

FOR THE POWER OF TWO HEARTS

With increasing electrification, the automotive and supplier markets will change. Hybrid or electric drive vehicles need different components from those with an internal combustion engine. Thanks to a project lasting many years with electric drive specialists EM-Motive, Feintool is already well established in this field.

Text: Christian Raschke **Photos:** Rudolf Wichert



An eye to new markets.
Feintool Key Account
Manager Markus Liebig
sees hybridization and
electromobility as
an opportunity.

➤ When you walk through the workshops at Feintool System Parts in Obertshausen, you can trace the evolution of sheet metalworking with your own eyes. In one shop there are forming and transfer presses up to seven meters high, loudly stamping out their work. One gate further on, there are CNC milling centers and robotic arms, humming quietly as they put the final touches to the previously produced blanks. “Here we combine the best of the old and new worlds, so to speak,” says Markus Liebig. As a key-account manager at Feintool, he looks after such customers as Daimler and EM-Motive, a joint venture between the car-manufacturer and the technology group Bosch.

If it were only a matter of chipless forming, the story would be quickly told. The experts from Feintool System Parts in Obertshausen have been capable of handling single or multistage presses, including the associated toolmaking, for many years with both hands tied. However, the combination of sheet metal forming, laser welding and the subsequent machining of the 20-centimeter blanks in three fully automated CNC turning and milling centers is new and unique in this form. “Suppliers rapidly become on solutions of this sort of technology based on their complexity and the required tolerances,” says Frank Platten. The Head of Purchasing at EM-Motive is happy to have found a partner like Feintool. Dimensional accuracy has to be right, there can be no

burr left behind and even the so-called residual contamination requirements are high, so every part has to be thoroughly cleaned again by ultrasound in a washing installation. Admittedly the finished components, a rotor and the associated support flange, are used as key components in a hybrid transmission system. “They form the housing for a 20-kilowatt electric motor. Powerful magnetic fields are created when the motor is running, so every piece of metal shaving would mean disaster,” explains Liebig. With Feintool, EM-Motive can rely on the fact that the components supplied are perfect – and that when fitted in Mercedes S and E-Class hybrid saloons they will provide the necessary extra thrust to reduce fuel consumption.

