



# Molding the future: ENGEL takes composite approach to composites

**Cordelia Sealy**

Austrian company ENGEL has grown from a machine manufacturer to a worldwide leader in injection-molding system solutions over the last 70 years. Peter Egger, Director of ENGEL's Center for Lightweight Composite Technologies, tells Reinforced Plastics how ENGEL has done it and what the future holds.



Peter Egger

Ludwig Engel founded ENGEL in 1945 as a machine manufacturer producing components for steel mills and cable cars. But in 1948, ENGEL patented its first plastics press. Four years later, the company introduced an injection-molding machine onto the market and, by 1959, was providing a complete range of injection molding machines. ENGEL was one of the first companies in Europe to produce injection-molding machines in series.

Since then, the company has remained 100% family-owned and independent of external investors. This unique position has enabled the company to plan for the long term and respond to market trends at an early stage. The company has developed from

a manufacturer of injection-molding machines to a system supplier and preferred partner for sophisticated injection-molding solutions to the worldwide market.

In 2012, ENGEL founded the Center for Lightweight Composite Technologies to support the development of new composite technologies and manufacturing processes. Located at ENGEL's large-scale machine production facility in St. Valentin, Austria, the Center has 18 staff working on development, application technology, and project management for lightweight composites. Peter Egger, Director of the Center explains how its work is bringing innovative composite technologies to the market.



ENGEL's Center for Lightweight Composite Technologies in St. Valentin, Austria.

### What is ENGEL's main focus?

As a single-source supplier, ENGEL delivers highly integrated and automated manufacturing cells including not only injection molding machines, but also upstream and downstream processing steps, processing technology, molds, automation and other peripheral equipment. Besides injection molding machines, ENGEL develops and manufactures various types of robots and, in addition to this, has established a worldwide network of system partners.

### Who are ENGEL's main customers?

We deliver injection-molding machines, robots, and system solutions to major global corporations, as well as medium and small-sized injection-molding companies in the automobile, teletronics, packaging, medical, and technical molding industries. This includes white goods and household products, toys and sports equipment, among other things.

### Where is ENGEL currently seeing growth in its markets?

At the moment, North America and Asia are among the strongest motors driving growth and are expected to remain so in coming years. However, Europe showed it still has some potential over the last fiscal year.

### Why did ENGEL establish the Center for Lightweight Composite Technologies?

The objective of the Center for Lightweight Composite Technologies is to promote the intensive interdisciplinary development of fiber composite technology with partner companies and universities to accelerate the market launch of new manufacturing processes. One important precondition for successful fiber-reinforced plastics (FRP) projects is that the materials, design, and production process mesh in the best possible way. This can only work if enterprises bundle their expertise along the value chain. Composite engineering needs 'composite' development.

### What are the major challenges facing the lightweight composites sector?

People are not ready to design with composites, composites are still quite expensive, and processes have not made their way fully into automation.

Of the materials with lightweight construction potential, FRP composites are particularly promising, combining optimum mechanical properties with low material densities. Aerospace and racing have long known this and push extreme lightweight construction to a very high level. But because only small quantities are required in these sectors, the demand for automated processes compatible with large series production is not so pronounced.

In the automotive sector, there are high demands on safety, comfort, energy efficiency, and environmental protection. It is a real challenge to satisfy all these requirements equally—conflicts of aims repeatedly appear. For example, new safety regulations and higher comfort requirements lead to higher vehicle weight, which goes against requirements for lower energy consumption. Reducing vehicle weight is an important key to resolving this conflict, so increased use of lightweight construction materials is essential.

As in aeronautical engineering, the automotive industry currently uses FRP composites with thermoset matrix systems. However, vehicle manufacturers are extending the requirements spectrum to other parts, with a focus on mechanical properties,

quantities, and the total unit cost. These requirements can be satisfied by thermoplastic FRP composites. The strengths of these materials are the result, in part, of shorter cycle times and ease of integrating function, which improves the unit cost, particularly in large series. Apart from the advantages that thermoplastic matrix systems can be tailored to an application and specific structural/property profiles can be obtained, they can also be recycled. The lifecycle of materials is increasingly considered holistically. Components that are produced in large series, in particular, require simple recycling solutions.

### How is the Center addressing these challenges?

Lightweight design in automobile construction is currently one of the strongest drivers of innovation. Aircraft construction leads the way, but the established processes for producing lightweight components in this sector cannot be simply transferred to the automobile industry, which is characterized by large batch numbers. It is, therefore, necessary to develop new processes, as well as new materials, to achieve the productivity and cost-efficiency required by automobile manufacturing. Important keys for this include injection molding, which offers much potential for process integration and automation, and thermoplastic matrix systems that allow for short cycle times.

As an injection-molding machine manufacturer with a great amount of expertise and experience in automation, ENGEL is making significant contributions in this area.

The Center's particular focus is on processing semi-finished thermoplastic products (thermoplastic fabrics and tapes) and on reactive technologies that use thermosets and thermoplastic systems, such as HP-RTM and *in situ* caprolactam polymerization, as well as compression technologies.

In the automotive sector, our main focus is to bring composites from the lab or small-batch number processing to a production technology for large volumes. For example, the combination of thermoforming thermoplastic fabrics with injection molding in the organomelt process and the development of efficient new vertical systems for the HP-RTM process. We are working on how to realize improved input of composite materials by using thermoplastic UD-tapes where we really need it.

### How is ENGEL developing its relationship with the automotive sector?

The dynamic markets in the automotive industry require a high level of innovation, and ENGEL delivers this on a daily basis. There are two examples I would like to describe here.

ENGEL is a one-stop source of tailored system solutions: from automation, process engineering, and mold project engineering, through to training and services. In turn-key business, all the plant components are precisely matched right from the outset. This means that efficiency as well as quality potentials can be made full use of, resulting in the lowest possible unit costs and improved competitiveness. Integrating robots, process engineering, testing equipment and other peripherals with control technology also facilitates the use and control of more complex processes, making a decisive contribution toward greater reproducibility and process reliability. When ENGEL is used as a system supplier, the customer only communicates with one ENGEL contact, which can speed up the project planning and startup of the plant significantly.

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