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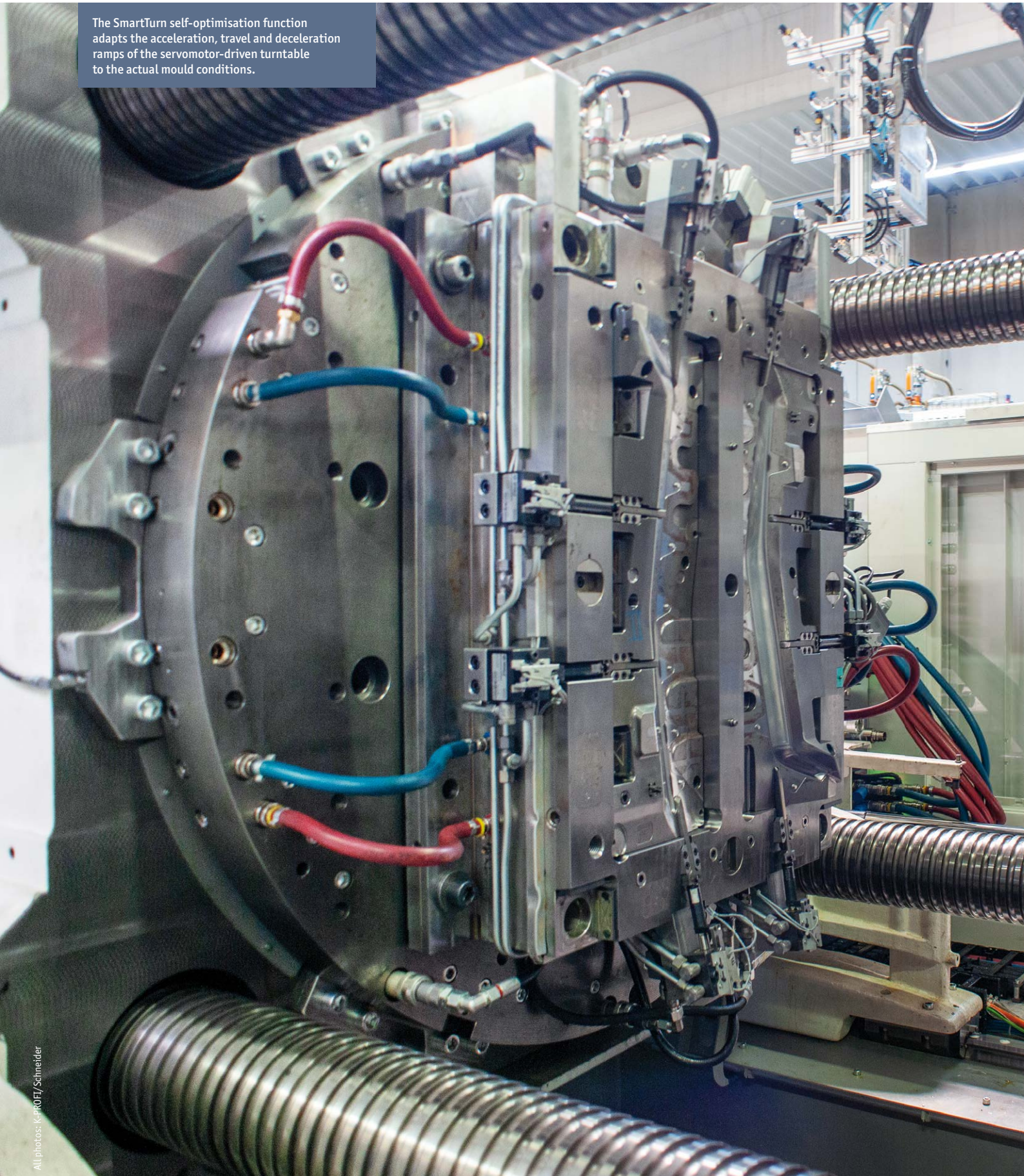


