

Long-lasting in a difficult environment

Optical midget meets high expectations of a leading automotive supplier

In just a few years, what is probably the smallest optical sensor of its kind has become a real perennial favorite in the production facility of Federal-Mogul Sealing Systems in Herdorf. And there are several good reasons for this.

Federal-Mogul Sealing Systems GmbH is a company of the Federal-Mogul Corporation, a leading global manufacturer of products and solutions, primarily for the automotive industry and manufacturers of light and heavy commercial vehicles. The Group is divided into the two independent business units "Powertrain" and "Motorparts". While "Motorparts" specializes in the distribution of spare parts for the global vehicle market and also supplies OEMs with various products in this segment, the "Powertrain" division focuses on the manufacture of OEM products for the automotive sector as well as for heavy-duty and industrial applications.

Many different tools

"We are part of the Powertrain division and manufacture cylinder-head gaskets for combustion engines and heat shields at the Herdorf site with around 400 employees on a production area of more than 12,000 square meters. Such shields are deflector plates that protect the electronics in the engine compartment, e.g. in manifolds, from excessive warming," explains Dirk Sagorny, Head of Electrical Maintenance at Federal-Mogul Sealing Systems. The company's production covers almost all vehicle makes and all engine variants. The number of different tools required, e.g. for the stamping machines used to manufacture the cylinder-head gaskets, is correspondingly high.

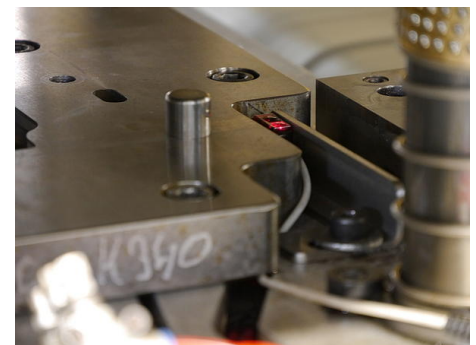
"Production takes place from a running steel coil, whereby we manufacture the individual layers of the seals, also known as multi-layer steel seals (MLS seals), using progressive dies that combine several work steps."

Cost factor feed control

In the MLS punching shop, forked light barriers were initially used to check the feed rate of the steel strips. From Federal-Mogul's point of view, this solution was certainly not economical, as the sensitive and expensive devices had high failure rates due to their use. Some devices were sometimes destroyed during the changeover of the punches, for example when the belt accidentally hit the fork leg of the light barrier housing and bent it. "As attempts with a diffuse laser reflection sensor did not bring the desired success due to its external dimensions and the switching frequency being too low, there was initially no real alternative to the forked light barrier - until an application specialist from ipf electronic presented us with sensor innovations during his visit. This drew our attention to a very small optical sensor with some interesting features."



Small jack-of-all-trades and often an economical alternative to other sensor solutions: optical sensors from the OTQ9 series with background suppression. Here in size comparison with a 10-cent coin. All pictures ipf electronic.



Due to its dimensions, the diffuse reflection sensor can be installed directly in the progressive dies of the MLS punching shop for feed control.

Lots of potential in the smallest installation space

The sensor in question bears the description **OTQ90170** and is approximately the size of a 10-cent coin. This makes it one of the smallest optical sensors with an integrated amplifier and adjustable background suppression. The sensing range is adjustable from 2 to 60mm on both stationary (static) and moving (dynamic) objects. With a switching frequency of 1kHz and a response and decay time of $\leq 0.5\text{ms}$, the device, which works with visible red light, is particularly suitable for the recognition of the smallest objects and for position detection in fast-running processes.

"In terms of our specific application, the diffuse reflection sensor convinced us as an economical and therefore genuine alternative to costly forked light barriers in several respects: its extremely compact design, its background suppression, its dynamically adjustable sensing range and its high switching frequency and low response time. Taken together, these features offer great potential for flexible applications."

Fast reaction times required

Due to its dimensions of just 9.2x10.8x21.2mm, the diffuse reflection sensor can be installed directly in the progressive dies of the MLS stamping shop. The devices are already pre-set for the respective applications in the Federal-Mogul Sealing Systems tool shop. According to the maintenance manager, depending on the application, it is also possible to teach the sensor very easily from the outside via the outside via a teach box, which is connected on site with an adapter cable, without having to touch the device itself.

