

"A 100 PERCENT SUCCESS"

RELIABLY DETECT MARKINGS EVEN ON DIFFICULT MATERIAL

Reliably detecting codes on different glass materials for tracking in a production process at all times is not easy, as a manufacturer of special glass had to learn. With high-performance camera sensors and adapted lighting technology, however, the problems, which were always associated with production stops, could be solved in the long term.

Glass is not just glass, and with coatings just a few nanometers thick, its material properties and functions can be decisively changed. One person who can tell a lot of interesting things about this is Peter Röhlen, Managing Director of Prinz Optics GmbH, based in Stromberg (Hunsrück). "Not many people do what we do. That's because of the dip coatings alone, using the very rare sol-gel process. We're one of the few companies in the world using that on an industrial scale."

PROVEN PRODUCTS WITH A LOT OF FUTURE POTENTIAL

With this process, a very wide variety of products can be realized using different coating materials without major retooling. "The process is always the same: You dip glass into a specific coating liquid and pull it out again at a defined speed," explains Röhlen. This is how Prinz Optics produces color-effect glass, optical filters and, most recently, coatings of glass, plastic and metal surfaces with nanoparticles that create, among other things, antimicrobial surface structures (see box).

Prinz Optics' optical filters have long been in demand, for example, in industry, medical technology, research and development, and lighting technology. Nevertheless, new fields of application are constantly opening up, e.g. for 3D printers in which polymer mixtures are cured with UV light. "For this, we supply special anti-reflective glasses so that the UV light penetrates the polymers well and they cure well," says Peter Röhlen.

LAYER BY LAYER TO THE HIGH-END PRODUCT

Like all products, the optical filters are manufactured in a dip coating facility. After basic cleaning and a multi-stage cleaning and drying process, the glass panes used for this purpose, known as "substrates" in technical jargon, are transported on a single conveyor line to a clean room, where they are positioned in a coded workpiece carrier. With a robot the panes are placed in one of four coating chambers. After coating, the robot repositions the panes in a workpiece carrier.

The coating is then cured at approx. 480°C in a roller hearth furnace. After that, the substrate is usually reintroduced into the process for subsequent coatings. Says Peter Röhlen: "This is a chaotic production process, with certain substrates for special UV filters going through the process up to 22 times, which takes several days. Since the layer thickness inevitably changes due to the many furnace runs, the substrates are also repeatedly tested in between."

RELIABLE TRACKING THROUGHOUT THE ENTIRE PROCESS

With the variety of products of varying complexity that are in the plant at the same time, reliable tracking is essential. Among other things, the robot in the clean room must have the information about which position on the workpiece carrier to approach so that it transports the correct pane to the correct coating chamber. Therefore, each substrate is marked with a 2D code and directly verified via a camera system before it is first transferred into the system. Another camera is installed in front of the reinsertion for products that have already been coated. The third camera system is located in the clean room in front of the entry into the workpiece carrier. All devices are integrated into the Profibus DP installation via fieldbus nodes.

MANY REASONS FOR ERROR DETECTION

The facility has been in operation since Prinz Optics was founded in 2008 and is always kept up to date with the latest technology. The cameras with integrated incident light have also been in use since this time. But in recent years, there have been repeated problems, as Röhlen reports: "The substrates, which vary in thickness and have different optical properties from one another, are sometimes not always at right angles to the camera system on the conveyor line. This sometimes resulted in unwanted reflections, so that the cameras could not capture the 2D code. In addition, in recent years we have added new glass materials to our product range. The cameras also had problems with this because, for example, material hardness can negatively affect the marking result."

TIME LOSS NOT ONLY DUE TO PRODUCTION STOP

A misreading of the code immediately resulted in the interruption of production. If the camera in the clean room was the cause of this, it became particularly problematic, according to Peter Röhlen: "An employee then had to change completely, enter the cleanroom, write down the 22-digit code, and then manually transfer it to the process visualization. This not only cost a lot of time, but also always harbored potential for errors, for example, because the code was noted incorrectly or not entered correctly." When the camera manufacturer also discontinued the systems and stopped maintaining the parameterization software, an adequate replacement had to be found.

CAMERA SENSORS WITH EFFICIENT SOFTWARE

Peter Röhlen contacted ipf electronic because the sensor specialist has, among other things, high-performance camera sensors in its portfolio with the **OC53**. The company from Altena finally recommended a solution in combination with a homogeneous surface light that works using the transmitted light method.

The **OC53** series consists of a range of variable camera sensors in different versions, from compact devices with lens, image sensor and lighting, to devices with C-mount lens connection and integrated flash controller for illumination control for a high degree of flexibility. The efficient parameterization software for the camera sensors offers a wide range of graduated inspection features and enables the devices to be used in a variety of applications with very different tasks.