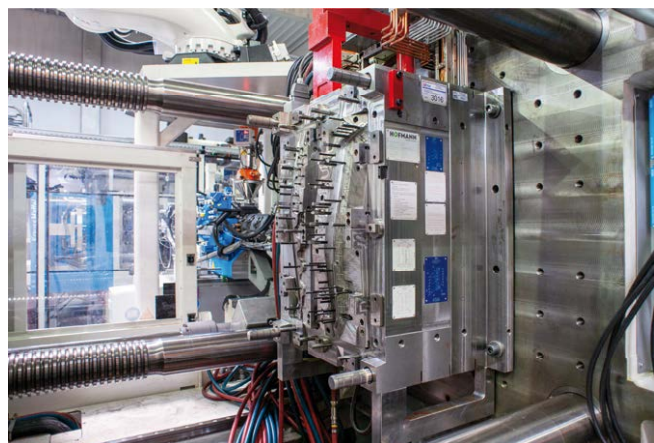
How Nifco Germany increases efficiency in 2K injection moulding with a new function

An Assistant for the Optimum Turn

Special reprint

The SmartTurn self-optimisation function adapts the acceleration, travel and deceleration ramps of the servomotor-driven turntable to the actual mould conditions.





Injection-side mould half of the 2C decor strip with insert-holding slides for holding the preformed decor foil.

An Assistant for the Optimum Turn

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“We are constantly working on making our processes as efficient as possible,” says Claus Haban, plant manager of Nifco Germany GmbH, Weissenburg, highlighting the never-ending improvement process as an automotive supplier. Every saving contributes to success. And every (further) step counts. Digital tools for process optimisation are becoming increasingly established in injection moulding production. Nifco has now tested a new software function for rotary table applications in the field for machine supplier KraussMaffei. Claus Haban and his team report on initial experiences and the potential for the production of multi-component parts.

Text: Dipl.-Ing. (FH) Sabine Rahner, Editor K-PROFI

Since 2014, the plant that emerged from Kunststofftechnik Weissenburg GmbH & Co KG (KTW) has been part of the Japanese Nifco Group and now operates jointly with the former Kunststofftechnik Schmidt GmbH & Co KG from Solingen as Nifco Germany GmbH. In contrast to the North Rhine-Westphalian site, which concentrates solely on interior components for the automotive industry, the Bavarian site in Weissenburg supplies OEMs with complete assemblies for both the interior and the exterior as a Tier 1. The two locations are closely linked and form an independent group within the group, which has also been supported by a US location in Toccoa/Georgia since 2016. Nifco

stands for Nippon Industrial Fastener Corporation and refers to the origin of the Japanese parent company: the manufacture of fastening elements. “Our product range is completely different from that. Our components are much larger than in the Asian Nifco plants,” explains Plant Manager Claus Haban.

Two-thirds of the 29 injection moulding machines in Weissenburg produce interior components, besides kinematic components mainly finished visible parts, either with IML, IMD or high-gloss decor directly from the injection moulding. In addition, two painting lines open up a wide range of colour and paint variants as well as chrome (VI) substitute coatings. ZSB (assembly) parts up to complete instrument panel modules are produced in the in-house assembly department. Exterior applications from Weissenburg include complex air ducts with mounted air flap control and large parts such as underbody panels or wheel arch covers, which are produced on the largest injection moulding machine with a clamping force of 23,000 kN. While weight aspects are increasingly important for exterior applications, which Nifco Germany addresses with physical foam injection moulding (Mucell), among other things, the increase in functionalities challenges the developers in the interior area. „Light is a big issue for all OEMs. We rarely produce a decorative component without a light component. No matter whether it's an instrument panel or door trim, ambient lighting is usually involved,” Claus Haban knows.

Decor, light and function for the interior

"There are highly interesting developments in this area, including projectors that bring snowfall or sunshine into the interior. But where the journey ultimately takes us is up to the customer. We are open to any new technology," says Haban. To this end, Nifco Germany operates its own development centre for component and process development at the Weissenburg site. "For our product range, the worldwide development takes place here in Weissenburg. We develop everything from the component to the tool to the finished ZSB and pass on our experience both to the Solingen site and to Nifco KTW America in the USA." Claus Haban considers globalisation to be one of the greatest challenges. To supply OEMs in the USA directly, Nifco Germany launched its first plant abroad in Georgia in 2016. It produces interior and exterior parts for BMW's X models, among others, and since 2018 also components for Daimler. Claus Haban accompanied the start-up of this local branch for three years before coming to Weissenburg: "The location in the USA is very well utilised. We are currently expanding production capacities there." In the beginning, the plant in Georgia was equipped with 22 injection moulding machines from KraussMaffei, including Mucell technology for weight-saving underbody panels.

