

AUTOMATION IN INJECTION MOLDING

COMPACT, FLEXIBLE SENSOR TECHNOLOGY FOR PARTS HANDLING

Reliable sensor technology is indispensable for the automated handling of injection molded parts. However, if the mounting space for this is very small, robust as well as compact solutions are required. RICO Elastomere Projecting GmbH, based in Thalheim (Upper Austria), specializes in the development and construction of injection molds, the automation of injection molding machines, and the production of elastomer parts (see info box at the end of the article).

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

ROBUST SENSORS FOR THE SENSING OF GRIPPER STATIONS

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

The sensors should first monitor whether all parts have been removed from the injection mold. If this is not the case, the PLC of the machine receives a signal and stops immediately, whereby the relevant robotic gripper station and thus the position in the mold is also identified. After the injection molded parts have been deposited, the sensor system also ensures that all robotic gripper stations in the handling head are empty for the next part removal from the mold.

WANTED: COMPACT AND VERSATILE SOLUTION

"We had previously used optical sensors to monitor the robotic gripper stations, but their electronics could not withstand the higher temperatures on the injection molding machine in the long term. We therefore turned to ipf electronic's application specialist, Thomas Wally, for an alternative to the vulnerable sensors," reports Beständig. In addition to higher temperature resistance, the new sensors should above all be compact, since there is very little space available for mounting them on the handling heads in the area of the robotic 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 reflections sensors with adjustable sensing range. This enables us to use a standard sensor type very flexibly for different handling heads," emphasizes Roland Angerer.

OPTICAL "THE TINY SENSOR" FOR INDUSTRIAL USE

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

HIGH FLEXIBILITY FOR A WIDE RANGE OF SOLUTIONS

"We have been using ipf electronic's optical sensors for several years and have had consistently positive experiences. As simple, compact solutions, they always work reliably and withstand even the higher temperatures for a short time during parts handling on the injection molding machines. Moreover, 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 Beständig.

PROCESS MANY SIGNALS WITH LOGIC

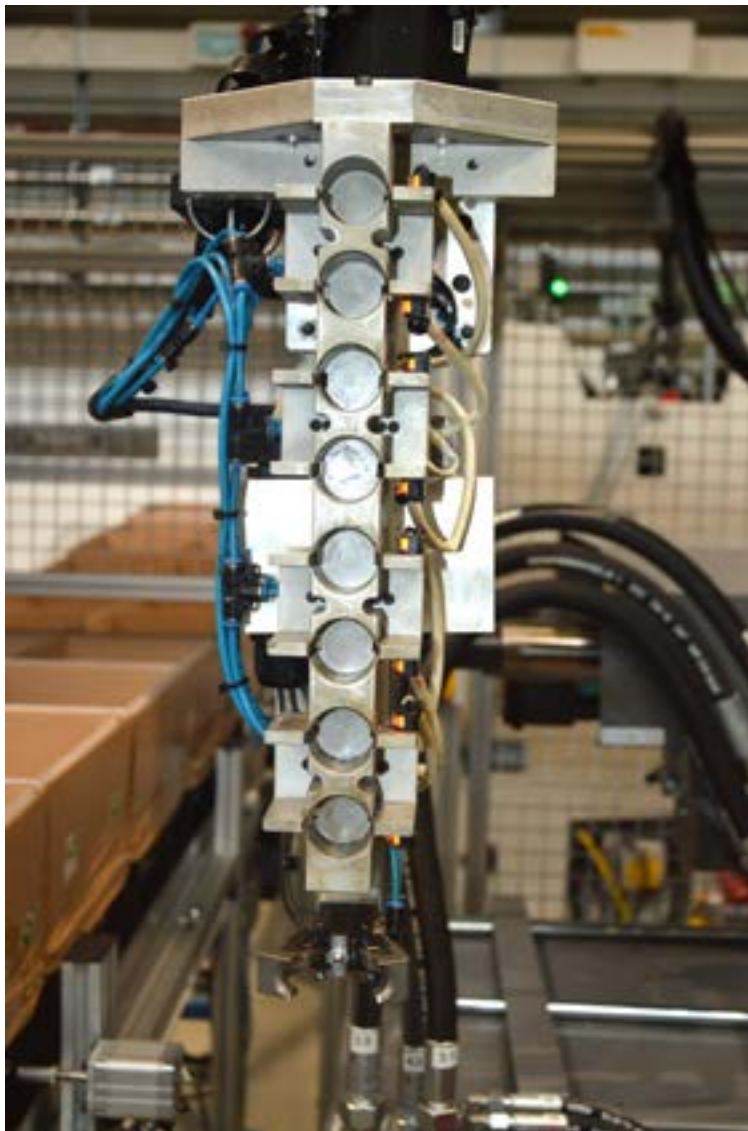
ipf electronic has a very wide range of products. Therefore, it may come as no surprise that in the course of the partnership cooperation, other solutions from the sensor specialist also attracted RICO's interest. Roland Angerer comments: "The handling heads we have developed include very complex solutions with a large number of sensors for a wide variety of queries. To be able to process the wide range of digital sensor signals despite the limited number of control inputs, we use logic modules from ipf electronic."

