# PRESS RELEASE

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**Equipment for mass manufacturing of carbon parts**

**RTM presses offer short cycle times and high part quality**

*Waghäusel/Göppingen, March 7, 2014* – Carbon fiber-reinforced plastics (CFRPs or simply carbon) have been used for the manufacturing of cars for several years now. As the ultra-light and extremely rigid material is much more expensive than steel or aluminum, however, it is rarely used in mass manufacturing processes. Schuler now offers lines which can economically produce CFRP parts – even in large volumes. They are used by BMW, for instance, to manufacture carbon-fiber parts of the new electro vehicle i3.

For the manufacturing of carbon parts, Schuler uses the RTM (Resin Transfer Molding) process in which woven carbon fiber mats are placed in a die, filled with resin and hardened by applying heat and the pressure of the press. “High-pressure RTM presses not only enable shorter cycle times for complex parts with high requirements regarding geometry and rigidity, but also deliver consistently high part and surface quality,” says Product Manager Raimund Zirn. This virtually eliminates so-called voids, i.e. resin-free vacuum pores or gaps within the part or along its edges.

In the high-pressure RTM process, resin is injected as quickly and smoothly as possible into the vacuum mold which is opened by just a few tenths of a millimeter. This gap injection process enables the resin to spread over the mat with far less flow resistance and thus with low injection pressure. It then quickly infiltrates the mat before polymerization is started by heat induction.

## The curing process begins with the wetting of the last fibers

“The vacuumizing, fast resin injection, high resin pressures and tempered dies mean that the gelling process virtually begins with the wetting of the last fiber,” explains Raimund Zirn. Curing takes four to eight minutes – the thicker the part, the longer, as the reaction heat cannot be led as easily into the die. Depending on the part, the necessary resin pressures also vary between 30 and 150 bar. Large-surface exterior panels with clamping areas of 3,600 x 2,400 mm require total press forces of 36,000 kN or more.

Due to the geometry of the part or cavity surface, the die’s center of loading is not necessarily in the middle of the press. There are also off-center forces from the injection positions. “The parallelism control prevents the slide or upper die from tilting during gap injection and thus ensures smooth and even injection over the entire surface,” explains the Product Manager. With a positioning speed of 1 mm/s, the Schuler presses achieve parallelism values of 0.05 mm in absolute terms with diagonal clamping surfaces of 4 m.

The preform and part handling processes, as well as the necessary die cleaning, account for a considerable part of the RTM cycle lasting two to three minutes. “This largely involves the removal of plastic residues, which mainly stick to the polymer seal located in the lower die,” adds Raimund Zirn. On request, however, Schuler can fit the RTM presses with two shuttle moving bolsters so that a common upper die can be operated with two alternating and movable lower dies. This reduces downtime to the period it takes to replace the lower dies, e.g. with a distance of 4.5 m per moving bolster approximately 20 s.

## Upstroke short-stroke presses offer more benefits

RTM presses are available in two designs: conventional downstroke machines work with a fixed bed and moving bolster, and a slide whose press force is transmitted via cylinders in the press crown. Parallelism is ensured by four servo-controlled counterpressure cylinders located at the bed corners. These are also responsible for the breakout force needed to counter the adhesive forces and open the die.

In the upstroke short-stroke press, the slide only acts as support during the pressing process. From top dead center, the slide is moved by a drive cylinder to its support position and locked there. The actual working stroke is performed by the bed plate, driven by several short-stroke cylinders. Parallelism is ensured by the servo controlling of these cylinders. The breakout force in upstroke presses is achieved by the withdrawal of the bed plate. “The benefits of the upstroke short-stroke press compared to downstroke designs are the high closing speeds of 1,000 mm/s, the shorter pressure build-up times of under 0.3 s and the significantly lower construction height,” states Raimund Zirn.

## Order from British National Composites Centre

These benefits coupled with Schuler’s expertise in the field of forming technology also led the National Composites Centre in Bristol, UK, to place an order with the press manufacturer for a line to manufacture composite materials. The order is for an upstroke short-stroke press with 36,000 kN of press force and a clamping surface of 3.6 x 2.4 m. With its various process modes, the press covers all common press methods for composite materials, including CFRPs.

### Pictures

Bild1.jpg: The benefits of the upstroke short-stroke press are high closing speeds, shorter pressure build-up times, and a lower height.

Bild2.jpg: Schuler presses are used by BMW to manufacture carbon-fiber parts of the new electro vehicle i3.

*Please name Schuler as the photo source.*

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*As the technological and global market leader in metal and plastic forming equipment, Schuler offers cutting edge presses, automation, dies, process know-how and services for the entire metal forming industry and lightweight vehicle construction. Its clients include car manufacturers and their suppliers, as well as companies in the forging, household equipment, packaging, energy and electrical industries. Schuler is the market leader in coin minting technology and supplies systems solutions for the aerospace, railway and large pipes industries. The company can trace its roots back to a locksmith shop founded by Louis Schuler in 1839 and celebrates its 175th anniversary in 2014. In fiscal year 2012/13 (ending Sep. 30), Schuler posted sales of € 1,185.9 million. With 5,600 employees, Schuler is represented in 40 nations around the world. The Austrian ANDRITZ Group holds a majority share in Schuler.*