

Hand-in-hand for customised solutions

Precitec 3D Metrology co-operates closely with customers to develop application-specific optical measuring solutions. Jochen Schulze explains.

Albert Einstein won the 1921 Nobel Prize for Physics. But for what? Not his groundbreaking relativity theories but the pioneering and less publicised work on the nature of light. A century later, light-based solutions developed by Precitec Optronics are enabling ultra-precise and extremely fast in-process, in-line and offline measurements in a wide range of industries. Precitec specialists listen closely to a customer's requirements and then work hand-in-hand with them to deliver a customised solution.

Precitec's optical measuring technology is used throughout manufacturing industry for quality inspection and measuring applications. But the benefits of utilising the company's 3D metrology expertise for customised solutions are particularly apparent in the three applications described below.

Measuring multi-layer laminated glass

The growing need for multi-layer measurement of laminated glass is evident in widely varying industries, eg smart glasses, AR or VR goggles and architectural, safety or bulletproof glass. The strict quality demands made on such glass can only be met through ultra-precise measurement of the multiple layers.

Because the materials used in these multi-layer laminated glass applications are mostly optimised for specific wavelength ranges, however, they are often non-transmissive to infrared light. So, the optical measuring technologies commonly used in inspection processes are no use in these multi-layer applications. Moreover, differences in the refractive indices of the various materials are very small, as the materials used have to be index-matched to ensure correct imaging. Add to this the often highly expansive nature of the materials (eg the chemical components of the plastics or the index-



Precise measurement of the multiple layers is crucial for an extremely high degree of accuracy for laminated glasses.

matched glues) and it is obvious that customised solutions are required.

The secret of successful customised solutions is close collaboration with partner companies or the customer in question. Precitec's CHRocodile 2 IT series of interferometric sensors are the only devices capable of measuring all the glass, PVB, polyethylene or other materials in multi-layer laminated glass. The CHRocodile 2 IT RW, for example, enables fast scans over large areas through up to 70,000 non-contact measurements per second on any kind of surface texture or finish. Although equipped with an ultra-compact optical probe of just 15mm in diameter, this device has a large working distance of 40mm (optionally 100mm), excellent lateral (6.2 µm) and axial (2 nm) resolution and a wide measuring range of 4.5mm in glass (n=1.5). Last but not least, its robust measuring technology is perfectly suited to harsh industrial environments.

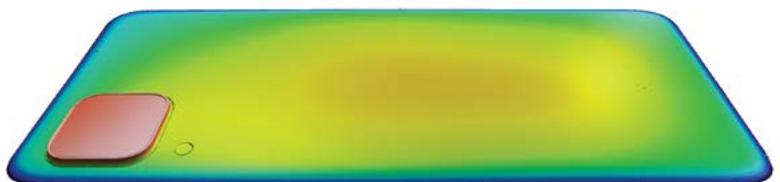
Scanning multiple automotive windscreen types

Increasing quality demands, differing windscreen curvatures, minimised cycle times; tough challenges face the automotive glass industry. Close collaboration between the specialist German machine builder Xactools and Precitec has resulted in the XacAIM Flexible Scanning System, a customised solution to speed up the measurement of different windscreen types and to reduce associated costs. Tactile-based template systems can only measure one particular windscreen type at a time but the auto glass industry would prefer to cover multiple types with just one measuring machine, without the need to change templates. The different curvatures are a challenge, however.

To overcome this problem, Xactools and Precitec developed a dynamic scanning system with three



XacAIM scanning system for multiple automotive glasses.



3D topography of smartphones with a camera module.

axes. The X and Y axes move over the glass and measure distance and thickness at the required points, while the Z axis follows the differing curvatures of the various windscreen types. The XacAllM Flexible Scanning System, which utilises a CHRocodile MPS12/24 with 12mm probes, enables multiple windscreen types to be measured with no need to change any fixtures. A 'golden reference' piece is clamped into the system's holders and measured to serve as a CAD model. Subsequently, multiple windscreens can be measured in all three axes and the results compared with the CAD reference to check if the measurements are within the required tolerances. If not, the windscreen is automatically sorted out.

Besides speeding up quality inspection, the XacAllM Flexible Scanning System also reduces the cost of controlling each windscreen. Consequently, a ROI within one year (or even less) is expected. Whatever the windscreen type, this customised solution ensures fast and ultra-precise inspection.

Inspecting 3D glass for consumer electronics

Glass components of high complexity and structural geometry (3D glass) play a vital role in smartphones, tablets, television screens and other consumer electronics devices. What all 3D glass has in common is the high demands placed on manufacturing processes. The glass may be as thin as 2 μm , very small or have complex curved edges. Consequently, quality inspection is highly demanding and must be fast and stably repeatable, as these devices are mass-produced.

In measuring the critical dimensions of 3D glass parts (length, height, width, curvature and radius) Precitec's CHRocodile Chromatic Line Sensor (CLS) delivers highly accurate results even on curved glass surfaces, without tilting the sensor or the sample. Thanks to a line length of up to 5mm with 192 measuring points, the dimensions of surface grooves and gap sizes (eg between display glass and the surrounding frame) can be measured in a single shot. The sample frequency of 6 kHz (1.3 million measuring points per second) enables ultra-short cycle times for high quality inspection.

Precitec's Flying Spot Scanner (FSS) combines an interferometric sensor with an optical scanning probe to enable fast planarity inspection of glass surfaces and measurement of glass or coating thickness, step heights and air gaps. The high speed scanning technology minimises cycle times in measuring layer thicknesses, as well as lateral and vertical alignments. Freely definable scanning paths allow users to select the exact layer to be measured. In this way, non-contact measurements in the sub- μm range at rates of up to 70,000 measurements per second can replace X,Y motion systems.

Precitec's CHRomatic Vision Camera (CVC) enables 2D surface images of even curved and complex geometries (eg of scratches) to be recorded at up to 140 kHz with a lateral resolution in the μm range. Depending on the chromatic objective used, the depth of focus can vary between 150 and 3,000 μm . This dramatically reduces inspection cycle times (eg of scratches) as no time-consuming autofocus adjustment is needed, as is the case with conventional microscopes. ●

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