Fraunhofer ACADEMY

Fraunhofer IFAM

COURSE PROGRAM

TRAINING CENTER FOR ADHESIVE BONDING TECHNOLOGY

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TRAINING CENTER FOR ADHESIVE BONDING TECHNOLOGY
Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM
– Workforce Qualification and Technology Transfer –

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CONTENT

FOREWORD

The Fraunhofer IFAM in Bremen deserves the honour to have first formulated and successfully implemented the basic idea of continuing education made by Fraunhofer. At the WZK, “knowledge generators become knowledge mediators”, the researcher becomes a learning coach for industry. The workforce qualification at Fraunhofer IFAM also served as a model for the foundation of the Fraunhofer Academy in 2006 and was also one of the founding members of the Fraunhofer Academy at that time. The Fraunhofer Academy is the continuing education institution of the Fraunhofer-Society. Through its continuing education formats, the Fraunhofer Academy passes on the latest research knowledge and competencies of the Fraunhofer Institutes to business enterprises for the best possible qualification of their employees. In cooperation with renowned partners and partner universities, the Fraunhofer Academy offers part-time study courses, certificate courses and seminars lasting several days. As a founding member, the WZK has made a decisive contribution to the Fraunhofer Academy’s ability to offer continuing education for more than 4200 customers per year at more than 35 institute locations. This makes innovative first-hand Fraunhofer research knowledge accessible to german small- and medium-sized companies. Many learning innovations were first established at the WZK. The WZK was the first Fraunhofer institution to establish continuing education as a professional service for our industrial customers and to export its Fraunhofer teaching and learning standards worldwide.The offer of the Fraunhofer IFAM is one of the TOP programs of the Fraunhofer Academy. It meets the highest quality standards – with didactically experienced and top-class Fraunhofer experts. The participants not only gain technical expertise through training, but also have access to a network that is actively supported by offers such as the “Bremer Klebtage“. You too can benefit from the research competence of the Fraunhofer IFAM and allow yourself the professional advantage.

Best regards,
Dr. Roman Götter,
Head of the Fraunhofer Academy

Fraunhofer
ACADEMY

www.academy.fraunhofer.de

TRAINING CENTER FOR ADHESIVE BONDING TECHNOLOGY

This brochure gives an overview of the courses at the Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM, Bremen.

The Adhesive Bonder, Adhesive Specialist and Adhesive Engineer courses are offered in German or English.

If you wish an In-House training course to be provided at your company, we are able to hold the courses in either German, English, or with translation into the respective national language at any suitable location anywhere in the world. Please contact us so that we can discuss the necessary arrangements for the relevant course and plan the timing.

The courses fulfill the requirement according DIN 2304 and DIN 6701.

The training center is certified and meets the requirements according to DIN EN ISO/IEC 17024.

We hope you find our course program of interest and look forward to welcome you and your colleagues as participants in one of our courses.

The training team at Fraunhofer IFAM

BREMEN BONDING

www.bremen-bonding.com

Dates, prices and the registration form can be found on the Internet at www.bremen-bonding.com or in our event brochure.

COURSES

EAB

EAS

EAE

EUROPEAN ADHESIVE BONDER (EAB)

IN ACCORDANCE WITH GUIDELINE EWF 515
THE COURSES FULFILL THE REQUIREMENT ACCORDING DIN 2304 AND DIN 6701

EAB

Objectives of the training course
The participants will become trained for using adhesive bonding technology in industrial production. The course provides a fundamental understanding of adhesive bonding, enabling the special aspects of bonding processes to be understood and taken account of in production. The relevant context and importance of work instructions hence become clear. Successful completion of the course enables participants to independently undertake bonding work in a technically competent way.

Duration of the training course and examination
The EWF-European Adhesive Bonder training course is fulltime and lasts 40 hours (one week), including the examination. To aid the learning, the theoretical part is backed up by practical assignments. The course ends with an examination (practical, written and oral). A prerequisite for taking the examination is regular attendance at the course sessions.

Preliminary course
The computer-based preliminary course touches topics which will be covered in the actual course and is offered to participants in advance online to freshen up their knowledge, if they wish. The learning program was developed to ease introduction to the theory and to refresh old knowledge. This preliminary course can be studied at any time and place which is convenient for the course participant and allows customized preparation for those who will take the actual training course.

