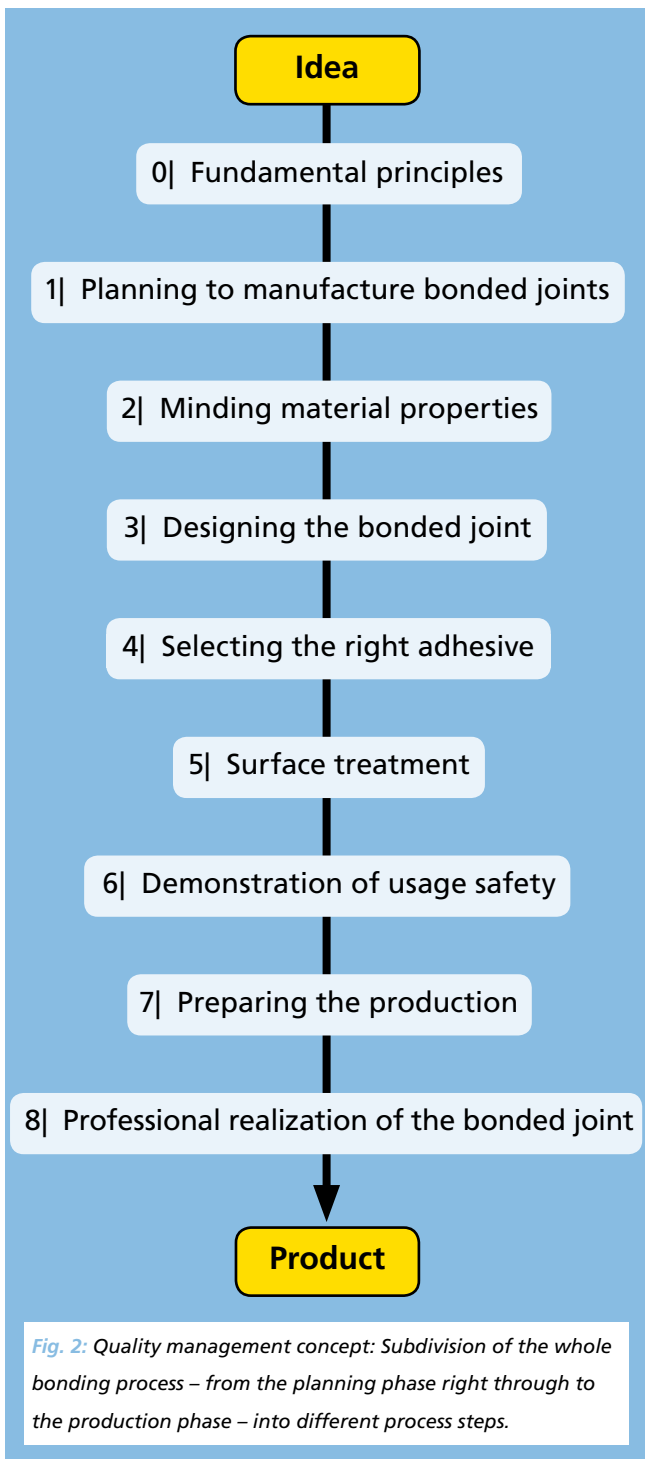
This line of thought has a negative effect on adhesive manu-

facturers and on the image of adhesive bonding technology for potential adhesive users.

The guidelines prepared by Fraunhofer IFAM in conjunction with the Industrieverband Klebstoffe e. V., “Adhesive bonding – the right way”, will make a huge contribution to improving the trust in adhesive bonding technology and raising its image (Fig. 1). If the number of application errors – indeed even just the biggest errors – is reduced and the number of effective bonded joints increases, then the project will have made a contribution to qualified market development (QMD) of adhesive bonding technology.

## Objective

The objective of the project was to prepare general guidelines for adhesive application and quality assurance, from the initial planning phase for a product through to repair respectively disposal of the bonded product. “Adhesive bonding – the right way” will primarily allow adhesive users to identify options for quality assurance for their applications and to select suitable methods.



In addition, the guidelines will make adhesive users aware of the key special features of adhesive bonding and so help them avoid major errors when selecting and using adhesives. The guidelines perfectly complement the supracompany training courses in adhesive bonding technology, the advice given to users by adhesive manufacturers, and product training.

The target group includes existing users of adhesives and also prospective users who require information about how to avoid pitfalls when using adhesives. “Adhesive bonding – the right way” was developed for both adhesive manufacturers as well as users, has general validity, and is relevant for all industries. The guidelines are available in both German and English.

### Contents

The guidelines are relevant for simple examples of industrial structural bonding as well as for more special bonding applications, e.g. for the packaging sector, the installing of parquet floor, the shoe manufacturing industry and the building industry. They are based on the proven principles of the comprehensive quality management (QM) concept that was developed at Fraunhofer IFAM (Fig. 2).

The most significant features of the QM concept are:

- ➔ the holistic view of the bonding process and
- ➔ differentiation between the bonding process and measures for quality assurance.

- 1 Adhesive bonding technology – a reliable joining method.
- 3 Cleaning and activation of complex component surfaces using atmospheric pressure plasma.
- 4 Manual application of a moisture-curing polyurethane adhesive from a cartridge.



First of all the bonding process is subdivided into the planning, conception, design, elaboration, production, and usage phases. For each of these phases there is further subdivision into the individual process steps (Fig. 3 + 4). This means that, for the first time, users have available a complete and logical sequence that describes the course of the process. Practical experience shows that simply keeping to the correct sequence respectively iteration of process steps results in major errors being avoided, so saving not only time but also money. The positive effect here is essentially due to the timely and complete procurement, elevation and consideration of data.

“Adhesive bonding – the right way” also contains information about how to correctly carry out the processing steps. Whilst this information can in principle be obtained from books on joint design, design catalogs, technical data sheets, text books on adhesive bonding technology, and standards, there is often no time during the industrial working day to carry out time-consuming fact-finding from different text sources. The inclusion and the equitable allocation of this information in a logical way in the guidelines is an added benefit.

The main intention and innovative aspect of the guidelines is, however, to inform users about quality assurance. The arrangement and guidance of the information are carried out by the process steps. This means, for each individual step all known options and methods are described to allow quality assurance of each single process step (Fig. 5).

## Conclusion

The guidelines provide users with information about the bonding process at three different levels. Firstly, a proven sequence respectively iteration of process steps is recommended to the user. Secondly, users are provided with information about how to effectively carry out each step. Thirdly, options and methods for the quality assurance of each process step are given.

A holistic view of the bonding process combined with the linking of information in the described way, which provides quick and intuitive knowledge for relatively inexperienced users of adhesives whilst sparing them from the complexity and sheer amount of information available, has not existed up until now. The guidelines “Adhesive bonding – the right way” now remedy what was seen by many users as a major shortcoming.

<http://leitfaden.klebstoffe.com/>

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5 *Assessment of lap shear specimens after testing.*