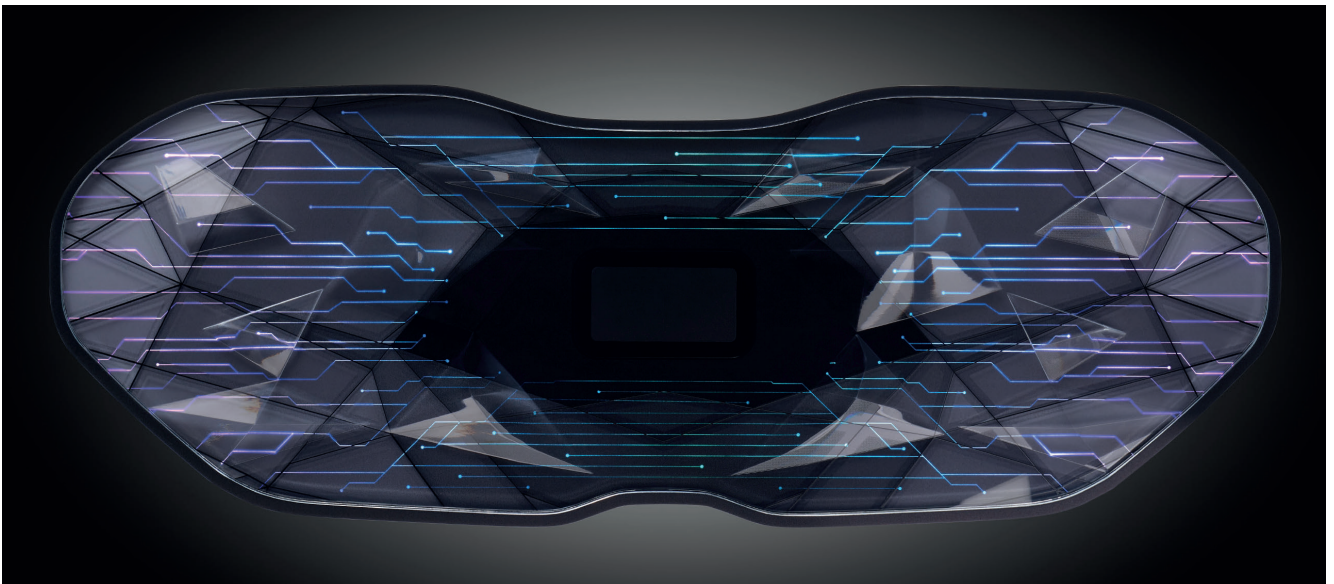


An Eye-Catching Addition to Electric Vehicles

Award-Winning Front Panel Combines Exciting Design with an Efficient Manufacturing Process

Electric vehicles do not sport the classic radiator grille. This opens up new possibilities for automobile manufacturers when it comes to designing the front of their vehicles. A good example of this is Leonhard Kurz's "Iconic Space Grille", which was recognized at the Automotive Brand Contest 2020. The component not only illustrates modern vehicle design but was also produced in a new production process.



The Iconic Space Grille can be adapted to the design of electric vehicles. With different lighting, it enables communication with other road users and an individual design according to the request of the user © Kurz

E-mobility is on the rise across Europe. Almost 400,000 electrically powered vehicles were registered in Germany alone last year, according to data released by the German Federal Motor Transport Authority at the beginning of January. And the trend continues to rise. Between seven and ten million electric vehicles will be on German roads by 2030. This poses challenges for the automotive industry – not least in terms of vehicle design. The conventional radiator grille, which is no longer required for electrically powered vehicles, changes the identification platform in the front section, which is important for many brands, and thus the face of the car.

"With this in mind, the Leonhard Kurz team thought about the extent to which a connected and robust surface can be created, which not only showcases the brand but also makes it possible to interact with the environment," explains Fabian Bürkel, Project Engineer Technology & Innovation Management at Leonhard Kurz. The result of these deliberations is the Iconic

Space Grille (**Title figure**). A testament to the successful design was, for example, the ABC Award at the Automotive Brand Contest 2020 which recognized the front section of the vehicle. With its 3D prism design, highly efficient in-mold decoration technology, and crystal-clear, self-healing polyurethane surface (PU), the company from Fürth in central Franconia, Germany, was able to win over the judging panel.

Futuristic Design for Modern Vehicles

"The special design of the component, which creates striking backlighting effects using modern and customizable LED technology, lets the vehicle communicate with other road users," Bürkel explains. "At the same time, technical components such as cameras and sensors – which will be important features in the future, especially for autonomous vehicles – can be installed largely invisible under the smooth, connected surface," he adds.