The blue-and-white injection moulding machines also dominate the scene in the three production halls in Weissenburg, which have a wide range of clamping forces from 800 to 23,000 kN. In addition to six older machines from other manufacturers, 23 injection moulding machines are made in Munich. With the exception of two 13,000 kN machines equipped with Mucell technology, the machinery focuses primarily on surface technologies such as Variotherm injection moulding for high-gloss components as well as IML and IMD processes for foil decoration, which according to Claus Haban is growing strongly. In 2015, the first rotary table injection moulding machine moved in, a KM1300 with Mucell equipment, followed by a GXL 651-3000/750 with rotary table, two of which have been in the hall since mid-2020 for capacity reasons. However, with a small difference in the MC6 machine control system: SmartTurn is the name of a new software feature that optimises the movement of the turntable (for more information on how it works, see the interview on page xx) and is to prove its practicality in field tests at Nifco.

New developments on the test bench

"Nifco is always one of the first contacts when it comes to field tests. We maintain an intensive partnership and mutually benefit from synergy effects," reports Frank Burkhardt from KraussMaffei's sales department. Nifco already supported the machine builder with earlier new developments, as Maintenance Manager Christopher Emerling knows: "We had the all-electric PX machine here for testing, as well as the APC machine function and later APC plus." Since this function for process monitoring and stabilisation has been available, Nifco equips every new acquisition with it. "We use the function on all machines equipped with it."

Being open to new things is the credo in Weissenburg. Therefore, the willingness to test the new SmartTurn feature in the field was not a question. Since the end of the first quarter of 2021, Nifco has even been using the new assistant in series production. The IML-2K series application is a decorative strip that is part of a ZSB interior component with a lighting module and is manufactured for

Plant Manager Claus Haban: "We are open to any new technology. We adapt to the market."



a compact class passenger car of an internationally operating German OEM. To accommodate the large mould, which weighs over 4 t, the 6,500 kN machine has the tie bar dimensions of an 8,000 kN version – hence the designation GXL 651. The clamping surface of the mould is 1,000 mm x 800 mm, and the rotary table moves its 1,350 kg ejector side into the correct injection position with high precision and dynamism cycle after cycle.

With each cycle, a six-axis robot mounted on the console inserts a preformed foil insert into the mould cavity, which is overmoulded in the first step with a crystal-clear polycarbonate for the image of the light window. After rotating the mould by 180 degrees, the pre-moulded part is completed with the second component, a black ABS/PC, to form the finished part. The robot removes the component and inserts a new decorative film in the same step. One cycle takes about one minute. And this could now be further improved by the new control assistant. Christian Stark, Continuous Improvement Coordinator, knows the details. He is the focus of attention when it comes to optimisation at Nifco Germany, and he is where all activities for continuous improvement converge. He summarises his experience with SmartTurn without further ado: "We were able to reduce our cycle time by more than 2 per cent. We had expected much less. SmartTurn is a great thing and easy to use. The function

is simply activated via the display of the machine control. Then the optimisation runs for a few cycles and the result shows up immediately in the actual value cycles."

Saves time with the same energy consumption

The team is very satisfied with the results. On average, the turning time for this application was reduced from 3.84 s to 2.73 s, i.e. by 1.11 s or almost 30 %, and the total cycle time was even reduced by 1.29 s – with identical energy consumption. "We are certified according to the environmental standard ISO 14001 and the energy standard ISO 50001. The fact that the optimisation is possible without additional energy expenditure was therefore particularly important for us," confirms Maintenance Manager Christopher Emmerling and adds: "The average power consumption of the motor is somewhat higher with optimisation, but due to the shorter running time, the specific energy requirement in kWh/kg is even slightly lower than the original value."

Claus Haban illustrates how valuable the savings are: "Even if the saving had been only half a per cent, the function would still pay off for us. In any case, we achieve higher utilisation of the machine. A two per cent saving on a 60-second component means that I can produce around 8,000 more components a year." Such further developments to increase efficiency are immensely important, especially for automotive suppliers and in view of the continuously demanded price reductions. "Depending on the project and OEM, savings are requested in the third year at the latest. And then there are only two options: Either I optimise the technical side or my processes."

