All inclusive: Continuous checking of the gloss factor and color value
A clever combination for a door manufacturer

The human eye can only be deceived rarely, especially with regard to glossy surfaces. For example, this is particularly evident in the case of residential doors. Here, under specific lighting conditions, the eye can even detect marginal differences in gloss or small matt areas. For the task of quality checking gloss paint surfaces in the production of residential doors however, this is very special challenge.

A company specializing in the production of residential doors must meet high quality requirements in terms of production. This does not only affect the production of doors, but also the application of paint. Up until now, in many cases, the correct level of gloss on painted doors could only be determined by a hand-held instrument that had to be placed on the surface. The quality testing department could only carry out this method at random and therefore ran the risk of costly rework. Therefore, the permanent and consistent automated testing of both the smoothness of the paint application and the correct gloss factor can only be implemented using a non-contact system.

A color sensor checks the correct shade of the pain

For this task, ipf electronic - the sensor specialist from Lüdenscheid – developed a very special sensor system in combination with a color sensor. The series OF34 (Fig. 1) color sensor controls the shade of the paint applied to the doors.

Fig.1

Due to the glossy surface, the sensor is equipped with a polarizing filter that eliminates the gloss effect and as such, allows a reliable measurement of the correct shade of white. The examination takes place from above without contact with a sensing distance of 30-40mm. If the color shade deviates from the previously teached-in reference values, the sensor emits an error signal.

A special solution for establishing the gloss factor

The electronic gloss sensor (Fig.2) developed by ipf represents a real innovation in the door manufacturer's automated testing of paint. It works completely independently of the color sensor at a distance of 15mm from the surface to be inspected and determines the gloss factor of the paint. If the thickness of the layer is poor, this gloss factor can vary and from time to time this would make the costly task of repainting necessary.

The gloss sensor integrates a white light source which illuminates the door surface at a predefined angle. The receivers which are also integrated into the system are arranged at different angles to this white light source: one in the exit angle of the light beam and another at an angle of 90° to the door surface.

Fig.2

According to the basic physical principle for the reflection of light on shiny surfaces - the entry angle is equal to the exit angle - the receiver positioned in the exit angle of the light source captures the light reflection 100 percent.

If the paint surface of the door to be inspected is more matt, this leads to a scattering of light on the surface, where the ray of light is reflected at varying strengths in all directions.

At the same time, the vertically arranged receiver picks up ever more signals in the gloss sensor in the same way as the weakness of the matt painted surface. The correct gloss level of the door surface can be established due to the specific signal distribution of both receivers, i.e. the relationship of the direct reflection of the receiver positioned in the pre-defined angle of reflection of the light source to the indirect reflection of the receiver arranged 90 degrees to the surface.

In this context, the prerequisite for the correct testing of the gloss factor established in a certain tolerance range is of course the previous learning-in of reference values. During the inspection, these are matched with the signals which are detected by the receivers.

The reliable compensation of potential dirt

Dirt and dust cannot be avoided in industrial processes and the same applies to the manufacturing of doors. As such, these types of environmental conditions necessarily cause a negative impact on the measuring of the gloss factor. If the transmitter is soiled as well as the light source, the receiver will no longer detect the correct signal. This unavoidable problem is however solved by ipf electronic in a clever way.

Part of the light which is emitted via the sensor is deflected via a semitransparent mirror. At the same time, a certain proportion of the light beam passes the mirror in a straight line whereas another part of the light is deflected via the mirror at an angle of 90°. An opening is located in the sensor housing in the direction of this deflected light beam from which the light emerges and within a distance of 20mm it is picked up by receiver again. Since the light has to pass through a certain section of ambient air, the level of contamination can be determined in the measuring range of the gloss sensor via the signal captured by the receiver. The corresponding damping is then taken into account by the gloss sensor. Through the integration of this so-called bypass it is possible to achieve a highly reliable compensation of the dirt during the measurements even under difficult environmental conditions.