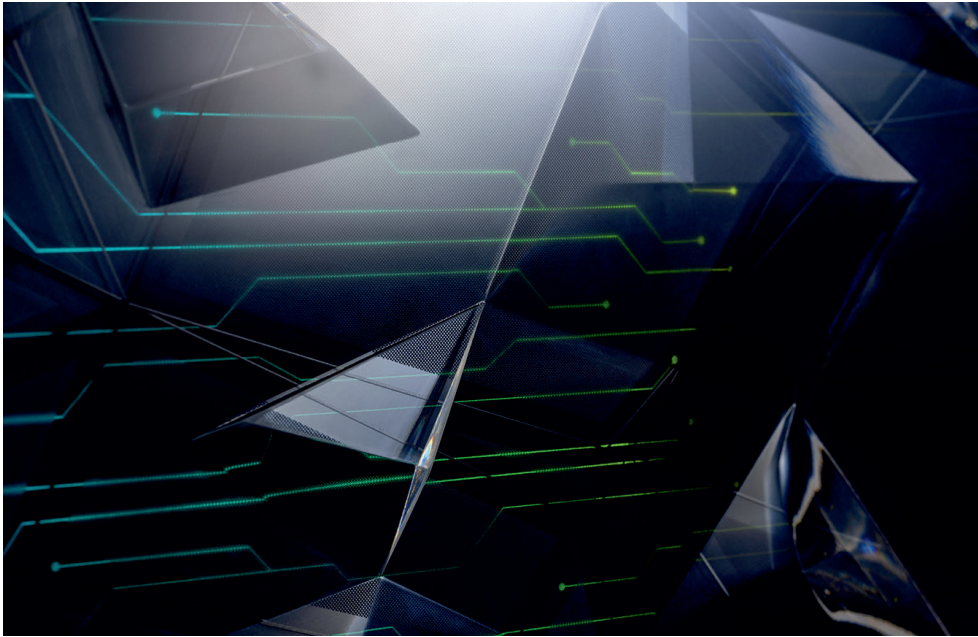


Fig. 1. The conductor tracks of the front panel can be illuminated in various colors. Among other things, this allows the design of the vehicle to be adapted © Kurz

The only similarity the Iconic Space Grille shares with a traditional radiator grille is the shape. Apart from this, the design, which can also be extended over the entire front of the vehicle, demonstrates the entire range of current design options: prisms of varying sizes stacked on top of one another emphasize the light reflections and create three-dimensional depth effects that appear even more dynamic thanks to the corresponding backlighting in day/night design. "As soon as the backlighting is on – just think dead-front look or Shy Tech – the night design appears and then replaces the indicators, for example. There are very different lighting situations, as well as partial illumination on one side and flashing on both sides, but also the use of different colors such as red, green, or orange," explains Alisa Schäfer, senior designer at Leonhard Kurz. On the one hand, the visual communication of the autonomous vehicle with the environment is realized in this way – flashing on both sides, for example, signals braking and shows pedestrians that they can cross the road. On the other hand, it is possible to customize the vehicle even more in line with the user's preferences thanks to the versatile technology, for example by visually projecting the music played inside the vehicle (Fig. 1).

The appearance of the Iconic Space Grille is just one of the many creative possibilities. "We have a great deal of creative freedom when it comes to design," emphasizes Schäfer. "Different decors can be implemented. The three-dimensional structures can be changed and, of course, logos can also be integrated," she adds. The PU layer can also be dyed in order to achieve different transmission levels and special design effects. The component submitted to the Automotive Brand Contest 2020 is just one piece that demonstrates how extensively the acquired areas can be used in the future. Its use is not limited to the automotive industry either: thanks to the special structure of the component and the great freedom in terms of design and material, the logo can also be integrated in a shoe or futuristic trim of a washing machine, for example.

"The newly developed IMD PUR manufacturing process makes a wide range of material combinations possible. We are not bound

to a specific thermoplastic material or surface decoration," explains Project Engineer Fabian Bürkel. IMD PUR is a process technology that combines the best of two processes: the design quality and variety of in-mold decoration, and the crystal-clear look, high surface protection and self-healing properties of PU coatings. »