Target groups and prerequisites for participation
The target groups are employees in companies which use and make adhesives who carry out bonding work independently following work instructions. Participants must have a good knowledge of the course language to enable them to understand the course material and take the examination in that language.

Further information including details of fees and course dates can be found in the course schedule brochure or on our website: **www.bremen-bonding.com**

COURSE CONTENT

Fundamentals

The course starts by introducing fundamental aspects of adhesive bonding technology. A comparison is made between adhesive bonding technology and other joining techniques. The integrity of bonds and the factors that influence the quality of a bond are explained using the concept of bonding forces. Participants acquire a fundamental understanding of the properties of adhesives.

Adhesives

In this section of the course the participants are familiarized with the most important types of adhesives used in industry and learn about the properties of those adhesives and the main areas of application. Emphasis is put on the importance of processing and applying the adhesives in the correct way and on the solidification conditions for the different adhesive systems. These aspects are reinforced by practical assignments.

Surface treatment

Customized surface treatment is vital if a bond is to function correctly and have good long-term stability. The course introduces surface treatment techniques that are normally carried out by workers as a direct part of the adhesive bonding process. Practical experiments give participants experience applying these techniques to a variety of substrates. Particular emphasis is put on the use of primers and adhesion promoters.

Test methods

In the practical part of the course adhesive bonds are created and then tested using commonly used procedures. Evaluation of the bond strengths and the fracture patterns allows adhesive bond defects and their effects to be recognized, so complementing the theoretical part of the course.

Manufacturing technology

The participants will be introduced in the fundamental aspects of manual production engineering. Besides they will be instructed how to identify and avoid sources of error.

Work and environmental protection

Participants learn about the principles for recognizing potential dangers when working with adhesives and auxiliary materials used in adhesive bonding processes. The importance of using protective equipment and wearing protective clothing is highlighted.

EUROPEAN ADHESIVE SPECIALIST (EAS)

IN ACCORDANCE WITH GUIDELINE EWF 516
THE COURSES FULFILL THE REQUIREMENT ACCORDING DIN 2304 AND DIN 6701

EAS

Objectives of the training course
The participants will become trained for using adhesive bonding technology in industrial production and for product development. On successful completion of the course, participants will be able to prepare work instructions and supervise European Adhesive Bonders and other employees on theoretical and practical matters relating to adhesive bonding. You will also be able to plan, organize, and monitor adhesive processes, monitor process parameters, and if necessary adjust them. You will be in a position to identify irregularities in production processes and respond accordingly. Successful completion of the course qualifies the person to take on the tasks and responsibilities of the supervisor in charge of adhesive bonding work in a company (in accordance with DIN 2304, DIN 6701 and guideline DVS® 3311).

Duration of the training course and examination
The course is a three week course. The course weeks are organized at a stretch to reduce travel costs for the participants. To aid the learning, the theoretical part is backed up by practical assignments. Each course week concludes with a written intermediate examination. The practical examination takes place during the second week of the course. The final examination must be taken within a period of twelve months. A prerequisite for taking the examination is regular attendance at the course sessions.

Preliminary course
The computer-based preliminary course touches topics which will be covered in the actual course and is offered to participants in advance online to freshen up their knowledge, if they wish. The learning program was developed to ease introduction to the theory and to refresh old knowledge. This preliminary course can be studied at any time and place which is convenient for the course participant and allows customized preparation for those who will take the actual training course.

Target groups and prerequisites for participation
Target groups are employees of adhesive users in industry and the handicrafts sector, adhesive manufacturers, the adhesives trade, and testing and quality assurance personnel. The course is aimed at master craftsmen in the handicrafts sector and industry and technologists and specialized technical employees with a professional qualification and leading function who wish to expand their knowledge in adhesive bonding technology. Participants must have sufficient knowledge of the course language to enable them to understand the course material and take the examinations in that language.

COURSE CONTENT

Fundamentals

The course starts off by introducing fundamental aspects of adhesive bonding technology. The advantages and limitations of adhesive bonding technology will be covered and a comparison will be made with other joining techniques. Participants will acquire a fundamental understanding of bonding mechanisms and the properties of adhesives. The key importance of wetting for the adhesive bonding process and how this can be influenced by various parameters will be highlighted.

Adhesives

There are thousands of different adhesive products. The range of products extends from elastic-soft polyurethanes right through to high strength epoxy resins. Participants will learn which types of adhesives are most important for industry and will get an insight into their distinctive properties and how they differ. Instruction on the processing and application of adhesives – accompanied by practical exercises using different types of adhesives – are key aspects of the first week of the course.

