ENGEL at China Composites Expo 2018 in Shanghai

Maximum efficiency for integrated composite processes in high-volume production

Schwertberg, Austria – July 2019

ENGEL, headquartered in Austria, supplies customised manufacturing cells from a single source to facilitate the highly efficient and cost effective series production of fibre composite components. At China Composites Expo 2019 from September 3rd to 5th in Shanghai, China, the injection moulding machine manufacturer and system solutions provider is presenting a broad spectrum of technologies based on examples from the automotive industry, from the processing of organic sheets and unidirectional tapes to HP-RTM and flow moulding with SMC.

“The government has strongly promoted electric mobility for years,” says Christian Wolfsberger, Business Development Manager Composite Technologies at ENGEL, explaining the special nature of the Chinese market. “As a result, lightweight design has developed throughout Asia with a special dynamic with ENGEL playing a successful role. ENGEL has long been one of the preferred partners to automotive companies with operations in Asia”. In cooperation with other companies and universities, ENGEL develops new, and highly cost-effective processes for FRP lightweight engineering in high-volume production at its Center for Lightweight Composite Technologies in Austria, which was established in 2012. At China Composites Expo, the machine manufacturer is providing insights into ongoing development work and large-volume projects that are currently being implemented.

Fully automated one-shot process with ENGEL organomelt

The processing and functionalisation of thermoplastic continuous fibre-reinforced semi-finished products, such as organic sheets or UD tapes, using the ENGEL organomelt process is one of the key focuses at ENGEL’s info stand at China Composites Expo. Last year,
the world’s first large-scale application was launched in the USA. Starting with organic sheets, Valeo Front End Modules in Smyrna, Tennessee, manufactures front-end carriers with integrated air ducts for a German brand name OEM. In 2018, the structural components received an Automotive Award from the Society of Plastics Engineers (SPE) for their innovative production based on organic sheets and its outstanding properties. The components use an extremely high proportion of organic sheet, resulting in significant weight savings and improved crash performance. In addition, it was possible to integrate the air ducts directly into the support using a double-shell structure.

The systems solution supplied by ENGEL for automated high volume production consists of a duo 1700 injection moulding machine, three easix articulated robots for preparing large quantities of metal inserts and for handling the organic sheet, one viper 90 linear robot and an ENGEL IR oven. ENGEL supplied the manufacturing cell as a systems solution from a single source. The two half-shells are produced in the same mould in a one-shot process. For this purpose, the two organic sheets are simultaneously heated in the IR oven, inserted into the mould, formed, and immediately after this, directly functionalised in an injection moulding process.

The organic sheets are based on glass fibres in a polypropylene matrix. Glass-fibre reinforced polypropylene is also used for overmoulding. It is only this consistent thermoplastic approach that makes it possible to integrate the forming process and functionalisation, and to connect the supporting structure and functional elements so that the materials interlock. “The fully automated one-shot process makes a significant contribution to reducing unit costs,” as Wolfsberger emphasises. A further benefit: the use of exclusively thermoplastic polymers simplifies the development of recycling strategies with the aim of returning the components to the material cycles at the end of their service life. “We can see that thermoplastic-based composite lightweight design is increasingly becoming the focus of product developers, both in the automotive and aircraft industries,” as Wolfsberger adds.

For everyone who would like to learn more about this topic: at 11 a.m. on the first day of the fair, Simon Liu, Head of Application Technology ENGEL Machinery (Shanghai), will report on the project and future prospects of UD tape processing together with Valeo at the Automotive Innovation Conference (AIC) in the conference area next to Hall 4, and will also be providing an outlook on UD tape processing.
Laying and consolidating tapes in the injection moulding cycle

ENGEL organomelt technology is suitable for both organic sheets and unidirectional (UD) glass and/or carbon fibre reinforced tapes with a thermoplastic matrix. Tapes make it possible to design semi-finished products in line with requirements and thus make even better use of the components’ lightweight construction potential. The components are either partially reinforced with just a few tapes or are produced from tape stacks several millimetres thick.

To be cost-effective in high-volume production, the stacks must be laid and consolidated inline and within the cycle of the injection moulding process. As a system supplier, ENGEL is in a position to offer integrated and fully automated solutions for the entire process – from individual tapes through to functionalisation in the injection moulding process – from a single source. Two systems are used for the production of the stacks. A pick-and-place tape stacking unit with optical image processing and a consolidation unit that can both be seamlessly integrated into the overall process, which significantly increases efficiency in the production of tailor-made tape solutions.

The tape laying cell was developed by ENGEL. With the cell, tapes can be laid and spot-welded together in a three-second cycle. Because the stacks are given the shape required for the component during laying, consolidation can be followed by forming and functionalisation in the injection moulding step without the need for intermediate trimming.

HP-RTM and SMC: More efficiency for duromer systems

At the fair, ENGEL is using two examples from the field of lightweight duroplastics design to demonstrate that production efficiency can still be improved – even for long-established technologies. One topic at the stand will be the CRP rear panels of the Audi A8. These large-scale components with a complex carbon fibre structure and local reinforcements are produced by Voith in Garching, Germany, on an ENGEL v-duo 1700 machine using the fully automated HP-RTM process.

ENGEL will also be presenting gear carriers based on C-SMC (Sheet Moulding Compounds). In a development project, ENGEL, together with the Institute for Polymer Product Engineering IPPE at Johannes Kepler University in Linz, Austria, as well as Hexcel from the USA and Alpex from Austria, have further developed the production process based on flow moulding for these dynamically highly stressed vehicle components. The starting material is a flat car-
bon prepreg with fibre lengths of 50 mm and a matrix of epoxy resin. Analysis of the first components shows significant weight savings and improved component properties compared to the original aluminium component.

From sophisticated visible and outer skin components to structural components with integrated functionality, flow moulding with SMC is used for a wide range of fibre composite components. With its powerful measuring and control technology, flexible compression moulding process and integrated parallelism control, the ENGEL v-duo machine is predestined for SMC processing. The processing parameters can be specifically adapted to the component requirements in order to achieve an even higher quality.

ENGEL at China Composites Expo 2019: Hall 4, Stand A3532

ENGEL supplies highly integrated and fully automated production cells for the manufacture of composite components from a single source. The illustrated system for organomelt technology comprises a duo injection moulding machine, a viper linear robot and an easix articulated robot, an IR oven as well as conveyor belts and other handling units.
The tape laying cell developed by ENGEL uses high-resolution camera technology to produce precise stacks from tape blanks.

In short cycles, flow-pressing with C-SMC allows complex geometries to be achieved. ENGEL is showcasing the potential of this process with transmission carriers.

Pictures: ENGEL

ENGEL AUSTRIA GmbH

ENGEL is one of the global leaders in the manufacture of plastics processing machines. Today, the ENGEL Group offers a full range of technology modules for plastics processing as a single source supplier: injection moulding machines for thermoplastics and elastomers together with automation, with individual components also being competitive and successful in the market. With nine production plants in Europe, North America and Asia (China and Korea), and subsidiaries and representatives in more than 85 countries, ENGEL offers its customers the excellent global support they need to compete and succeed with new technologies and leading-edge production systems.
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