



¹ *Manual lamination as an introduction to manufacturing FRPs – one aspect covered in the FRP-Specialist training course at the Fraunhofer IFAM.*

FIBER REINFORCED PLASTIC SPECIALIST (FRP-SPECIALIST)

Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM – Adhesive Bonding Technology and Surfaces –

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Objectives of the training course

The course provides training for employees involved in designing fiber reinforced plastics and planning their industrial manufacture. Direct linking of the theoretical and practical knowledge means that the participants acquire a fundamental understanding of the effects of the individual components (e. g. fibers, matrix materials, core materials, fillers) on the properties of the final FRP components. This knowledge is vital to be able to effectively monitor production processes. The course thus teaches the participants how to select suitable raw materials and manufacturing methods in order to meet the product requirements. After successful completion of the course, the participants will be able to select suitable matrix materials to manufacture high-quality FRP components. They also acquire a comprehensive overview of current manufacturing methods and learn the differences between processing thermosets and thermoplastics.

Duration of the training course and examination

The total duration of the course, including the examination, is 120 hours and is split into three one-week modules focusing on different topics. To aid the learning, the theoretical part is backed up by a large number of practical assignments. Each course week ends with a written intermediate knowledge test. There are final oral and practical examinations on the last day of the course. A prerequisite for taking the examination is regular attendance at the course sessions.

Target groups and preconditions for participation

The course is aimed at employees in industry whose work involves planning the manufacture of FRPs and implementation in the process chain. The course is also aimed at employees in companies that want



to start manufacturing FRPs. Participants must have adequate knowledge of the course language to enable them to understand the course material and take the examinations.

COURSE CONTENT

Fundamentals

The course starts by covering the fundamentals of fiber reinforced plastics (FRPs). In theoretical and practical sessions, the participants learn about the special features of these materials and about the various components of FRPs (fibers, matrix materials, core materials, fillers) and their effects on subsequent component properties. The differences between thermoplastics and thermosets are explained as are the typical features and properties of different fiber materials. Also covered are special aspects relating to the processing of FRPs. The practical sessions highlight the advantages and disadvantages of the various joining methods for FRPs (e. g. adhesive bonding, bolts/screws).

Influencing factors

In order to customize the product properties to specific requirements, it is vital to have knowledge about all influencing factors and their effects on the final products. The participants learn how to estimate the effects of the individual raw

materials (matrix, fiber type, textile semi finished product) on the resulting properties of the FRP component and how to use these findings in the production process planning. They also learn that not only does the nature of the raw materials have a key effect but also their concentration and spatial distribution. Optimal laminate structure and component geometry to maximize fiber/matrix interactions are also dealt with.

Manufacturing methods

The participants are introduced – in theory and practice – to the principles of manual and machine-based production technology. In addition to manual lamination, the special features of modern production methods such as thermoplastic processing, vacuum infusion technology, resin transfer molding (RTM), press methods, autoclave technology, winding methods, and pultrusion are discussed. The effect of the choice of matrix on the FRP production process is covered as are the necessary boundary conditions for production processes. Also discussed is how the production process, as well as the choice of raw materials and laminate structure, can affect the resulting properties of FRP components. In addition, the identification and prevention of errors and defects are discussed.

Safety and environmental protection

Fundamental safety measures to be taken when working with fibers, plastics, and auxiliary materials are discussed. The proper use of work equipment and protective equipment is also covered.

Certification and accreditation

| The Division of Adhesive Bonding Technology and Surfaces is accredited according with DIN EN ISO 9001, and the laboratories for material testing, corrosion testing, and paint/lacquer technology are further accredited in accordance with DIN EN ISO/IEC 17025.

2 *The high practical content of the FRP-Specialist training course reinforces the theoretical content.*