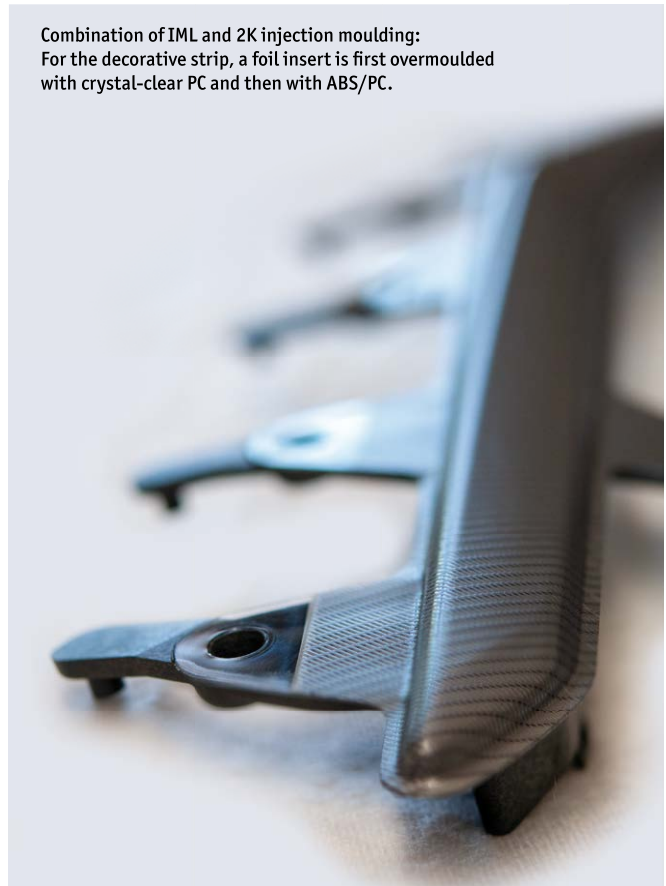
Nifco makes use of energy-saving potentials

The certified environmental and energy management systems also come with corresponding specifications and targets. "We have to look everywhere in the company to see where we can save in order to pass the audits," reports Christopher Emmerling. In the past, a number of energy optimisations were implemented. Nifco Germany has encased the plasticising units of all injection moulding machines with full cylinder insulation. "These heating jackets are very good. They save us around 30 per cent of the energy used to heat the cylinders. And because virtually no more heat is emitted to the outside, they help prevent accidents." In addition, the hydraulic drive concepts of the machines were optimised and constant pumps were replaced by frequency-controlled servo drives. "Depending on the machine size, we save up to 25 per cent energy." Nifco Germany sees further potential in automation, as Christian Stark knows: "KraussMaffei offers an eco-mode for the six-axis robots. The programmed speed is often too fast. The Eco-Mode calculates the required speed so that the robot is above the machine in time. This saves us around ten per cent energy." The site is currently converting its lighting concept to LED technology and expects to save 43,000 euros this year alone.

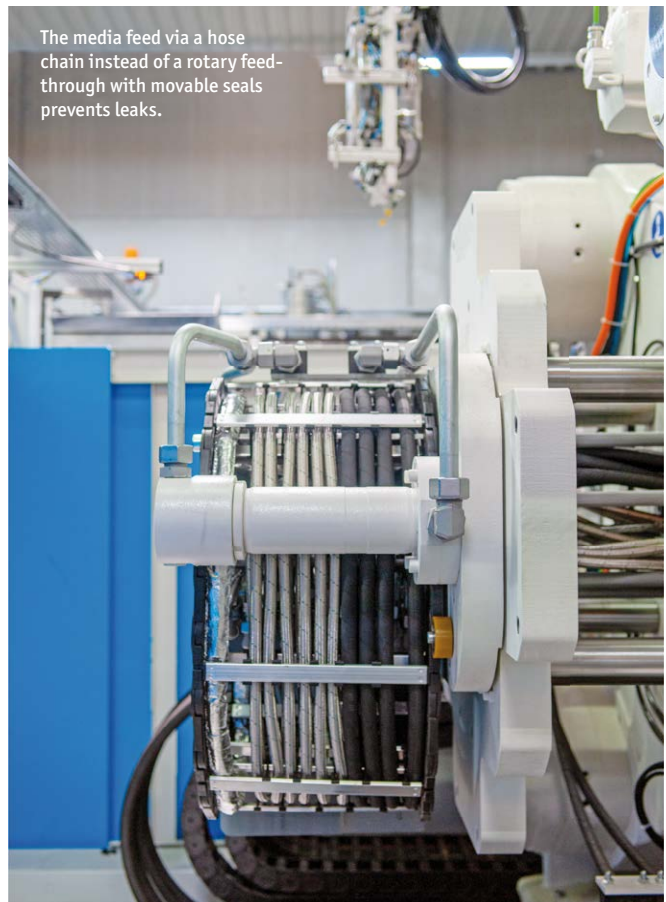
... and plans to expand digitalisation

"Our next improvements are in the digital area. On the one hand, we are planning to use the RedBox from KraussMaffei for a remote connection to give service access, and on the other hand, a BlueBox to be able to manage data centrally. In addition, we will have the first machine equipped with the Smartcube from KraussMaffei and test