Substrates

The course will provide the participants with knowledge about the structure and behavior of substrate materials when they are subjected to external forces and environmental influences. This will help participants estimate deformation and property changes in adhesive layers, and so understand the resulting requirements of material specific surface treatments.

Surface treatment

The importance of the condition of the surface of substrates for the adhesive bonding process is another topic covered in the course. Participants will gain theoretical and practical knowledge of the most important methods of surface treatment for a variety of different materials. The topics covered will range from cleaning the surfaces of substrates via mechanical, physical and chemical pre-treatment methods right through to the use of primers and adhesion-promoters.

Properties of the adhesive layer

In order to assess the suitability of an adhesive for a particular application it is necessary to appraise the deformation behavior. Put another way, the factors that determine the deformation behavior set the limitations for the use of a particular adhesive system. Fillers and absorbed moisture can affect the deformation behavior just as significantly as temperature and adhesive layer thickness.

Test methods

The quality of an adhesive bonded joint concerns far more than merely high strength after curing. Other factors that are just as important are reproducibility and long-term stability. The necessity to use destructive test methods to determine the quality of joints is demonstrated using samples which the participants will make themselves during the course. The limitations regarding the transferability of results from standard tests to real components will become clear.

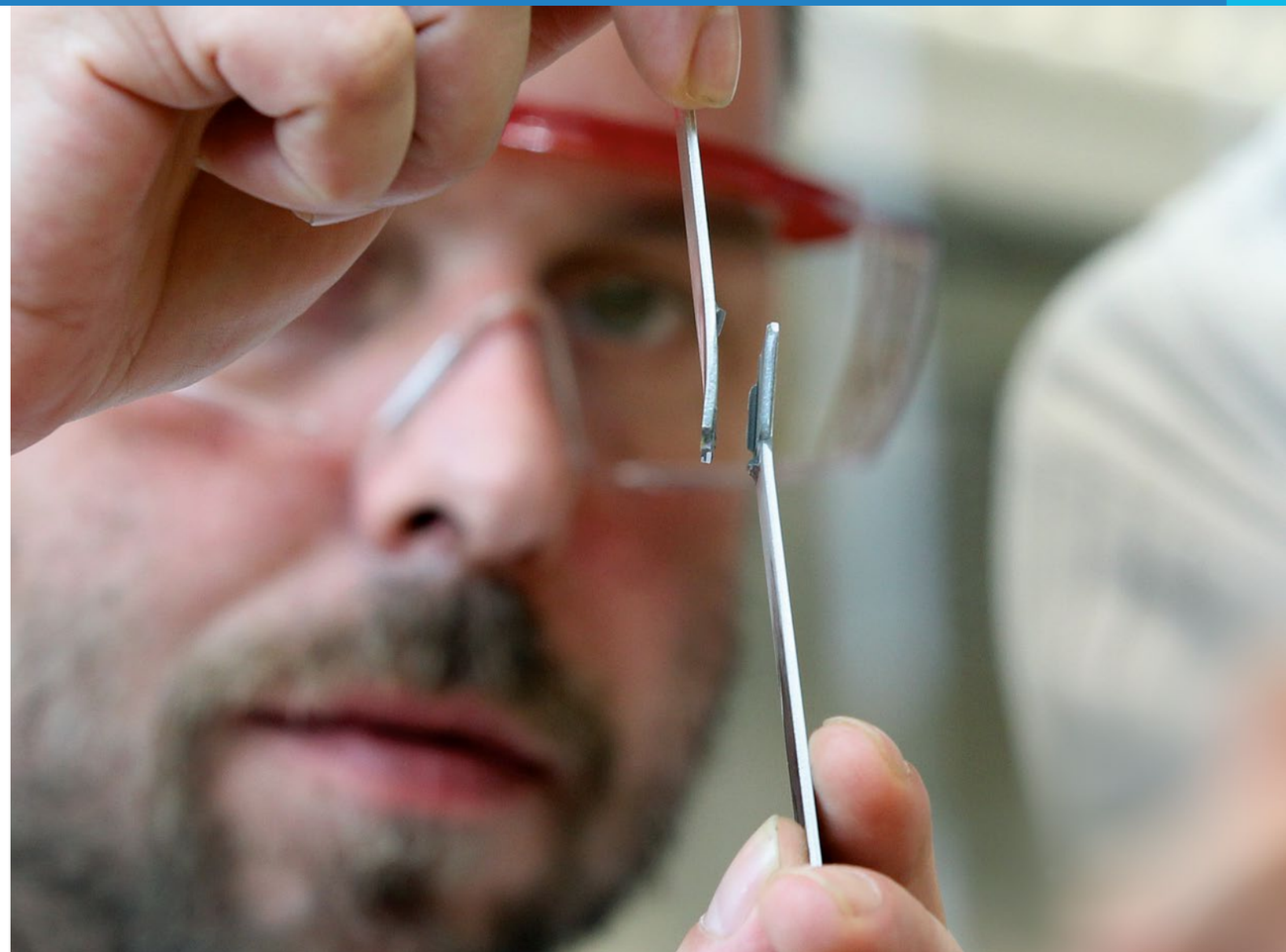
Work safety and environmental protection

