

Kunststoffe international

RECYCLING

Two-Stage Treatment of Post-Consumer Material to Neutralize Odors

page 47

EXTRA

Materials and Processes for Medical Technology

page 17

SURFACE TECHNOLOGY

Pretreating Free-Form Objects with Rotary Plasma Ensures Adhesion of UV Digital Print

page 58

Quality of Things™



- Injection molding machine →
- Hot runner controller →
- Valve gate nozzles →
- Mold** → **Quality**
- Mold temperature controller →
- Dryer →
- Other peripherals →



- Cloud
- MES / ERP
- Smartphone
- Internet



Fig. 5. Personalized: A motorcycle helmet printed in the Omnifire 1000 (© Heidelberg Druckmaschinen)

manager at BVD and himself a keen football player. The PU and PVC footballs initially each received three plasma treatments of varying length while they were being continuously rotated. After printing, Knecht tested the balls under real conditions: two two-hour football training ses-

sions, including penalty shootouts. Only balls which survived the test with their print in at least as good condition as the manufacturer's screen-printed imagery were selected for the three-month pitch test. The subsequent visual test in the laboratory showed that the quality of the UV print satisfied the specified requirements for adhesion.

Plasma also Suitable for Large Areas

What the 250 model can do in miniature, the Omnifire 1000 (Fig.4) unveiled by Heidelberg in autumn 2016 can match on a large scale. With a six-axis robot, it is capable of printing any shape of free-form object up to 1.4m in length made from a range of different materials. For example, it can be used to personalize motorcycle helmets (Fig.5), ice hockey sticks made from composite materials, or polycarbonate suitcases. And it is also suitable for industrial production processes, for instance

parts for automotive interior trims or overhead lockers in aircraft. After surface cleaning and activation with Openair plasma, series-production parts as well as after-sales parts can be enhanced with individual, colored motifs. The plasma rotary nozzle can be operated trackwise to pretreat large areas.

Summary

The decision to opt for atmospheric pressure plasma has been worth it for Heidelberg, concludes 4D printing product manager Ivar Emde. "Plasmatreat rotary plasma is a key element of our production process which allows us to obtain good ink adhesion and wettability quickly and efficiently on a very wide variety of materials." He goes on to say that the dry process was reliable and reproducible, the technology was low-maintenance and the pretreatment process environmentally friendly. ■

Core Temperature Critical for Economical Operation

Gentle and Energy-Efficient Forming of Composites

In order to produce, by hot forming, high-performance components out of planar and pre-formed composite semi-finished products, circulating hot air ovens are required to heat thermoplastic composite materials homogenously: that means temperatures have to be the same in the surface and the core. Temperature tolerance is merely $\pm 2^{\circ}\text{C}$ here. This also enables precise results with hybrid semi-finished products, i.e., tailored parts.

According to information provided by producer **HK Präzisionstechnik GmbH** in Oberndorf, Germany, their circulating hot air ovens consume up to 90% less energy than units operating on a conventional process. The largest type they supply to the automotive industry in the U.S. of America. "Major users have rated our circulating hot air ovens as efficient and process-secure, and an energy supplier has made the same statement", points out Heinrich Ernst, head of marketing at HK Präzisionstechnik.

He states that their oven can also pre-heat pre-formed composite semi-finished products in a gentle, homogenous and precise way. Such types of semi-fin-



Circulating hot air oven for hot forming of planar and pre-formed composite semi-finished products

(© HK Präzisionstechnik)

ished products are, e.g., glass mat reinforced thermoplastics (GMT) or low weight reinforced thermoplastics (LWRT), pre-formed prepregs as well as hybrid materials.

A new variant of the oven is designed to heat "advanced" GMT, which is a semi-finished product based on polyamide and reinforced with carbon fibers. The challenge of the process is to thoroughly heat the semi-finished products to ap-

prox. 280°C , while applying nitrogen for inertization. The share of oxygen inside the oven needs to be under 2%, to prevent the material from oxidizing. The required amount of nitrogen the unit withdraws directly from the atmosphere, feeding it into the oven.

To the product presentation:
www.kunststoffe-international.com/3810405