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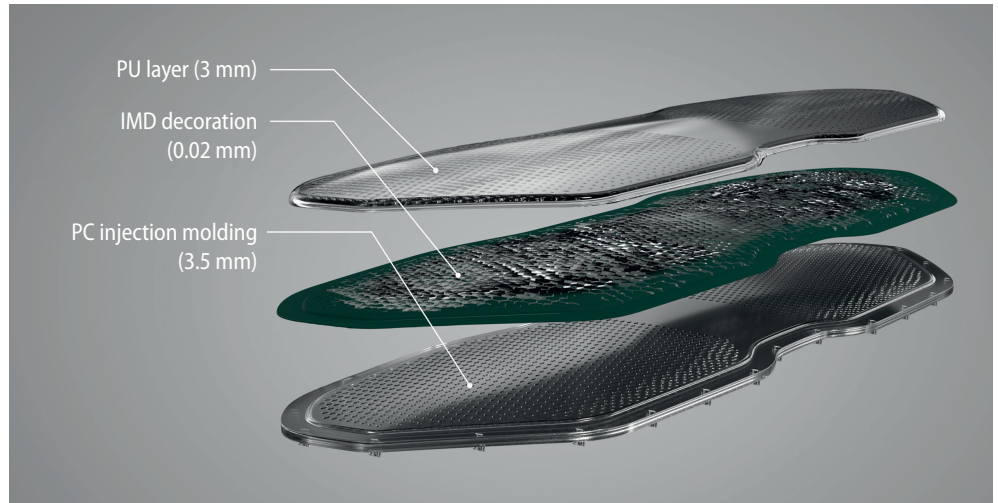


The Mineral Engineers

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Fig. 2. The award-winning design consists of three layers: a lower layer of PC, the only 0.02 mm thick IMD decorative film in the middle, and the PU top layer

© Kurz



PU – the Ideal Material in Exterior Design

With its diverse properties, PU is particularly suitable for modern automobiles. Autonomous vehicles, for example, require materials that are permeable to Lidar and radar beams – something which PU can provide without restrictions. In addition, the installed cameras must be able to perceive the environment in its entirety without any negative influences, which is ensured by the glass look of the versatile plastic. At the same time, external components are exposed to strong environmental influences, which leads to high demands on the resistance of the surfaces. The components therefore benefit greatly from PU's self-healing effect. As a result of pressure and heat, for example in car wash facilities, micro-cracks in the PU coating seal back up again.

A Closer Look at the Iconic Space Grille

The structure of the Iconic Space Grille consists of three partially wafer-thin layers (Fig. 2); the Leonhard Kurz team used polycarbonate (PC) at the bottom to create the desired transparency. However, other thermoplastic materials such as polymethyl methacry-

late (PMMA), acrylonitrile butadiene styrene copolymers and blends made of PC and ABS can also be used, depending on the desired design. The middle layer, the IMD decorative film, is pure varnish with a thickness of approx. 0.02 mm. The PU layer is at the top. "This setup is the standard setup of the IMD PUR manufacturing process. Depending on the customer's technical requirements, the best economical layer variant can be chosen to a certain extent," explains Bürkel. PU has the advantage over thermoplastics in that a variability in the PU layer thickness of 0.5 mm is possible and that >10 mm can also be supported. If required by the customer, a fourth decorative layer is also possible, which is integrated on the back of the PC and creates additional depth effects. In this way, the design elements, icons, or even logos can be inserted at the various levels of the component, which ensures a very appealing 3D effect in the visual end result.

Process Combines Several Work Steps

Production using the IMD-PUR process is very efficient, since two process steps can take place within the same tool (IMD-PUR sliding table tool, manufactured by Schöfer) (Fig. 3). The first pro-

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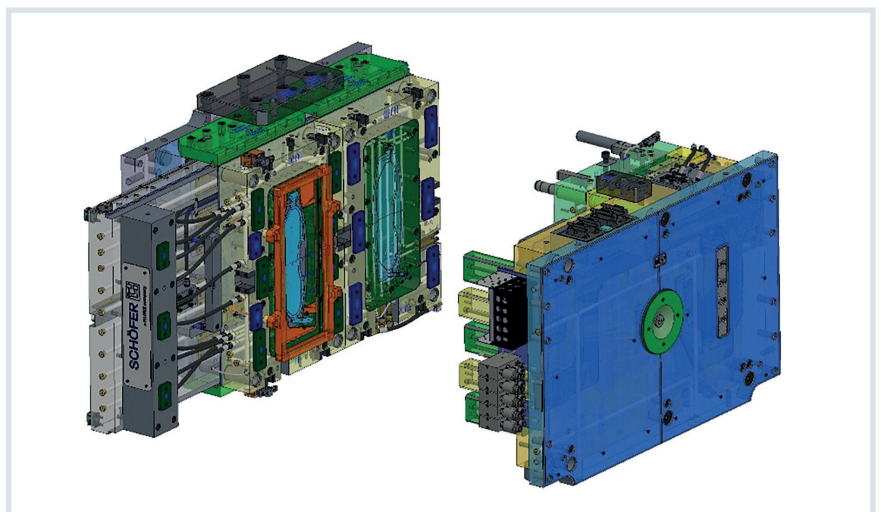


Fig. 3. With the sliding table mold tool setup, injection molding of the thermoplastic material and flooding with PU are carried out one after the other © Kurz

