SCHULER

FORMING THE FUTURE

# PRESS RELEASE

## Form hardening convention

**Experts from science and industry present their latest developments and insights at Schuler facility in Waghäusel**

*Waghäusel, June 11, 2013* – From one generation to the next, cars often add a few kilograms in weight due to the increase in on-board electronics and safety-related technology. With the launch of its new Golf, Volkswagen has succeeded in reversing this trend for the first time. This was made possible by a strict adherence to lightweight construction methods, such as press hardening. A convention held by press manufacturer Schuler in Waghäusel attracted some 80 visitors, who were all keen to hear about the latest developments and insights from leading industry and academic experts.

So how exactly does press hardening work? "Blanks or pre-formed parts are heated in a furnace to a temperature of 930 degrees Celsius," explains Schuler Sales Manager Jens Aspacher. "The heated blanks then have to be fed into the press as quickly as possible to prevent rapid air cooling." There is a time window of just ten to twelve seconds. The press remains closed for a few additional seconds during the forming process: during this time, the parts are cooled and at the same time hardened," says Aspacher.

The cycle times range from 8 to 30 seconds. In combination with a two-slide press and Schuler's fast feeder solutions, however, the productivity of the PCH concept can be significantly enhanced. "A key factor in determining high quality and short cycle times is the fast heat transfer from hot part to cooling water," stresses Schuler's expert. "The weakest link in this chain sets the speed."

**Several influencing factors on the part's cooling period**

"The determinants of the part's cooling period include the transferred energy, which depends heavily on the thickness of the blank, as well as the heat transfer between blank and die," adds Dr. Dirk Haller of Schuler. "Further factors are the die's thermal conductivity and energy dissipation, i.e. the number of cooling channels, the temperature of the cooling medium and the flow in the cooling channels."

Dirk Haller works in Schuler's Technology Field "Process Technology" which has so far designed, built and delivered almost 50 dies for the press hardening process – for customers such as Fiat and VW, SSDT in China and Proton in Malaysia. A further 30 dies were produced to cut the press hardened parts. The experts not only support customers by building and trying out the die, but also during the production launch process – including staff training, for example – and throughout small batch production.

The general rule is: the higher the contact pressure, the faster the heat transfer and the shorter the cooling time – and the greater the performance. "This contact pressure is normally produced by spring assemblies, nitrogen gas springs or hydraulic cylinders in the die, or a draw cushion in the press," states Haller. "By greatly increasing the contact pressure using PCH cushions and dies, optimizing the cooling channels and selecting the die steel according to the part, we succeeded in further accelerating the heat transfer process and thus drastically reducing cycle times." PCH stands for "Pressure Controlled Hardening", the name Schuler has given this further development of press hardening.

**Tensile strength of up to 1,500 megapascal**

"The parts are still about 200 degrees hot when they are finally removed from the press and ready for further processing," adds colleague Jens Aspacher. The scaling which forms on the surface can be shot blasted or completely avoided by coating the blanks in advance. Once they have cooled down, the parts finally have a tensile strength of up to 1,500 megapascal – meaning they have to be cut using a laser or other special tools.

Due to their greater rigidity, less material is needed per part to ensure the same level of stability – thus reducing weight. In contrast to the cold forging of high-strength steels, less press force is also required: 400 to 1,200 metric tons, compared with 2,500 to 3,000 metric tons. The spring-back effects are also greatly reduced.

**Need for press-hardened parts to quadruple by 2015**

All these benefits have led to a dramatic increase in the number of press-hardened parts produced around the world – including bumper supports, roof frames, sills, B-columns and tunnels: compared to around eight million pieces in 1997, the figure had already reached 124 million by 2010. In the next two years, demand is expected to almost quadruple to as many as 450 million pieces.

This is partly due to the fact that part characteristics can be determined more accurately. Examples include parts with patch blanks or the "tailored tempering" method. Schuler also collaborated on a joint project sponsored by the German Ministry for Science and Research entitled "Flexible heat treatment for the tailored shaping of part characteristics and the increased energy efficiency of the hot forging process chain". The main focus was on parts such as B-pillars: they should be as rigid as possible in the middle but able to be deformed at their ends in order to absorb energy in crash situations. This can be achieved using dies with varying temperature zones, which are either heated, cooled or insulated.

In their lecture "Flexible laser cutting line as an alternative to classic shaped blanking", Peter Wolter and Manuel Hunger presented a new development of Schuler Automation in Hessdorf. Schuler's new laser cutting line combines proven coil feeding technology with innovative laser cutting technology and thus creates the first continual laser

cutting process from the coil. The ability to individually program several laser cutting heads working in tandem ensures maximum flexibility and offers new perspectives – with previously unknown throughput rates – for the tailored cutting of blanks. This will play an increasingly important role in press hardening.

Further experts at the Press Hardening Convention in Waghäusel included Dr. Michael Alsmann, Jörg Clobes and Tim Wicke from Volkswagen in Kassel, with their presentation "Lightweight construction with hot stamped car body components – challenges for mass manufacturing", Harald Lehmann from Schwartz Wärmebehandlungsanlagen ("Heating concepts for press hardening") and Thomas Huinink, Jörn Moritz and Jens Schrödter from the Institute of Metal Forming and Metal Forming Machines at the Leibniz University of Hanover ("Material characteristics and model building"). Prof. Ralf Kolleck of the Institute for Tools and Forming of the Technical University of Graz gave a lecture on materials and coatings. The lecture held by Torsten Schwab (Schuler Automation Gemmingen) was entitled: "Faster and safe – automation for press hardening lines".

**Captions**

Bild1.jpg: Car body parts are given far greater rigidity by Schuler's press hardening equipment.

Bild2.jpg: Parts such as B-pillars can be produced in such a way that they are rigid in the middle but able to be deformed at the end.

Bild3.jpg: Schuler's new laser cutting line combines proven coil feeding technology with innovative laser cutting technology.

Bild4.jpg: Around 80 participants at Schuler's Press Hardening Convention heard lectures from industry and academic experts.

Bild5.jpg: During a tour of the plant, visitors saw which parts can be produced with the aid of press hardening.

Please name Schuler as the photo source.

***About the Schuler Group – www.schulergroup.com***

*As the technological and global market leader in metalforming, Schuler supplies machines, production lines, dies, process know-how and services for the entire metal-working industry. Its clients include car manufacturers and their suppliers, as well as companies in the forging, household equipment, packaging, energy and electrical industries. Schuler is also the market leader in coin minting technology and supplies systems solutions for the aerospace and railway industries. The company employs around 5,500 people and is represented by its own facilities and sales offices in 40 nations around the world. In fiscal year 2011/12 (ending Sep. 30), Schuler posted sales of € 1,226.1 million. The Austrian Andritz Group today holds a majority share in Schuler.*

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