Combination of IML and 2K injection moulding:
For the decorative strip, a foil insert is first overmoulded with crystal-clear PC and then with ABS/PC.



The media feed via a hose chain instead of a rotary feed-through with movable seals prevents leaks.



Improves cycle time and protects the engine

After six months of development, KraussMaffei has tested the SmartTurn optimization option not only in field tests at selected customers but also in-house on five different rotary platen and insert machines. The function is currently offered for injection moulding machines with rotary tables or indexing units in the GX series, and there are plans to extend it to other series. Andreas Handschke, Technology Manager Multi-Component & Foaming at KraussMaffei, explains how it works.

K-PROFI: Mr Handschke, why does one need an option to optimise the turntable movement, why doesn't the turning unit move optimally by default?

Andreas Handschke: As a machine manufacturer, we don't know which tool the customer will use later, we don't know the weight, the dimensions and therefore we don't know the moment of inertia. But this is the decisive criterion for how fast the motor can be started up. So that the user does not have to suffer a total

failure sooner or later when trying to exhaust the cycle time without having an eye on a possible motor overload, we have taken precautions and initially assume that the heaviest possible tool is set up. Of course, with the consequence that the turntable then rotates too slowly in comparison if the customer uses lighter tools.

How have you solved this dilemma so far?

We released the parameters after consultation, of course not without appropriate written assurance. Users justifiably asked for automatic detection. This gave us the idea of using the intelligent MC6 control to detect the optimum turning movement for the individual application.

And how does the control recognise the optimum?

As soon as the user selects self-optimisation in the control, the inverter starts to rotate gradually faster than the presetting for the maximum permitted tool weight. Since the turntable is usually in reversing mode for a pre-moulded and a finished moulded part, i.e. it rotates backwards and forwards by 180 degrees, an optimisation loop of the inverter includes a counterclockwise and a clockwise rotation. The MC6 control communicates with the inverter to detect the gap to the optimum from the recorded parameters per cycle.

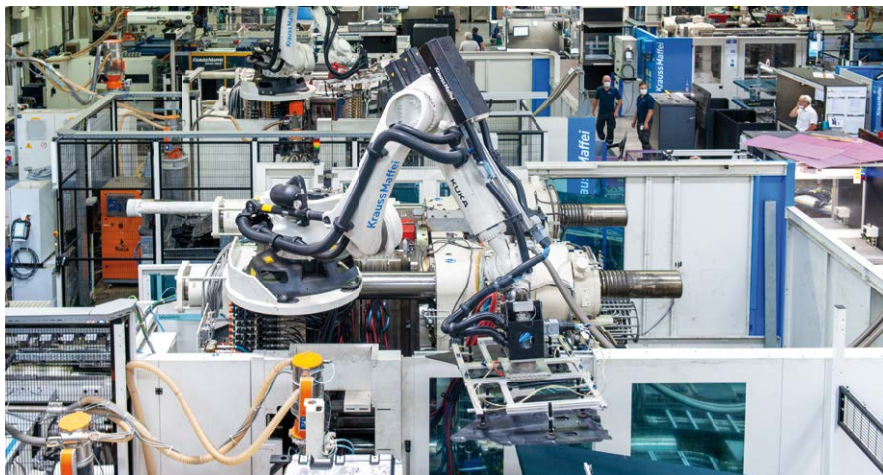
In just a few cycles, SmartTurn works its way towards the optimum using intelligent algorithms and adapts the acceleration, travel and deceleration ramps to the actual tool conditions. A safety buffer avoids overloading the motor and machine in continuous operation.

Nifco was able to save more than one second of cycle time in the tested application. Does the function bring further advantages?