"Ignorance" is the main cause of accidents at work. The correct handling of adhesive systems hence requires an extensive fundamental knowledge of the specific hazards associated with the materials being used. This does not only apply to the adhesives but also to the many auxiliary materials that are used in the adhesive bonding process.

Further information including details of fees and course dates can be found in the course schedule brochure or on our website: **www.bremen-bonding.com**

EUROPEAN ADHESIVE SPECIALIST (EAS)

EAS



EUROPEAN ADHESIVE ENGINEER (EAE)

IN ACCORDANCE WITH GUIDELINE EWF 517
THE COURSES FULFILL THE REQUIREMENT ACCORDING DIN 2304 AND DIN 6701

EAE

Objectives of the training course

The EWF-European Adhesive Engineer course trains employees to supervise the whole spectrum of bonding work from product development to production and on to repair activities. For correct technical application of adhesive bonding technology this function requires interdisciplinary thought, decision-making and actions, as well as being able to oversee and take account of the entire product life cycle in a responsible way. Successful completion of the course qualifies the person to take on the tasks and responsibilities of the supervisor in charge of adhesive bonding work (in accordance with DIN 6701 and guidelines DVS® 3311 and DIN 2304).

Duration of the training course and examination

The total duration of the course, including the examination, is 332 hours and is split into 4 two-week sections focusing on different topics. The course weeks are spread out over a period of 7 months. The first seven course weeks finish with a written examination over the topice of each week. The whole course must be completed within a maximum period of 3 years and ends with an oral examination over the complete course.

Target groups and prerequisites for participation

The target groups are engineers and scientists in all disciplines and sectors of industry who either currently use adhesive bonding technology or wish to use this technology in the future. The EWF-European Adhesive Engineer course fulfills the requirements of DIN EN ISO 9001 for specially qualified personnel for supervising processes whose results cannot be fully verified and which are hence also referred to as “special processes”.

A precondition for participation is a degree in engineering or natural sciences (Bachelor degree and higher) at a university or technical college. Persons interested in the course, but who do not fulfill these requirements, can participate in the course as guest, but won`t recieve the official EWF-certificate.The successful course attendance will be confirmed by the issue of a certificate of attendance. This is a recognized qualification for taking on the tasks and responsibilities of the supervisor in charge of adhesive bonding work in a company (in accordance with DIN 6701 and guidelines DVS® 3311 and DIN 2304). Participants must have sufficient knowledge of the course language to enable them to understand the course material and other technical literature and take the written and oral examinations in that language.

COURSE CONTENT

Principles of materials

This topic covers the fundamental principles for understanding adhesive bonding technology. This includes knowledge about the primary and secondary structures of polymers and other materials and the relationship between this structural information and application-related properties.

Bonding properties of materials to be joined

The subject matter here concerns the bonding properties (bulk and surface) of metals, plastics, fiber reinforced plastics, and glass. These are key aspects for understanding the necessity for and effects of material specific surface treatment methods.

Adhesives, bonding mechanisms and application properties

The processing characteristics and solidification mechanisms of different types of adhesives and their properties in the solid state are key topics of adhesive bonding technology. An insight into the composition and formulation of adhesives will also be given. A practical session will take place to consolidate the theoretical information.

