Automation in injection molding

Compact, flexible sensor technology for parts handling

Reliable sensor technology is essential for the automated handling of injection molded parts. However, if assembly space is extremely limited, robust and compact solutions are required. RICO Elastomere Projecting GmbH, based in Thalheim (Upper Austria), specializes in the development and construction of injection moulding tools, the automation of injection moulding machines and the production of elastomer parts (see info box at the end of the article).

"In principle, customers can use our solution in their own production. However, many also commission us to manufacture their injection-molded parts using single, dual or multi-component injection molding, whereby we always process liquid and solid silicones," explains Roland Angerer, Technical Director at RICO .

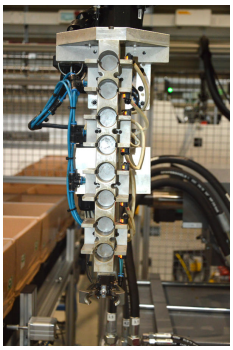
Powerful network for individual projects

RICO Elastomere Projecting GmbH is part of the RICOGROUP, a global full-service provider for individual elastomer and plastics projects. With a total of four locations in Austria, Switzerland and the USA, the group forms an international technology and production network. The portfolio ranges from the production of injection molding tools, via consulting on component development, to the series production of customized components. The focus is on the processing of elastomers, especially liquid silicone (LSR) and solid silicone (HTV), whereby the components are manufactured using single, two or multi-component injection molding.

Robust sensor technology for the inquiry of gripper stations

As already mentioned, automation is one of the company's specialties. Among other things, robot-assisted handling heads are developed for removing injection molded parts from a machine. The number of gripper stations integrated into the handling heads for damage-free handling of such parts varies depending on their complexity and size. "To inquire about the gripper stations, we need optical sensors that can withstand the temperatures of up to +70° that occur briefly during handling on an injection molding machine," says Roland Beständig, an electrician in Application Technology.

The sensors are initially intended to monitor whether all parts have been removed from the injection mold. If this is not the case, the machine's PLC (programmable logic controller) receives a signal and stops instantaneously, also identifying the relevant gripper station and thus the position in the mold. After the injection molded parts have been deposited, the sensor system also ensures that all gripper stations in the handling head are empty before the next part is removed from the mold.

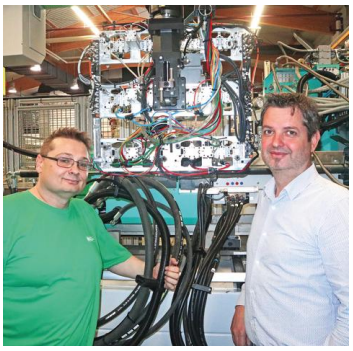


Eight-fold handling head with gripper stations for damage-free removal of injection molded parts from a machine. (Image: ipf electronic)

Wanted: compact and versatile solution

"We had previously used optical sensors to monitor the gripper stations, but their electronics could not withstand the higher temperatures on the injection molding machine in the long term. We therefore turned to the application specialist at ipf electronic, Thomas Wally, to find an alternative to the susceptible sensors," reports Durability. Along with higher temperature resistance, the new sensors needed to be compact, as there is very little space available for mounting them on the handling heads in the area of the gripper stations.

"Because the customer-specific automation solutions we develop are fundamentally different in terms of the size of the parts we want to handle with them, we also needed flexible diffuse reflection sensors with adjustable switching distance. This enables us to use a standardized sensor type very universally for different handling heads," emphasizes Roland Angerer.



Roland Beständig (left) and Roland Angerer have had positive experiences with the versatile solutions from ipf electronic. (Image: RICO)

Optical "tiny" devices for industrial use

The choice finally fell on the optical sensors **OTQ80100** and **OTQ80200** from ipf electronic, as they met all of RICO's requirements. The IP67 sensors, which operate with red light, are extremely compact at 8.2 x 25 x 12mm and are designed for robust industrial applications thanks to their vibration resistance up to 500Hz and shock resistance up to 50g. The sensors, designed for a maximum ambient temperature of up to +55° C, withstand the brief high temperatures during part removal from the injection molding machine, as tests have shown. Last but not least, the switching distance of the sensors can be manually adjusted in the range from 6 to 14 mm.

The optical sensors **OTQ80100** and **OTQ80200** are very compact and are suitable for use in different handling heads with different gripper stations thanks to the adjustable switching distance. (Image: ipf electronic)

High flexibility for a wide range of solutions

"We have been using the optical sensors from ipf electronic for several years now and have had consistently positive experiences. As simple, compact solutions, they always work reliably and can also withstand the briefly higher temperatures during parts handling on the injection molding machines. In addition, we can use the devices very flexibly in different handling heads. We now have an estimated several hundred of these sensors in use," says Roland Durability.

Process many signals with logic

ipf electronic has a very broad product range. It is therefore not surprising that other solutions from the sensor specialist also attracted RICO's interest in the course of the partnership. Roland Angerer comments: "The handling heads we have developed include very complex solutions with a large number of sensors for a wide variety of inquiries. We use logic modules from ipf electronic to be able to process the wealth of digital sensor signals despite the limited number of control inputs."

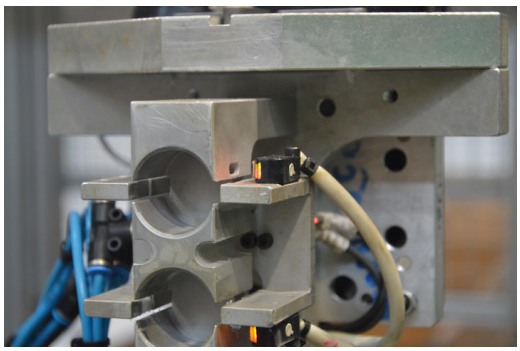
Integrated electronics instead of internal wiring

In one specific case, a handling head with more than 50 sensors was fitted with a total of eight logic modules of type **VL310108** with various functions, including in combination with the logic modules **VL150102** were integrated. The logic modules **VL310108** in IP67 are designed for a wide temperature range from -30° C to +85° C and have a total of eight sensor connection points per unit. These are supplemented by the fully electronic dual logic modules **VL150102.** The features of this solution: the AND linking of the outputs of the sensors connected to this logic module is not carried out via internal wiring, but via the integrated electronics.

Instead of internal wiring, the integrated electronics of the **VL150102** performs the AND linking of the sensor outputs so that "clean" signals are always present at the control unit. (Image: ipf electronic)

In a wired series connection, however, the switching output of the first sensor internally supplies the operating voltage for the second sensor, whose output is then the switching output of the distribution terminal. Depending on the voltage drop or starting current of a sensor, this can lead to instable switching behavior. The electronics of the **VL150102** ensures that "clean" signals are always present at the control (unit), just as if only one sensor were connected.

The outputs of the logic modules **VL310108** were also combined with distributor islands from ipf electronic, which ultimately significantly simplified the entire wiring on the handling head. "Thanks to the solutions from ipf electronic, we were able to implement a compact handling automation system despite a large number of sensors," concludes Roland Durability.



The compact optical sensors of the OTQ series enable easy lateral mounting of the gripper stations. (Image: ipf electronic)