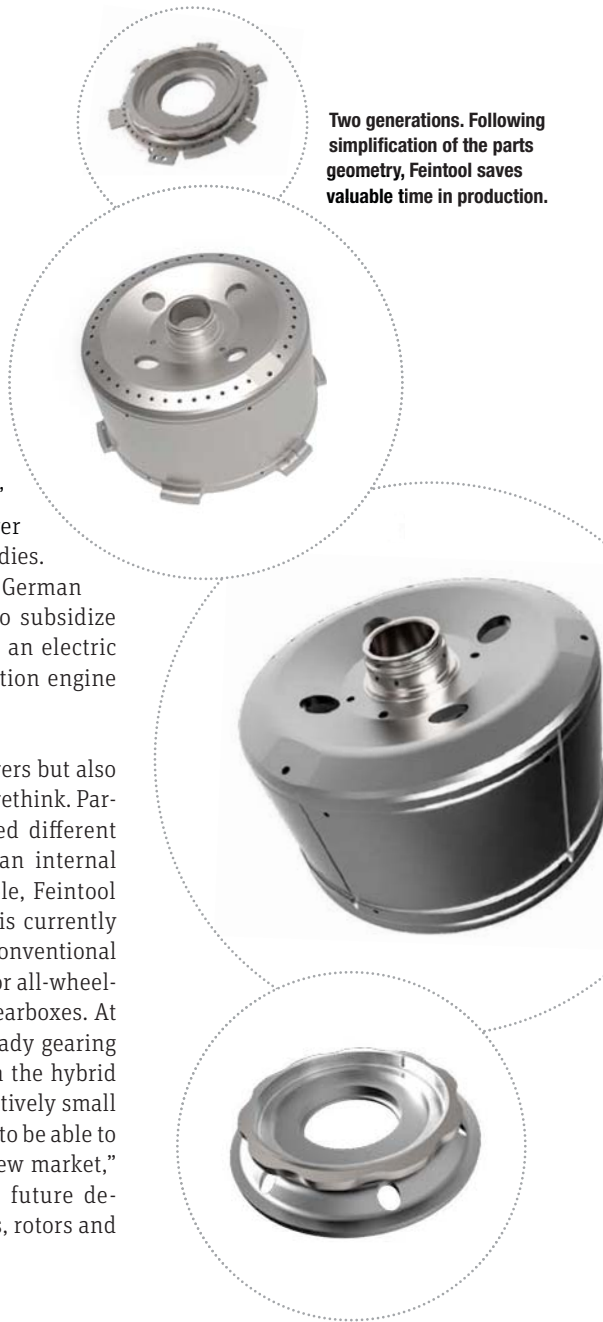
AHEAD OF ITS TIME

The project has been running since 2008. “We have done some really pioneering work together,” says Platten. The little 20 kW additional drive is enough to enable leaving a parking space under electric propulsion, to pull away, or to assist the internal combustion engine when accelerating. “Daimler were absolute pioneers when they launched this first hybrid eight years ago,” says Platten. Now EM-Motive has developed another, 80-kilowatt model, enabling a speed of 70 Km/h with a range of about 50 kilometers under fully electric propulsion. Admittedly the vehicle registration figures are still low. Of the 3.2 million new cars sold in Ger- ➤

many in 2015, only 33,600 were hybrids. But Frank Platten is convinced: "Hybridization will come. I think that hybrids will be as common a sight in 10 to 15 years as petrol and diesel vehicles are today." Particularly if cars with the power of two hearts receive state subsidies.

For example in mid-2015, the German Federal government decided to subsidize buyers of hybrid vehicles with an electric motor and an internal combustion engine to the tune of EUR 3,000.

Not only for the car manufacturers but also for Feintool, this means a rapid rethink. Partially or fully electric cars need different components than those with an internal combustion engine. For example, Feintool System Parts in Obertshausen is currently producing millions of parts for conventional drives, above all clutch plates for all-wheel-drive clutches and automatic gearboxes. At the same time the plant is already gearing up for the future. "Even though the hybrid project naturally has a comparatively small production volume, we are glad to be able to gain some experience in this new market," says Liebig. He sees potential future demand in particular for housings, rotors and



Two generations. Following simplification of the parts geometry, Feintool saves valuable time in production.

flanges for electric motors, whether as axle drive units or separately on each wheel, an area in which Feintool is well positioned thanks to the ongoing project with EM-Motive. They are key components of an electric motor. For example, EM-Motive mounts magnetic segments on the rotor, which are later caused to rotate by means of electromagnetism. "Not every company can produce sheet metal parts of this type," adds Frank Platten, "but Feintool has been working with Daimler for a long time on other projects, so we knew what quality we could expect and we gave them a chance."

The forming specialists from Obertshausen made good use of the opportunity, and working with EM-Motive, they embarked on a steep learning curve, including two years of preliminary development.

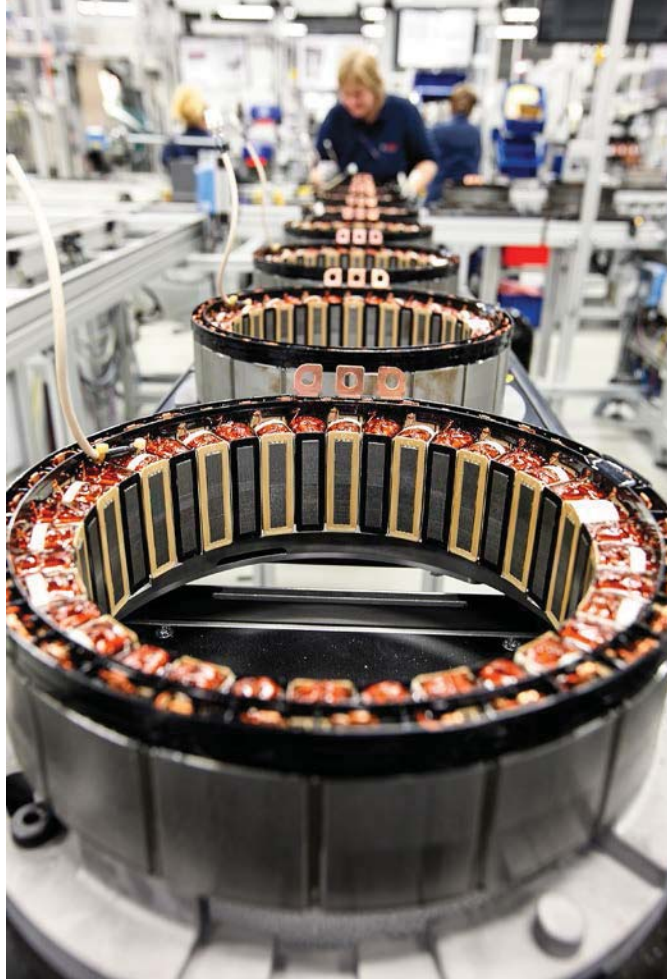
"The combination of forming and cutting is a balancing act," explains Liebig. The blanks for the rotor are cut and formed from 6.5-millimeter sheet steel on single presses, and the blanks for the support flange are cut and formed from four-millimeter sheet on the multiple-stage press. None of these are standard processes, says the qualified toolmaker, who has worked in Obertshausen for 23 years. Using a developed tool design, the steel blank itself has to satisfy a predefined degree of forming and the associated reduction in forming errors. "Because following that, machining sheet steel which is ideal for forming within the finest of tolerances makes the job really tricky." Why? A formed sheet steel component is under inherent tension, which is then released to some extent during machining. In addition to which, a hub is laser-welded onto the rotor before machining. "There too we had to learn how to heat the part as little as possible so that it did not warp," says Liebig. Otherwise consistent machining would not be possible either.

