

Interview PROF. DR. Andreas Gross

Professor Andreas Groß is head of the Workforce Training and Technology Transfer department at Fraunhofer IFAM. As part of his work on quality assurance for adhesive bonding, he has been chairman of the DIN/FSF work group on "DIN 6701" and the work group on "Bonding and DIN 6701" since 2001. He is also Convener of Working Group 52 "Adhesive Bonding" for CEN/TC 256/SC 2 "Railway Application", a member of the DIN work group on "DIN 2304" and a member of ISO TC 11 "Plastics"/Working Group 5 "Adhesives".

1. What is the goal of DIN 2304?

Quite simply: make the application of adhesive technology even safer! By which I am definitely not saying that adhesive bonding isn't safe. Properly applied, it's a fantastic joining technology with considerable development potential for the 21st century. For me, adhesive bonding will be the no. 1 joining technology in the 21st century. Like welding was in the 20th century and riveting in the 19th century. The only proviso is: "applied correctly". DIN 2304 ensures this by specifying the "state of the art" for the professional organisation of adhesive bonding processes in the user company.

2. What do you mean by "correctly applied"?

Well, I don't want to go too far. I'll just say this: like welding and riveting, adhesive bonding is a "special process" according to ISO 9001

3. And what do you mean by "special process"?

... "special processes" are manufacturing steps, product units or products that can't be tested non-destructively with one hundred percent certainty. That means that I can't reliably predict how long the product will last. A welded joint, for example, is a "special process" precisely because we don't have a one hundred percent non-destructive testing methodology that scientifically tells me how long the welded joint will remain with what residual strength. And if welding is already a "special process", then gluing is even more so.

4. Why's that?

Quite simply, there are more factors affecting the quality in the production of an adhesively bonded joint than in welding. Furthermore: any quality-influencing factor in adhesive bonding technology is more sensitive in its impact on the quality of the joint. In addition, the adhesives we use are plastics. Plastics are subject to moisture. In the case of adhesives, adhesion and cohesion are affected.

5. Back to the question: what do you mean by "applied correctly"?

The user - no matter where they are - must ultimately view adhesive bonding technology in holistic terms. From concept to finished product and all its facets. That includes maintenance and repair. The adhesive alone is only part of this. Moreover: today's industrial adhesives are high performance materials! We therefore need to consider them and use them as such.

6. "From an objective point of view, about 90% of adhesive bonding errors are not adhesive errors but adhesive application errors." (Source: [adhesion: ADHESIVES & SEALANTS 4/2015](#)).

Exactly! At Fraunhofer IFAM, we not only examine our research and development work but also technical adhesive damage. We have decades of experience in this. And that 90% is a conservative estimate. I've now been working in adhesive technology for nearly 35 years. Believe me, if there's one sentence I don't want to hear, this is it: "It's the adhesive which makes trouble!"

7. What advice would you give companies to increase their knowledge of adhesive bonding?

Let's go back to the welders. They have a cross-hierarchical, product-neutral personnel qualification system for their technology, which has been internationally recognised for over 50 years. From welder to welding specialist to welding engineer. A welder knows what he's doing. There's been a similar system for adhesive bonding for 25 years: cross-hierarchical levels from executive level to supervisory / managerial level up to the technical decision-making level, internationally recognised degrees according to ISO 17024, sector and product-neutral, etc. Underlying Europe-wide harmonised guidelines: European Adhesive Bonder - EAB, European Adhesive Specialist - EAS, European Adhesive Engineer - EAE (www.kleben-in-bremen.de / www.bremen-bonding.com). These guidelines set out the admission requirements, the duration of training and the scope of examinations. No official examination, no final document.

8. In your opinion, how does DIN 2304 impact the commercial vehicle industry?

Good question! I'll mention four points:

1. DIN 2304 helps in legal disputes in the event of damage. As I said at the beginning, DIN 2304 describes the "state of the art" for the professional organisation of adhesive bonding processes. That is, it concretises the existing quality management system, for example that according to ISO 9001. European product safety law is legally binding. It requires products to be made according to the "state of the art". If it concerns a technical adhesive bonding case which must be clarified in court, the first question is: "Did the user company work according to the state of the art?" The second question is then: "Where is the state of the art for adhesive bonding documented?" And believe me, the step to DIN 2304 is extremely short. For user companies which then have to admit that they did not manufacture according to DIN 2304, the air gets thin. Very thin even! So I believe that a change in consciousness is occurring in the commercial vehicle industry. In future, adhesive bonding technology will be viewed with completely different eyes. Namely as a high performance technology. And that's how the technology is approached. And with qualified staff, who know what they are doing.
2. DIN 2304 reduces costs. Experience has shown that consistent use of the standard reduces the number of adhesive bonding errors. That reduces costs.
3. The quality is increased by implementing DIN 2304. DIN 2304 can therefore be used very well as a marketing tool.

4. With the implementation of DIN 2304, companies gain trust from clients and authorities. A company that is certified according to DIN 2304 shows that it takes adhesive technology seriously and has the appropriate competencies.

9. In your opinion, what is the role of adhesive manufacturers, like SABA, in the implementation of DIN 2304?

DIN 2304 is a pure user standard! The user - and only the user! - is responsible for the use of adhesives! That's it! He can't shift that responsibility to others. The task of the adhesive manufacturer is to deliver the adhesives ordered by the user company in the specification ordered by the user and also to prove the desired quality of his products. After delivering to the user, however, he can no longer accept responsibility, because he has no decision-making power over how his products are handled in the user company. He can only advise. He can't decide anymore. And the adhesive manufacturer shouldn't get involved in any dubious legal constructions that user companies could use to circumvent the responsibility that DIN 2304 unequivocally attributes to them. DIN 2304 is a user standard and the adhesive user is responsible for the quality of their adhesively bonded products.

10. You've already addressed the certification of companies. How can companies in the commercial vehicle industry become DIN 2304 certified? Which steps would you recommend?

So, to reiterate: DIN 2304 does nothing other than use an existing QMS - e.g. according to ISO 9001 - specified for adhesive technology. Companies in the commercial vehicle industry are predominantly certified according to ISO 9001. To start with, you can obtain advice on their adhesive bonding processes and their compatibility with DIN 2304 (www.sicher-kleben.de) and conduct so-called pre-audits. Once these are completed, the second step follows: certification by a so-called "third party", i.e. a certification body accredited according to ISO/IEC 17065 (www.tbbcert.de).

Can I add something to your first question about the goal of DIN 2304? ...

11. Yes, please do....

With DIN 2304, we will also achieve an image change for adhesive bonding technology. Let's be honest: in many areas, this image - formulated diplomatically - is still expandable. Again, I see a clear parallel with welding technology: when welding started around 100 years ago, it was the same. What the welders did in the 20th century was to transform the image into a very positive one. How did they do that? Early on, they developed and subsequently enshrined quality assurance measures in standards and regulations! This increased confidence in the technology. First among users and later in the common perception. So, we're doing the same with DIN 2304: similar quality criteria are laid down, which, if properly implemented, further boost confidence in bonding technology. And ultimately transform the popular image of adhesive bonding into a positive one.