

**In-line image processing systems recognize and document even the tiniest paint defects**  
**Flawless painted surfaces thanks to fully-automated 100% inspection**

In all sectors of industry, painting is still the process that is most susceptible to defects. Bubbles, smears and inclusions can be caused by dirt on the injection molding die, particles in the ambient air or inconsistencies in the paint that is used. Until recently, it was impossible to automate the reliable inspection of painted surfaces, which meant a higher cost and risk factor. Newly developed, fully-automated in-line paint inspection systems have now proven their efficiency outside the automotive sector in many other global industries, such as white goods and bathroom furniture.

Painting and coating processes, some of which are largely automated, are the last station in the assembly line. In the past, skilled employees performed visual inspections manually. However, quality assurance based on the accuracy of the human eye is extremely subjective, even if the inspector has many years experience and training, and the results are practically impossible to reproduce. Factors of influence on inspection quality extend from the person's individual perception of quality and scope of discretion to their performance capability on the day in question. For practical reasons, this inspection takes place at a point in the process where any necessary reworking by the inspection employee can be carried out at lowest cost. However, defects that are overseen cause additional high costs and interruptions in the production process.

The practical paint inspection systems for fully-automated defect recognition on any painted surface available today are a solution to this problem and have already revolutionized this area of quality assurance.

**Pictures**



Coating defects



Pigment defects



Embedding defects

**Electronic eyes recognize even the tiniest defects**

These systems incorporate the manufacturer's many years of experience in the field of image data processing. Sophisticated camera systems with downstream intelligent evaluation logic also perform the task of defect recognition and evaluation.

Modern design – for example in bathroom furniture – often consists of large white or single-colored surfaces with elegantly curved or rounded shapes. Bathtubs and washbasins mutate into genuine bathroom landscapes. Even the tiniest irregularities on the painted surface catch the consumers' eye and make the expensive products unmarketable.

In order to prevent the occurrence of such defects, high-resolution cameras – either stationary or mobile on robot arms – are used to reliably scan surfaces – even surfaces with problematic shapes – during the production process. Color defects, dust inclusions, craters, pin holes, drips, paint run, scratches, orange peel and other typical defects are reliably recognized and their coordinates are mapped. A marking station then uses the coordinates of the detected defects to identify them with dye markers. This process enables the spatial separation of the inspection, which is performed in the dust-free zone immediately after painting, from marking and reworking.

Although the robot vision systems used for conventional applications control the production process as 'master', the robots used for paint inspection applications and their vision system control units are the 'slave' to their control task. The robot guarantees the precise sensor scanning of the contours of the inspection surfaces. Obviously, this is no insignificant task, and human eye/hand coordination could never accomplish it with such continuous precision and reliability.

Most white goods, such as stoves, washing machines, refrigerators and similar products, consist of straight, rectangular surfaces. In this case, it is practical to use inspection systems with stationary camera installations.

### Car Paint Vision ensures flawless automotive paint work

In the paint inspection systems for the automotive industry, the auto bodies pass through an overhead gantry containing several stationary cameras or cameras mounted on robot arms. The mobile cameras follow the contours of the inspected bodies based on data that is generated in advance from the design data (CAD data) and stored in an auto body model database. Data storage media on the auto body automatically switch to the appropriate program. This means that the inspection system can be used on the modern multi-model production lines used by automobile manufacturers.

Potential defects and their evaluations are also stored in a paint defect database. All typical defects are reliably recognized and their coordinates are mapped for the subsequent marking of the defect locations. This inspection also takes place in the dust-free zone immediately after painting, while marking and reworking are performed in a separate area.

Automated paint inspection systems consist of high-tech standard components that are suitable for industrial applications. The cameras, lighting and computers used for this technology have already proven to be effective for automated surface inspection applications in many other industries.

A PC with a convenient graphical user-interface serves as the central operator console. This is where all parameters are defined and modified as required. Teleservice via any on-line connection is provided as a matter of course.

#### Pictures



Paint inspection of complete car bodies  
(Car Paint Vision)



Fully automated marking of paint defects  
(Car Paint Vision)

### Drastic reduction of quality life cycle costs

Surveys have revealed that even slight defects on painted surfaces are more strongly rejected by consumers than minor technical defects. It is also extremely cost-intensive to subsequently remedy paint surface defects on the finished product. These high subsequent quality assurance costs can often dramatically impair the economic efficiency of the production process. The use of paint inspection systems with reliable, precisely definable results avoids these costs and generally provides an unusually fast return on investment.

Scanning instead of searching for defects has the advantage that a 100% inspection of the surface can be done economically and defects are recognized in accordance with specifically reproducible criteria. The employees can concentrate on eliminating the defects and their sources. This reduces personnel costs, optimizes production processes, enhances quality and thus improves competitiveness.

#### Author/Contact:

ISRA VISION SYSTEMS AG  
Industriestraße 14  
D-64297 Darmstadt  
Tel. : +49 (0)6151-948-172  
Fax : +49 (0)6151-948-140  
info@isravisision.com  
www.isravisision.com