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Process monitoring and quality assurance during injection molding

For plastics processing, Riegler relies on measurement technology from Kistler

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Maximum quality: that is the mandatory requirement for manufacturers of plastic systems used in diagnostics and the medical sector. Cavity pressure sensors from Kistler combined with the ComoNeo process monitoring system are helping this medical technology provider to manufacture its products safely and efficiently – and what's more, Kistler's technology also supports the company's ongoing development work.

Much more than a job: as soon as Christoph Merhold of Riegler GmbH & Co. KG starts talking about his work, his heartfelt commitment shines through. Since September 2017, he has handled Key Account Management for a leading pharmaceutical company at Riegler, a plastics specialist located in southern Hesse, Germany. "Personally, I believe it's important that the products we manufacture should be of very high quality so that they can serve their purpose – which is to help people. What we do here is rather different from what happens in the automotive industry, for example," he emphasizes. This young engineer is also responsible for innovation and ongoing technical development on behalf of the customer – every year, new products with large numbers of individual parts are added to the range.

Riegler is a midsize company that belongs to the global Wirthwein Group. With 300 employees at three sites, it produces over one billion plastic parts and systems every year: all of them go to about 500 customers in application areas such as diagnostics, medical technology, pharmaceuticals and cosmetics. And the trend is continuing to move upwards: two new clean rooms were commissioned recently for plastics production to even higher quality standards, and further expansions are already being planned. Merhold explains: "Our customers benefit from our services throughout the entire vertical production range – from single products manufactured in large quantities, assembly, toolmaking and contract manufacturing through to joint development, qualification and validation."

Many of the plastic parts produced by Riegler are disposable products that doctors and medical technicians need every day: examples include primary packaging, injectors and syringe systems, along with a host of other application instruments. Riegler's specialties include screw closures such as single-use caps for bottles or reagent vessels. "Closures, in particular, are anything but trivial: they call for special molds with the appropriate degree of precision to protect the contents – and at the same time, we have to make sure that the opening mechanism functions as intended," Merhold notes.

Cutting-edge injection molding plants operate with molds that have up to 96 cavities – and they are equipped with Kistler's ComoNeo process monitoring system

Reliable control of multi-cavity molds

Large sections of Riegler's injection molding production facility at Mühltal are highly automated, with cutting-edge machinery and plant. The multi-cavity molds deployed have as many as 96 cavities: they are devised in the development and design department, after which they are produced in the company's own mold shop by a team of 30 employees. End customers have high requirements and expectations: quality and cost are key factors, of course – but a good reputation always plays a critical part as well, especially for suppliers.

Some irregularities occurred recently during the injection molding of a two-part reagent vessel for laboratory analyses that is manufactured with a multi-cavity mold: once in every 200 000 or so parts, there was a pressure loss in the open hot runner, causing the scrap rate to increase to as many as 30 parts. "Without sensors, there was virtually no way of determining exactly when and where the problem was occurring," Merhold recalls. "I approached Kistler because we were already in contact with them on account of a previous project, and they are renowned for their cavity pressure sensors."

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Christoph Merhold, Engineer and Key Account Manager for Medical Devices in Riegler GmbH & Co. KG. (right) and Peter Jost, Sales Engineer Plastics at Kistler (left)
Riegler GmbH & Co. KG., Bahnhofstraße 80, Mühltal/Nieder-Ramstadt, www.riegler-medical.com

Peter Jost, Sales Engineer at Kistler, recommended the ComoNeo process monitoring system for reliable, convenient injection molding with the very highest quality: "When we realized that this was quite an urgent case, we loaned a system to Christoph Merhold at Riegler in the first instance, so that he could take his time and test everything out. There's almost always a certain degree of skepticism at the outset, especially in the injection molding sector where so much is based on empirical values," Jost comments. Thanks to cavity pressure monitoring with ComoNeo, it was possible to resolve this issue quickly and segregate the faulty parts – known as short shots. Since then, ComoNeo has been integrated into all three of the machines used to produce the special closures, and it is also planned for three more machines.

Christoph Merhold is delighted with the results: "As well as enabling automated segregation of short shots, this system achieves a higher level of automation and makes maintenance easier. As the user, you can see exactly what is happening in the mold, which cavity has a problem, how the venting is proceeding, which cavities are lagging behind, and much more besides." He continues: "I really appreciate how Mr. Jost of Kistler provided us with a system to test, so quickly and without bureaucratic fuss." The HMI for ComoNeo is located directly on the machine, so users benefit from a fast overview and full control over the live injection molding process. "And I really have to bang the drum for Kistler when it comes to user-friendly operation. You quickly find your way into the system, and most of our employees can manage on their own after a brief training session," Merhold adds.

Process data – the basis for quality assurance and development
Kistler's cavity pressure sensors also prove to be extremely robust, and they can easily withstand 10 million cycles – an essential attribute, given the huge quantities produced in the plastics industry. "I should also mention that the sensors are fitted with a replaceable 'single-wire cable' – and that's a very major point in their favor as far as handling is concerned," Peter Jost notes. "That's because it can happen that a cable is damaged during installation – so in that case, you can simply change it without having to replace the whole sensor."

Insights and valuable process data gained thanks to ComoNeo also help Christoph Merhold and his colleagues at Riegler with developing new molded parts and systems, especially as regards long flow lines in the injection molding process. Another advantage: thanks to the integrated ComoNeoRECOVER Restart Assistant, tried-and-tested settings can easily be transferred to other machines – so plug-and-produce is no longer a matter of wishful thinking for plastics processors. "And just in case something happens: here at Kistler, we accord high priority to good service," Peter Jost points out. "Spare parts, commissioning or staff training – no matter what the requirements are, we regard service as a key issue and we aim to provide the best possible support for our customers."

Christoph Merhold nods in agreement: "I've rarely known a working relationship that runs as well as our collaboration with

Cavity pressure monitoring with ComoNeo by Kistler makes easy work of process monitoring and quality assurance for injection molding

Kistler. It's always easy to approach their staff, and we've already worked together to bring about a large number of small improvements." He concludes by taking a look into the future for Riegler: "As the next step, we intend to improve the connection to a new MES system. That will allow us to track down the precise cause of parts that might be faulty. Then we shall be stepping up our efforts to improve traceability: for example, the dimensions, cavity pressure during production and other process variables will be available for each part via a QR code. At the end of the day, it's all about building up the trust of the customers and end users – and making sure that the patients are safe."

Perfection in plastics processing
Kistler's ComoNeo process monitoring and control system offers injection molders a variety of options for optimizing their production. The benefits: guaranteed quality and enhanced efficiency – adding up to cost savings. These functions are in use at Riegler:

- **ComoNeoGUARD:** helps users to define monitoring windows that gradually enable accurate segregation of good and bad parts. The benefits: guaranteed part quality and less pseudo-scrap.
- **ComoNeoMULTIFLOW**: allows hot runner balancing through individual adjustment of the nozzle temperature for molds with multiple cavities – to ensure identical injection conditions in all cavities and automatic correction of deviations.
- **ComoNeoRECOVER:** makes it possible to reproduce a proven injection molding pro-cess on a different machine. The user is guided through the adaptation step by step, any deviations are identified and the Assistant suggests corrective actions.

As well as the features listed here, many other functionalities are available in ComoNeo: examples include prediction, assistance, monitoring and control – the system can be adapted individually to meet the requirements for each particular application.

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