INTEGRATED ELECTRONICS INSTEAD OF INTERNAL WIRING

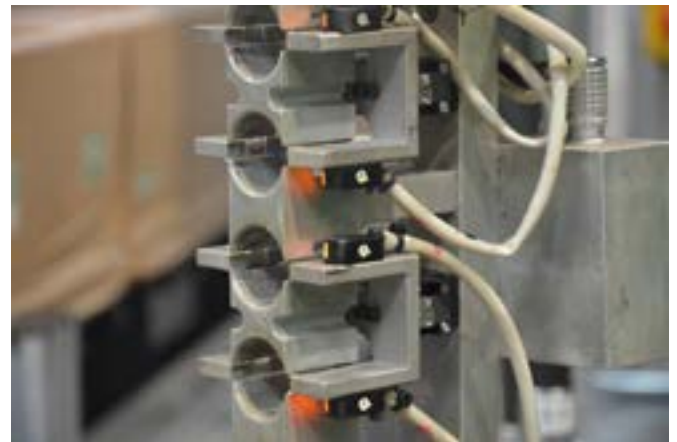
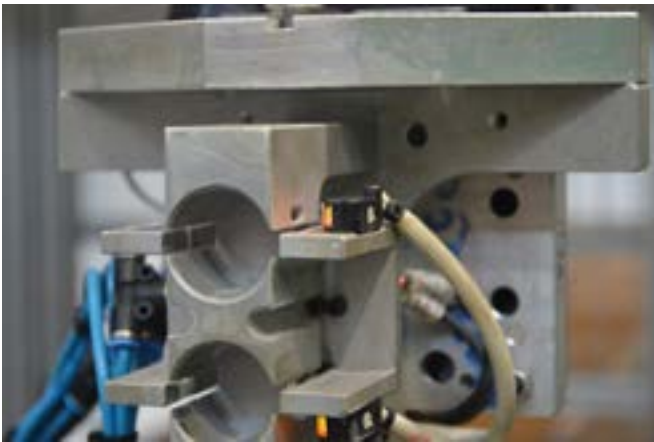
In a concrete case, a total of eight logic modules of type **VL310108** with different functions were integrated in a handling head with more than 50 sensors, among others in combination with the logic modules **VL150102**. The **VL310108** logic modules in IP67 are designed for a wide temperature range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

In a wired series connection, however, the switching output of the first sensor supplies the operating voltage internally for the second sensor, whose output is then the switching output of the distributor. Depending on the voltage drop or starting current of a sensor, this can lead to unsafe switching behavior. The electronics of the **VL150102**, on the other hand, ensure that "clean" signals are always present at the controller, just as if only one sensor were connected.

The outputs of the **VL310108** were also combined with logic modules from ipf electronic, which ultimately simplified the entire wiring at the handling head significantly. "Thanks to ipf electronic's solutions, we were able to realize a compact handling automation here as well, despite a large number of sensors," Roland Beständig concludes positively.



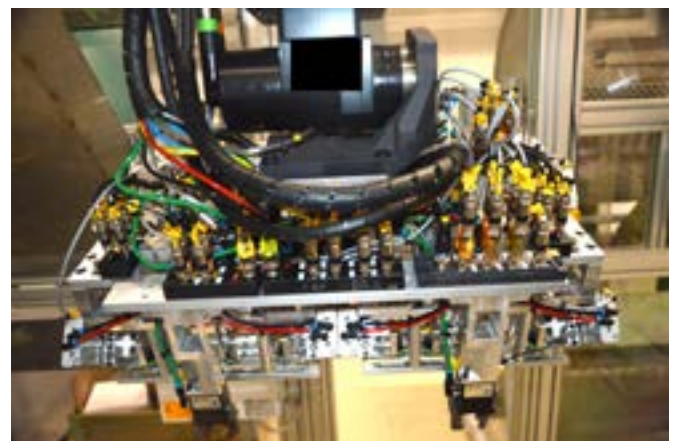
Eight-cavity handling head with gripper stations for damage-free removal of injection molded parts from a machine. (Image: ipf electronic)



The compact optical sensors of the **OTQ** series allow easy mounting on the side of the gripper stations. (Image: ipf electronic)



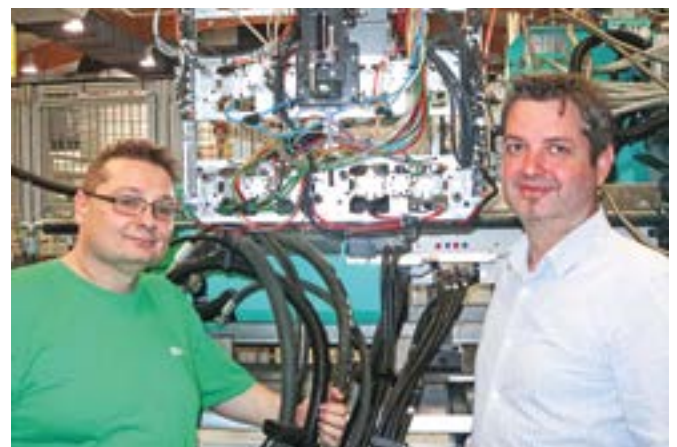
The **OTQ80100** and **OTQ80200** optical sensors have a very compact design and are suitable for use in various handling heads with different gripper stations due to the adjustable switching distance. (Image: ipf electronic)



This complex handling head integrates more than 50 sensors, whose digital signals are combined via logic modules from ipf electronic. (Image: ipf electronic)



Instead of internal wiring, the integrated electronics of the **VL150102** takes over the AND connection of the sensor outputs, so that "clean" signals are always present at the controller. (Image: ipf electronic)



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

Powerful network for individual projects

RICO Elastomere Projecting GmbH is part of the RICO GROUP, 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 molds, through consulting in 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), with components being produced using single-, two- or multi-component injection molding.