Analysis of adhesives and surfaces

Amongst the analytical methods mentioned in the course are:

- Differential Scanning Calorimetry (DSC)
- Dynamic Mechanical Analysis (DMA)
- Thermal Gravimetric Analysis (TGA)
- Infrared Spectroscopy (IR)
- Differential Thermal Analysis (DTA)
- Electron Spectroscopy for Chemical Analysis (ESCA)
- Auger Electron Spectroscopy (AES)
- Scanning Probe Microscopy (SPM)
- Sacanning Electron Microscopy (SEM)

Adhesion

The main focus is to provide basic knowledge about the adhesion principles in the contact area between adhesive and substrate surface. The understanding of the fundamental forces and principles, which are the basis of adhesive bonding technology but which also provide limitations, is used for critical appraisal of many established models, proposals and processes. Practical experiments will also be undertaken.

Surface treatment

This topic covers the specialized cleaning of different surfaces as well as the effectiveness and areas of application of material specific pre- and post treatment techniques.

Manufacturing technology

The rheological behavior of adhesives as well as application and curing techniques are dealt with in this part of the course. This includes the various types and performances of the individual components of manual, semi-automatic and fully automatic equipment.

Joining techniques

This section will include a discussion of welding, clinching, riveting and lockbolting. The aim is to identify synergies when these techniques are combined with adhesive bonding and to hence open up new applications for which the individual techniques alone are inadequate.

Design and dimensioning

Further development of dimensioning and calculation methods for adhesive bonding technology is currently a hot topic of research. This course gives an insight into rules of thumb and fundamental analytical as well as numerical models and describes their practical relevance. Using examples, the procedure for solving a variety of constructional tasks will be explained. Attention will also be put on matters relating to the evaluation design and the determination of knock down factors.

EUROPEAN ADHESIVE ENGINEER (EAE)
EAE

Quality management, test methods (destructive and non-destructive), ageing

To supplement a general quality management system, which is not dealt with here, the course covers the topic of quality management from a specific technological point of view. The entire process chain from the conception stage right through to the end of the lifetime of the product is considered from a quality assurance perspective. The focus is put on non-destructive test methods and the ageing of bonded joints.

Work safety and environmental aspects

The area of responsibility of an EAE also involves participation in decision making on matters relating to work safety and environmental protection. The course hence covers physiological and environmental issues, statutory regulations and protective measures relating to adhesives.

Further information including details of fees and course dates can be found in the course schedule brochure or on our website: **www.bremen-bonding.com**

IN-HOUSE COURSES

EUROPEAN ADHESIVE BONDER

in accordance with guideline EWF 515

EUROPEAN ADHESIVE SPECIALIST

in accordance with guideline EWF 516

In-House courses

Many larger companies now operate globally and have premises and production facilities in a number of different countries. We offer In-House training courses (European Adhesive Bonder, European Adhesive Specialist) to personnel at these locations, so minimizing travel time for the participants and reducing the costs for the company. Each course can have between 10 and a maximum of 18 participants.

The prerequisites for participation, length of the courses, objectives, and course materials are identical to the courses held at the Training Center for Adhesive Bonding Technology in Bremen. You can select the course language, depending on your needs. The courses can be held in German or English or translated (including the written course documentation) into the relevant local language. In consultation with the company/organization, certain aspects of the courses can be tailored so that they have relevance to specific production-related issues. On successful completion of a course, including the examination, a participant will receive a DVS®/EWF certificate and EWF certificate.

All equipment, materials, and documentation required for the courses (instruments/tools, consumables such as adhesives, substrates, etc. for the practical sessions, and written course documentation) will be made available by the Training Center for Adhesive Bonding Technology and will be transported to the venue prior to the course.

For courses outside the EU other regulations may apply.

General requirements for In-House training courses held at your company premises are as follows:

- The availability of, if possible, two separate rooms:
- Theory room with tables, beamer, flip-chart or whiteboard, including pens, etc.
- Practical room with work benches, adequate ventilation and air extraction, plus facilities for waste disposal.
- If agreements are made, production areas can also be used for the practical sessions.

Please contact us to discuss the necessary arrangements for a training course at your location and to arrange suitable dates.

We also commission national and international partners to give these training courses in accordance with our quality requirements. The tutors are trained by us and they have close contact with Fraunhofer IFAM via regular meetings. This guarantees the high-quality of the training courses, independent of the venue.

In many cases no translation costs are incurred because the tutors speak the relevant local language. Additionally, travel costs are lower because the participants attend the courses in their own country.