REFLECTION-FREE DETECTION AND LAYER TRACKING

The first system from ipf electronic was installed in the clean room at Prinz Optics in 2019. Even the change in lighting technology with transmitted light led to more reliable detection of the 2D code, since now a inclination of the panes and the quality of the marking no longer play a role. In addition, the large image field with improved position tracking has a positive effect on the recognition of the code. Position tracking is one of the efficient features of the parameterization software for the **OC53**, whereby the position and rotation of a product, text or code, for example, can be determined on the basis of contours, edges, circles or lines. All subsequent feature checks, in this specific case the acquisition of the 2D code, are aligned with the determined object position.

MANY PROBLEMS SUSTAINABLY ELIMINATED

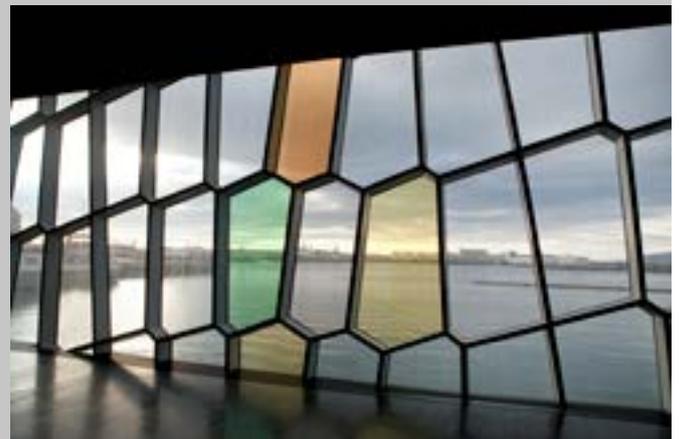
Peter Röhlen has to admit that he had a little concern about the reliability of the new camera based on his experience with the old systems alone. As it turned out, the worries were ultimately unfounded: "The identification works perfectly. Since ipf electronic's system has been in operation, no one has had to go to the clean room because of a error recognition. We were able to permanently eliminate the problems with the recording of the markings, the associated effort and, above all, the production downtimes. Due to the consistently positive experience, we finally replaced the other two cameras at the initial as well as re-entry point with the **OC53**. In this respect, this is a 100 percent success for us."



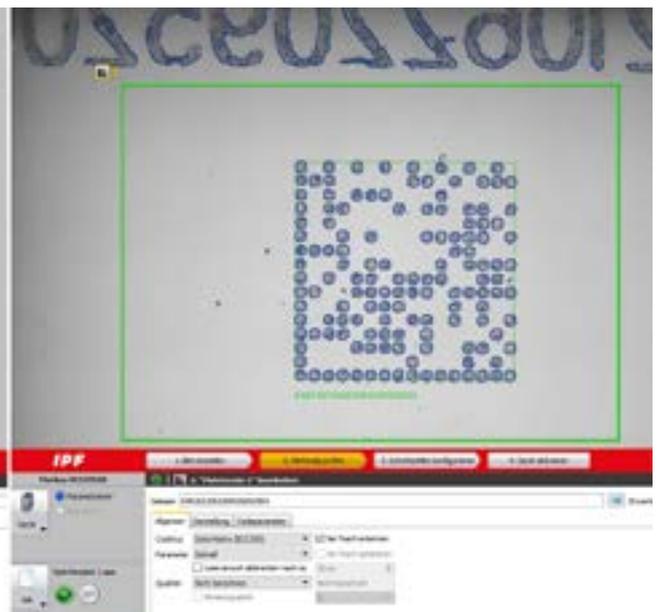
Layer tracking means that the marking is always reliably recorded and the code identified.(Image: ipf electronic gmbh)

i More than fascination from glass

Prinz Optics has been coating glass made of various materials and in different thicknesses since 2008. The sol-gel process with various coating materials creates color-effect glass, optical filters and nanocoatings. Color effect glass is valued, among other things, for its fascinating play of color and light, e.g. in architecture, art and lighting design (images). Optical filters, on the other hand, are in demand in industry, medical technology, research and development, and lighting technology. Such filters and certain light sources can be used, for example, to simulate sunlight over the entire wavelength range in order to test specific material properties. New at Prinz Optics is the coating of glass, plastic and metal surfaces with nanoparticles. The coatings with antibacterial effect enable long-lasting disinfection, e.g. of touch screens in public areas or of glasses used in refrigerators.



(Images: Prinz Optics GmbH)



Layer tracking means that the marking is always reliably recorded and the code identified. (ipf electronic gmbh)



A total of three cameras are installed in the plant. The figure shows the area of the infeed. There, the substrates are marked with a 2D code and immediately verified via a camera system. (Prinz Optics GmbH)



The **OC53** series consists of a range of variable camera sensors, from compact devices with lens, image sensor and illumination (left), to devices with C-mount lens connection and integrated flash controller for illumination control (right). (Image: ipf electronic gmbh)



Peter Röhlen, Managing Director of Prinz Optics: "We were able to permanently eliminate the problems with the detection of the markings, the associated effort and, above all, the production downtimes with the camera sensors." (Prinz Optics GmbH)