

A brilliant Idea: UV control using AOI: reliable and at the same time optimising the process.

For safety reasons some sensitive electronic automotive components are protected by a special coating. Conformal coating is used widely wherever there is a need to:

- Inhibit current leakage due to environmental contamination
- Inhibit Corrosion
- Improve fatigue resistance of Solder joints
- Provide Mechanical support

All of the above will increase reliability and reduce liability.

Reliability is the ability to function under specific conditions, for a specified period of time without failure.

Liability normally means cost! This could be a service cost for failure and having to replace a part. The most expensive reworks are ones that fail in the field! Or it could mean liable for thousands or millions of dollars where failure of a safety critical part meant injury or death.

Modus High-Tech Electronics GmbH in Willich, Germany has developed an automatic optical inspection (AOI) system for checking and optimising the conformal coating process.

The continued functionality of electronic devices in humid and wet surroundings can be vital in an extreme situation. For example; A vehicle is involved in an accident and falls into a river or a lake, this is a classic film scene you have seen many times but can also be very real. With the extreme pressure on the doors it is impossible to open them but if the electric windows can still function, passengers have an alternative means to escape their watery tomb. To guarantee this works in practice, controller PCB's for the electric winder motors need to be coated with a transparent protective varnish. This could mean the difference between them working or not.

Of course there are more obvious and simple requirements that need this protective coating in everyday situations. For example the difference in temperature from the inside of the vehicle compared to the outside, an interior light set into the headlining of a vehicle, can be subject to moisture buildup. It may not even be a problem in most places in Europe but in a country that has very high humidity, this becomes a real problem.

The modern coatings that are used, Acrylic, Polyurethane, silicone and synthetic rubber are all available with a UV trace to assist inspection. Typically transparent and invisible to the eye, coatings with a UV trace have improved the reliability and repeatability of the inspector's job. However automating this inspection process using AOI (Automatic Optical Inspection) is not simple. Modus High-Tech has invested heavily into this inspection process to successfully create a repeatable in-line and off-line automatic inspection solution. This is critical not only to inspect the conformal coating is thick enough and in the right places but also not in keep-out areas, like connectors or contacts which need to be free of all contamination.

There are UV particles in the varnish which fluoresce under UV light but because of the shiny surface, reflections can occur, this can lead to mistakes in the image processing. With this in mind, modus has developed a solution that recognises splashes from the coating material down to a size of 50 microns, in keep-out areas. Using their fine-tuned UV lighting and unique image filtering, excess coating or splash detection including bright surfaces, like gold contacts, can be detected.

Modus, one of the leading German AOI specialists has used similar technologies in many difficult test applications. Engineering a perfect match between hardware and software is the key to success for Modus. Most people associate scanner based systems with the low-cost document scanners that have been modified; this is far from the truth with modus. The specially adapted parallax-free lens is the heart of their systems. Fine-tuned with different coloured LED lighting have given them the edge on specialist inspection process. Unlike conventional camera systems inspection performed by the parallax free scanner with UV light overcomes the problems of shadowing caused by large or tall components (transformers, capacitors and connectors etc.). The differences in the reflected intensity of the varnish can be used to detect the thickness of the layer of the conformal coating (see picture).

Process optimisation.

Utilising AOI for conformal coating not only detects faults like missing areas and splash contamination but also helps with process control. Initial coating programs can be checked and fine-tuned to create uniform coating patterns with an even thickness. Existing processes can be monitored for change during the production run. A blocked nozzle or a material change can easily be spotted.