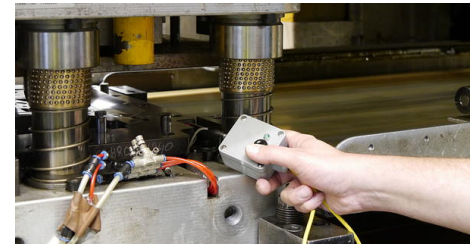
"For feed control, a hole is made at a defined point in the steel strip during the first cut, which must be recognized by the so-called feed sensor in order to ensure the correct position of the material in the tool for each individual stroke. The further transport of the strip is so fast that only milliseconds are available for the reliable detection of the so-called position hole. Within this very short time, reliable detection of the hole must be ensured and a switching signal must be made available to the PLC (programmable logic controller) of the punching press. If this does not happen, the punching press is stopped instantaneously via the PLC (programmable logic controller)."

Disturbing influences reliably eliminated

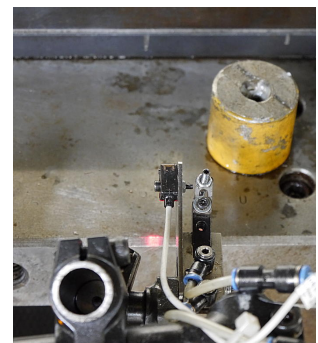
Background suppression is also necessary at the time of interrogation, as the sensor "sees" the shiny upper tool through the position hole and this must not be detected under any circumstances. The maintenance manager comments: "With the integrated background suppression of the **OTQ90170** we can eliminate this disturbing influence very reliably."



Press for the production of cylinder-head gaskets. Production takes place from a running steel coil, with the individual layers of the multilayer steel gaskets (MLS gaskets) being manufactured in progressive dies that combine several work steps.



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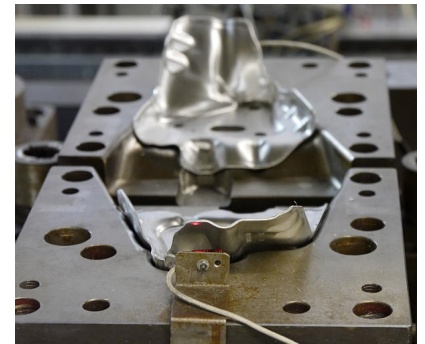
Versatile use: The compact sensors from ipf electronic are also used in the heat shield production of Federal-Mogul Sealing Systems in gripper units of the transfer system.

Reliable inquiry, even if the tape "makes waves"

Dirk Sagorny cites the comparatively large and, if required, dynamically adjustable sensing range of the optical sensor as another decisive advantage, which leads to very specific benefits in practical use: "For such a small device, the sensor has a relatively large switching distance of a maximum of 60mm, which gives me the opportunity to use it very flexibly for a wide variety of inquiries. We usually use a switching distance of around 30mm. Depending on how fast the respective feed rate is set for processing or at what cycle rate the punch is running, smaller waves can occur in the belt during further transport, so to speak, which increases the distance between the belt and the sensor. The sensor must be able to compensate for this, which in turn requires the largest possible adjustment range with exact adjustability of the end range. Ideally, the diffuse reflection sensor or range of the **OTQ9** is set so that it ends just before the upper tool."

Duration of use with certain limits

The optical sensors from ipf electronic have now been in use at Federal-Mogul Sealing Systems for more than five years. In the meantime, the tiny device has become a perennial favorite: "We have a constant need for these devices, as they understandably do not last "forever" due to the very harsh environmental conditions in our production. Aggressive oils are essential for forming and deep drawing. As the housing of the sensor is made of plastic for development and production reasons, there are of course certain limits to how long it can be used. Nevertheless, we are extremely satisfied with the solution, as all the devices we have tested so far have failed to meet our expectations."



High process reliability: Optical sensors integrated in various stations of the progressive die ensure that the respective blanks are available for processing.

Workpiece position detection in transfer presses

Federal-Mogul Sealing Systems has a great need for the devices, as they are in constant use - and not just in the MLS stamping shop: "We have recognized the versatility of the **OTQ90170** learned to appreciate." The devices are not only used for feed control in the production of cylinder-head gaskets, but also in the production of heat shields on transfer presses. "The presses have various processing stations and integrated handling systems that move the heat shields into different positions depending on the processing step. In some cases, the shields are rotated by 90 or 180 degrees. In these cases, the optical sensors from ipf electronic take over the position monitoring and position detection of the heat shields to ensure their correct position for the next punching process and thus reliable production."