ACCURATE TO THE MICRON

Together with partners and the customer EM-Motive, the experts at Feintool have consistently improved the processes in the last eight years. Components have been deburred completely automatically since the start of 2015. What was previously carried

At the push of a button. The deburring unit operates almost entirely automatically.





Final assembly. The rotors are assembled in the EM Motive plant.

“The team in Obertshausen has been very important for the development of our project.”

Frank Platten, Head of Purchasing at EM-Motive

out manually is now undertaken by two yellow-painted, five-axis, robotic arms. They work together almost like two hands, only more precisely and thousands of times over, always with the same quality. Number one picks up a part, turns and rotates it, while number two uses brushes and milling cutters to deburr the numerous holes, cuts and edges within a few minutes and gives the part the finishing touches.

There has also been a quantum leap in the quality of the geometry of the parts, so that they can be produced faster and more efficiently. “The first-generation rotors and support flanges were bolted together by means of six tabs,” explains Liebig. “In the second generation a solution was found for connecting the parts with a clamping collar. This saves around 200 grams in weight as well as a few minutes working time,” and with micron precision. Smallest permissible tolerance: only eight microns.

“Adhering to these tolerances was one thing; actually being able to measure them was an equally big challenge,” remembers Liebig. Conventional measuring equipment was inadequate. The solution was in the end a product-specific, high-performance, automatic measuring device for each component. When an employee places a sup-

port flange or a rotor into the device and closes the lid, up to 25 sensors approach the part and measure height, diameter, thickness, concentricities and parallelisms. Around 20 seconds later the signal is displayed on the associated screen, confirming that everything is OK, or not. “What is unusual”, says Markus Liebig, “is that, we carry out these measurements not in a clean-room but under entirely normal environmental conditions.” For that reason there is a master component beside each workstation, which is exposed to the same temperature as the workpieces and which is used regularly to reset the measuring devices. Finally, all the measured values are assigned to each component and archived by means of data matrix code.

“The whole issue of measurement and tolerances is a very good example of how Feintool has always remained on the ball,” says EM-Motive buyer Frank Platten. “The team in Obertshausen has been very important for the development of our project.” Reason enough for him to consider them again and again for future inquiries. “We currently have a new part in the acquisition process, and Feintool is closely involved,” he confirms. So it is entirely possible that the pioneering work which has been done will soon pay off again for all those involved. <



Feintool System Parts Obertshausen

With its 360 employees, the plant in Obertshausen is the biggest production facility of Feintool System Parts Europe and has been part of the Group since 2012. With Herzing+Schroth GmbH, the company previously based there, Feintool acquired a proven specialist in forming technology. With the aid of additional technologies for follow-up processes, such as nitriding, laser welding, balancing and CNC machining, ready-to-fit parts systems are developed there and supplied for series production. The basic prerequisite for this is the in-house tool design and toolmaking facility.