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On the basis of increased quality and cost pressures, inline inspection of product quality has become an integral part of quality control. This is particularly true in plastics processing and injection moulding, where defect detection and colour control of components are important aspects of the production cycle. Both can be inspected directly and fully automatically during production by using appropriate sensor technology.

How do you achieve 100% inline control? This question can be answered concisely. Different inspection techniques can be skilfully combined, enabling easy, flawless in-process monitoring. In injection moulding, for example, the industrial thermolmager TIM 160 or TIM 400 infrared camera and the colorControl ACS7000 inline colour measurement system, both products from Micro-Epsilon, can be combined to measure and inspect during production. Here, a component is conveyed directly in front of the thermoImager TIM infrared camera during the production process. Modern injection moulding systems are normally equipped with an automatic handling system for removal and storage of components. The positioning of the component enables a precise time window to be met when recording thermographic images. This ensures that the thermographic images from one video image to another can be compared. During automatic removal of the components, a “good/bad” component decision must be made within a short time frame. The aim here is to prevent problems that may disrupt further processing and to take any corrective measures as quickly as possible, to avoid any unnecessary additional costs.

Defect detection using infrared radiation

The inline thermography system detects variations in quality by using an infrared camera. It records the entire component in up to six different views and examines it. The principle is simple: a thermolmager TIM 160 or TIM 400 miniature thermal imaging camera records the infrared radiation emanating from the workpiece and visualises it. The temperature distribution provides a...
Full control and high inline quality

If the thermoImager verifies a “good” component, its colour is then inspected directly using the inline colorControl ACS 7000 system. To date, 100% automatic (inline) control has not been possible. However, Micro-Epsilon has now made this possible. Up to now, it has only been possible to measure random samples of cooled parts. Fluctuations in temperature, known as “thermochromism”, cause changes in the colour of parts. This problem is particularly noticeable with red dyes, which makes it difficult to differentiate the colours. Even with a temperature difference of just 20°C, colour deviations of more than 2 ΔE units can occur depending on the colouring. In plastic injection moulding, the exact colour shade of the products is important, particularly in the automotive industry, where customers do not tolerate any errors.

Sensors for any material

The colorControl ACS7000 optical measurement system is unique. It provides three different sensor heads for different measurement tasks. For structured, highly reflective and shiny metallic surfaces, as in the example, a 360° circular sensor is the most suitable one. In the sensor, 24 lighting optics are arranged in a circular fashion around the receiving optics, providing continuous lighting that allows measurements to be carried out regardless of the angular position of the target object. For colour measurements on matt and fine-structured materials, the standard sensor is preferred. The transmitter and the receiver inside the sensor are arranged at an angle of 30°/0° or 45°/0° to each other.

Full control with high precision measurement

In the future, absolute control of each stage of the production process will be even more important than it is today. Industry faces increasing quality requirements and price competition. 100% inline control is now possible using technology from Micro-Epsilon in order to solve difficult, unusual measurement tasks for parameters such as displacement, distance, position, colour and temperature. In plastics processing and injection moulding, 100% control of quality can be achieved by combining the thermoImager TIM 160 or TIM 400 with the colorControl ACS7000 inline colour measurement system, which enables the detection of defective parts and incorrect colours, one after another directly in the production process. The faster the component or colour error can be recognised, the faster you can react. As a result, high rejection rates can be avoided and costs minimised. Not only do systems now exist for inline inspection tasks, but also individual solutions can now be custom-engineered for special measurement applications.

Photographs: Micro-Epsilon Messtechnik

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01 The standard sensor ACS1 is used for common measuring tasks

02 The thermoImager TIM 400 infrared camera offers high optical resolution of 382 x 288 pixels