Further information including details of fees and course dates can be found in the course schedule brochure or on our website: **www.bremen-bonding.com**

SPECIAL SEMINARS

According to ISO 9001, adhesive bonding is a "special process". This is due to the fact that important properties of the resulting bonded joints (e. g. the strength) cannot be tested with 100 % certainty by non-destructive means. Consequently there is a need to verify the bonding process via quality assurance measures. Namely, the process must be controlled and managed. The adhesive bonding process consists of a chain of steps, starting with the development and planning phases and on to production, final product inspection, and in some cases further steps (e. g. maintenance work during the usage phase).

A key aspect of quality assurance is the training of the relevant personnel. These personnel include those directly involved with the adhesive bonding work (e. g. production personnel, supervisors in charge of adhesive bonding work) and also those only on the periphery (e. g. personnel involved with purchasing, warehousing, and logistics), all of whom must possess relevant knowledge of adhesive bonding in order to effectively perform their work activities.

In addition to the existing, internationally recognized DVS®/EWF courses, we also provide special seminars for these groups of employees. The duration and content of these seminars can be customized to meet the needs of the relevant personnel.

We have already carried out special seminars for personnel working in the following areas:

- Purchasing
- Warehousing and logistics
- Production planning
- Operators of fully automated bonding plants and robots

We will gladly work with you to prepare new seminars to meet your particular needs or can adapt existing seminars to your wishes. These seminars can also end with theoretical and, if necessary, practical examinations, so giving the participants accreditation for their newly acquired knowledge. This is of particular relevance with regards to DIN 2304 which describes the organizational matters relating to quality assurance in companies using adhesive bonding technology and also, amongst other things, the required training qualifications for the relevant employees. We can also offer these special seminars In-House at your company.

Further information including details of fees and course dates can be found in the course schedule brochure or on our website: **www.bremen-bonding.com**

REFRESHER COURSES

Background and purpose of the Refresher Course

The Training Center for Adhesive Bonding Technology at Fraunhofer IFAM in Bremen has been providing internationally recognized courses in adhesive bonding technology for 25 years. During this period enormous developments have taken place in adhesive bonding technology and also in training in this technical field. The DVS®/EWF workforce training system has been successfully established in Europe and is now also being offered worldwide. The course contents have been continuously updated to take account of the dynamic developments in this technological field and enormous improvements have been made with didactic aspects of the courses. For these reasons we are now offering three-day Refresher Courses for our DVS®/EWF accredited courses. The Refresher Courses are directed at former course participants who want to refresh their knowledge of adhesive bonding technology and learn about the latest developments. The Refresher Courses meet the requirements of guidelines DVS® 3311, DIN 2304, and DIN 6701 for the continuous updating of adhesive bonding knowledge by supervisors in charge of adhesive bonding work.

Further information including details of fees and course dates can be found in the course schedule brochure or on our website: **www.bremen-bonding.com**

CONTACT AND COOPERATION PARTNERS

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If you any questions about registering for the course, then please contact

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FRAUNHOFER ACADEMY

Fraunhofer IFAM is a founding member of the Fraunhofer Academy

Handling new technology and new methods and processes wants to be learned. If current research knowledge is to unfold its innovative potential in companies, smart minds with the relevant know-how are needed. The Fraunhofer Academy, the consortium of all Fraunhofer Institutes with a focus on advanced training, provides the necessary qualification for specialists and managers. It is the expert supplier for advanced training on the job. Specialists and managers profit from a unique knowledge transfer flowing from Fraunhofer Research to the companies. The "knowledge generators" simultaneously act as "knowledge transmitters".

What started out as a project, has developed into a well established and renowned institution of the German education and training landscape.

Since the founding the Fraunhofer Academy has continually grown. In the beginning phase the academy comprised the activities of four Fraunhofer Institutes offering one program each, today 17 facilities are responsible for 25 programs in five thematic areas:

- Technology and Innovation
- Energy and Sustainability
- Logistics and Production
- Production and Testing Technology
- Information and Communication

Due to the close co-operation with industry and businesses, Fraunhofer knows the current technical as well as social challenges and turns research results into usable innovations in an efficient and targeted way. This up-to-date knowledge from experience is reflected in the course offers of the Fraunhofer Academy.

For further information about the Academy's program
www.academy.fraunhofer.de/en.html

WWW.BREMEN-BONDING.COM