In general, the lighter the tool, the more interesting this feature becomes and the greater the potential it offers. In addition to cycle time reduction, we also achieve motor protection with SmartTurn. To this end, the function not only optimises the turning speed but above all adjusts acceleration and deceleration based on the motor's characteristic curve.



Andreas Handschke, Technology Manager
Multicomponent & Foaming at KraussMaffei



Nifco Germany operates a total of 29 injection moulding machines in Weissenburg, here in the forefront, physical foam injection moulding (Mucell) on a 13,000 kN system.

Production cell for the decorative strip: 2C injection moulding machine GXL 651-3000/750 with rotary table and six-axis robot for film and part handling.



it in the next few weeks," announces Maintenance Manager Christopher Emmerling. Since the beginning of 2021, every new injection moulding machine from KraussMaffei has included this standardised hardware solution for the operation of digital products, which is already equipped for the 5G mobile communications standard; older machines can be retrofitted via interfaces. With the Smartcube, all data streams are recorded, analysed and stored in real-time on-site at the machine. "Smartcube is a high-performance IPC through which we can offer various digital solutions and service models. Among other things, this goes in the direction of predictive maintenance, process

analysis, detection of anomalies on the component, for example, in order to guide the operator in a targeted manner towards correction possibilities," explains Frank Burkhardt. Claus Haban is also convinced that it is precisely the independent detection of deviations in the production process that makes a further increase in quality possible. Such tools for condition and process monitoring in injection moulding are becoming increasingly established in practice.

How is Nifco Germany coping with the overall challenges surrounding the pandemic and the switch to electromobility? "Since our business is 100% oriented towards the

automotive sector and the latter is always subject to very large fluctuations, our company policy is strategically geared towards this. We were able to absorb the slump satisfactorily," admits Plant Manager Claus Haban. The range of parts has hardly changed. "We recognise the shift away from the combustion engine not by the parts themselves, but by how the call-off quantities shift." For the location in Weissenburg, the signs are pointing to growth. "Our order books are overflowing at the moment. We will have to expand here. But we are also aiming for further globalisation." ■

www.nifco.de; www.kraussmaffei.com



Frank Burkhardt, sales KraussMaffei: "Nifco is always one of the first contacts when it comes to field tests."



When it comes to continuous improvements, the focus is on Coordinator Christian Stark.



Maintenance Manager Christopher Emmerling: "The optimised process requires no additional energy and is easy on the motor."



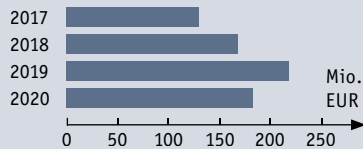
Joachim Schinke, head of the injection moulding department, inspects the decorative strip, which is challenging in terms of gap dimensions and surface.



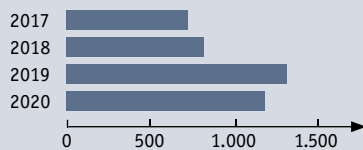
Simply tick the box: Christian Stark shows how SmartTurn self-optimisation can be activated in the control software.

NIFCO

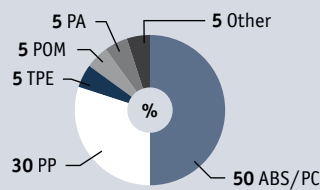
Turnover



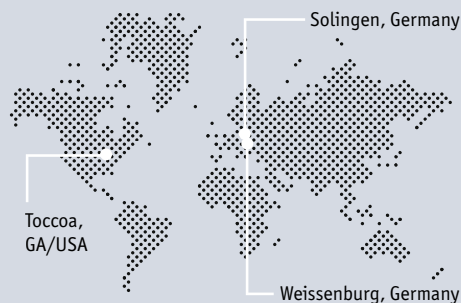
Employees



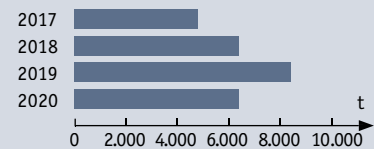
Processed plastics



Locations



Processing quantity



History

- 1997 **Foundation** of KTW Kunststofftechnik GmbH
- 2014 **Name change** to Nifco KTW GmbH
- 2015 **US site** by foundation of Nifco KTW America Corp.
- 2019 **Merger** of Nifco KTW and Nifco KTS to form Nifco Germany GmbH
- 2021 **Serbian site** by foundation of Nifco-Germany d.o.o.

Source: Nifco; Graph: K-PROFI