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There was a time not so long ago when last makers made only lasts and mould makers made only moulds. Increasing demand for ever greater accuracy in the lasts that are needed for direct bottoming systems particularly where polyurethane was involved, led to significant improvements in the way that lasts were produced. At the same time, ever shorter manufacturing lead times put tremendous pressure on both last and mould manufacturers as they were separate entities, producing different though closely interdependent products in separate factories which could be some distance from each other.

Although this has usually worked reasonably well, coordinating all the stages from conceptual design through to delivery of the total package of perfectly matching lasts and moulds is both difficult and time consuming. This has led to the concept of all the divergent parts being performed by just one company. Communication for the end customer is greatly simplified as they are dealing with only a single supplier rather than two or possibly three separate ones. Furthermore, the last, upper and sole can be designed together as a single package using a sophisticated software program. Data from this can be transferred directly to digitally controlled milling machines for the production of both the lasts and the moulds needed to produce either a sole unit or for direct moulding all under the one roof.

PRECISION LASTS

Extreme accuracy is required for direct moulding compounds such as PU and TPU where tolerances of around 0.2 mm are called for in regard to moulds and lasts to ensure no material is exuded during the injection cycle. Milling machines used today have special holding systems that allow the entire surface of the last to be milled including both toe and heel. Where even with the most skilled operators, 'toeing and heeling' could never be perfectly accurate or consistent, these machines produce lasts that are so precise they can be used for direct injection soling using highly viscous PU without the risk of flash.

Fagus-GreCon has been producing high quality shoe lasts in Germany for over one hundred years. Its portfolio ranges from tailor-made and high-precision shoe lasts for traditional footwear manufacture to technical lasts for the direct soling process. The lasts are all robust and notable for their durability. Furthermore, different systems to enable them to be 'broken' at delasting have been evolved to cope with the different shoe designs and constructions that are likely to be encountered. They also employ specialised top plates on the cone depending on the manner in which they are to be handled manually or by robots.

AGO lasts are straightforward and designed for conventional shoemaking processes such as the cemented construction. DA lasts have top plates that ensure absolute



Modern lasts are made to extremely fine tolerances using highly sophisticated milling machines.



HPML lasts are compatible with automated production systems and Industry 4.0.

precision of last and mould for direct bottoming using aluminium moulds. HPML lasts are again high precision for direct bottoming but, in this case, have special top plates that are compatible with automated production systems and Industry 4.0.

PRECISION MOULDS

The company now also produces precision sole moulds to go with its lasts so as to provide a total package for its customers. The new CNC machining centre at its headquarters in Afeld is able to produce moulds for direct bottoming using PU-PU, TPU-PU, R-PU or R-R for all common direct soling machines. In addition, there are moulds for PU and rubber (R) sole units, and Vulka moulds for direct moulding of rubber midsoles.

A shoe last is a relatively simple shape to machine as it is principally a succession of convex curves and lines. A mould is far more complex, consists of at least two parts and may well involve much fine detail that must be faithfully reproduced on the surface of the moulded sole. Five-axis machining is able to produce moulds for complex shoe soles in a single set-up, so allowing the complete model to be machined without any human intervention. It is extremely



Five-axis machining is used to produce complex and highly details moulds.

fast and development times from design to completion of a set of moulds can be as few as five days, depending on the complexity involved. There are two types of machine, one where all five axes of movement are generated through changing the orientation of the head and one with fixed orientation for the head and where the extra two axes are produced by tilting and/or rotating the work-piece.

Fagus-GreCon naturally uses five-axis machining as flexibility, and the highest possible precision and short lead times are now standard customer requirements. Moulds are freely accessible from all sides during machining due to the combination of a swivel rotary table, continuous five-axis machining and a linear drive in X (horizontal) and Y (vertical) directions. Thus, more complex moulds can be produced with a high degree of precision and a relatively short lead time. Overall accuracy is regularly checked by means of a corresponding software tool kit to ensure a uniform high quality throughout the mould.

DESIGN

Good design can provide unique and distinctive products, and also offer a new opportunity of identification to the user. Cooperation between Fagus-GreCon and its customers consists of a detailed exchange where it is discussed which last, which upper and which type of shoe is to be manufactured. The development of the sole design is based on data taken directly from the shoe last file. The company then tries as far as possible to develop common design proposals which not only follow the requirements of fashion but also the requirements of production technology at the customer's factory or factories.

As a leading international supplier to the footwear industry, Fagus-GreCon has set out to offer a unique service, one where the design, lasts and moulds all come from one source. Kai Greten, managing director of Fagus-GreCon describes the project process as "One meeting, one overall concept, one database and one project partner. The result: the highest quality for exactly matched lasts and moulds". Ever closer cooperation between manufacturer and supplier is becoming increasingly important in producing competitive quality footwear in a demanding global market and simplifying the supply chain in ways such as this. 