Esperanto in the machinery

From frontrunner to last mover: Germany's SMEs reflect one-to-one the scope in which companies are digitizing. Mechanical engineering is right in the middle. Open IoT platforms could help not just the hidden champions in their industries, such as clutch specialist Mönninghoff, in elevating their position on the global market.

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Whether button lift, T-bar lift, or chairlift, on the Brocken or in the Alps, in the Black Forest or in the ski hall: the thought of embarrassing themselves crosses the minds of even ambitious novice skiers before they ever start their first downhill. That usually happens when it's time to get on the lift. When skis, poles, and the center of gravity need to be coordinated all at once, pure physics or rather, inertia poses problems even for devout skiers at ideal weight. All too often they lose their footing and drop in the snow like a sack of potatoes to the amusement of everyone else in line. However, firstly, the lift is designed to generally make it somewhat easier for novices by slowing down and shallow braking, and secondly, this athletic challenge could become much easier in the coming years.

In no way will this be due to new training methods from ski instructors, but German high tech from the Ruhr. If only the digital twin's good ideas would be used in other industries.

290

Number of teeth in electromagnetic brake clutches

Latest coupling generations achieve

99 %

energy savings

NICHE, NOT MASS

The engineering company Mönninghoff has been manufacturing sophisticated drive technology from the center of Bochum for over 100 years. Brakes, clutches, overload systems: wherever forces, such as those between a motor and a gearbox, are efficiently transmitted, Mönninghoff products are used, but as is typical for medium-sized German enterprises not as mass-produced items, rather as small-batch, custom solutions for global machine and systems manufacturing. When something has to reliably switch in an aerospace application or a ski lift has to accurately slow down in demanding weather conditions, the technology by Mönninghoff and its 136 employees is often sought. "Clutch manufacturers are a dime a dozen. You put in a call this evening and you get 5,000 units the next day. We, however, specialize in elevated safety requirements or unique installation spaces. If you are at the airport and don't have a ticket to get through the turnstile, you can fight it all you want thanks to our technology, it won't move an inch. And if our drive technology doesn't work down to the last micrometer of a CT scan, the diagnosis most likely still leaves a lot to be desired," said Charlotte Finger, CEO.

Photo: Oliver Krato

These kinds of precision components play a major role in high-tech machine and systems manufacturing as well as in medical and environmental technology, which is why Finger does not prefer to think of the company as a supplier, but as a technology partner for its customers. This is why emphasis is placed on dialog with these customers' design engineers when it comes to finding the exact gear geometry for a given application. This customer focus, combined with high-precision manufacturing, forms the basis of Mönninghoff's competitiveness still. To Finger, the matter is crystal clear. "Longevity and quality alone will let us stay on the market for 30 years at most, then it's over," said Finger in giving a realistic assessment of the continued development that will be closely linked to digitization. The company's motto may be "A chip cannot produce torque", however, as Finger stressed, "While we still want to be manufacturing high-quality drive technology in a few decades, by then our products will need to have made a clear turn toward smart system solutions and additional digital services."

VALUE CREATION IN SYMBIOSIS

This is because the high-tech component from Bochum that is then finally integrated into an equally complex overall system and does what it is designed to do is just one of many. And it does it as is typical of German engineering often better than it actually needs to. "We may get a specification on the use of a product, but whether that's actually the case under real conditions is something we rarely able to determine later on," conceded Finger. This is because there is no direct contact between the component manufacturer and the end customer. That is left to, for example, the ski lift builder.

The solution here also lies in sensors and smart products that record the entire lifecycle of the product, as well as Mönninghoff's value creation chain in its entirety. A digital twin in the true sense, which can then offer valuable information from condition monitoring to predictive maintenance all the way to further product development. "This way, we would also know exactly what fluctuations occur during actual operation or at what maximum power our component is actually being used, and we would be able to adjust it accordingly. With more information from the entire product lifecycle (PLC), we could produce and design with much greater customization," affirmed Finger. In addition, smart products would arise that could be even better at helping customers solve their problems.

Mönninghoff would also have the opportunity to further optimize its production and, as a result, its cost structure. Obtaining this knowledge would also allow Mönninghoff to continue to be successful in the market beyond the next 30 years. Digitization would bring make-to-order manufacturing to markets that currently do not have close to the necessary budget. Specifically, there is a substantial price difference between a clutch that can switch four times per second and one that can switch just once or twice. Refined production planning would result in less waste while also reducing the need for prototypes.

IOT AS TRANSLATION AID

However, a critical challenge must be overcome for this kind of future scenario: the slew of languages used by the machinery. Mönninghoff is highly specialized and manufactures an enormous variety of products in top quality. “We have the Porsche of lathes, the Ferrari of grinders, and the Mercedes of hobbing machines in our hall. In addition, there is a wide range of software systems to keep everything up to date. And it all actually has to be incorporated into our ERP system and, on the whole, run like clockwork,” said Finger, describing the mess. According to Finger, what would be desirable is an IoT platform able to bring these machine manufacturers some of whom even compete against one another under one roof and communicate all development, manufacturing, and assembly processes in a single language. Meanwhile, Mönninghoff’s interim solution is to no longer pick from the colorful bouquet of German machine manufacturers, rather work closely with just one.

The next step for this platform could also be including small businesses and micro-enterprises, “Because we are the link between our often very big customers and considerably smaller suppliers. They sometimes still supply us with special screws with the most important details noted on a handwritten slip. We, however, are supposed to deliver products to our customers with a QR code containing information on the torque to which we tightened the screws during assembly,” said Finger, explaining the current breaks in the digital chain.

Therefore, a kind of central translator, like the one T-Systems offers, would be important. A basic IoT infrastructure that is open for every machine type, every manufacturer, every industry and every trade, without exception. One that has no restrictions in terms of interfaces and, moreover, makes it possible to participate in the network beyond its own value creation chain. “The most important aspects of the platform are openness and neutrality,” said Finger.

Once Mönninghoff is able to digitally represent its entire value creation chain, then perhaps nothing more would stand in the way of further optimizing ski lifts. They could then at some point take the turn even more easily and make getting on just a little easier. Novice skiers will be forever grateful to the company from Bochum.

Charlotte Finger, member of senior management at Maschinenfabrik Mönninghoff, in front of a picture of company founder Richard Mönninghoff.

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Photo: Oliver Krato