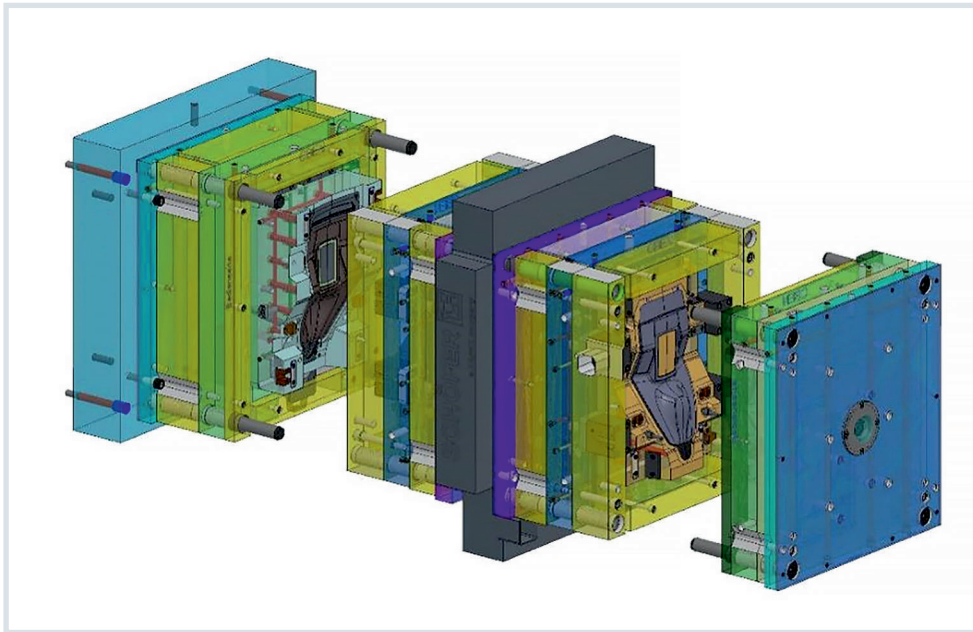


Fig. 4. The two process steps can be mapped in parallel in the spin-stack-mold tool setup © Kurz

cess step produces the basic component using the IMD process. At this point, while the plastic injection process is in progress, the decoration layers which were previously applied to carriers made of polyethylene terephthalate (PET) are connected with each other. The second step is to flood the produced IMD component with PU. The connection between the two layers, decoration and PU, is ensured by a specially developed compound layer, the top coat, which is part of the IMD transfer coating system. The two process steps can also run in parallel. However, this requires spin-stack-mold tool technology with a turning plate or cube technique (Fig. 4).

The corresponding injection molding tools can be manufactured by Schöfer, a subsidiary of Leonhard Kurz. Dr. Markus Koppe, Head of Advanced Technology at Schöfer, explains: "The sliding table setup is more suitable for smaller quantities. However, this tool has the advantage that it is comparatively cost-effective and can be used on conventional injection molding machines. The cube setup, on the other hand, catapults us right into the high-performance category. It is very suitable for larger series where a more specific injection molding machine must be used. The associated higher costs are justified for larger series. Depending on customer requirements, it should be decided which variant is better suited and more economical."

All other work stages relating to the production of front designs for vehicles such as the Iconic Space Grille can also be implemented within the Kurz group of companies. Leonhard Kurz subsidiary Burg Design, for example, is known in the automotive industry as a manufacturer of sophisticated design finishes and has many years of experience in the production of interior and exterior components for various vehicles.

"Working closely with its subsidiaries, Kurz can implement all steps, from design through application and process development to tool development and tool construction," emphasizes Project Engineer Fabian Bürkel. "Of course, we also work with external partners in individual process steps, for example with material manufacturers and injection molding or polyurethane mixing plants."

Streamlining Processes and Shortening Paths

The relationship between tool technology and process is a synergy that plays an extremely important role in corresponding production technologies. "On request, we can offer customers a turnkey solution and thus also support the design of the process technology – for sample parts and, if desired, for the first series parts. Prior to process and tool selection, Kurz also offers a comprehensive support package comprising feasibility analysis, geometry evaluation, design study, and design realization. Via Schöfer we can provide series support in the area of 2-component technology, but in many cases we simply support the customer with our expertise in the individual process steps," Bürkel adds.

The Main Benefits of IMD PUR at a Glance

- Resource-saving, efficient manufacturing process
- Serial production possible
- Sturdy, self-healing surfaces
- Extensive creative freedom when it comes to design with excellent 3D effects
- Futuristic light concepts possible
- Lidar and radar beam compatible

With the "one-shot process" that IMD PUR represents, not only can appealing designs be implemented, but also current challenges in the economy can be addressed. As climate protection and sustainability become increasingly important, procedures that streamline processes and save unnecessary paths are required. This can be achieved by the IMD-PUR process. ■