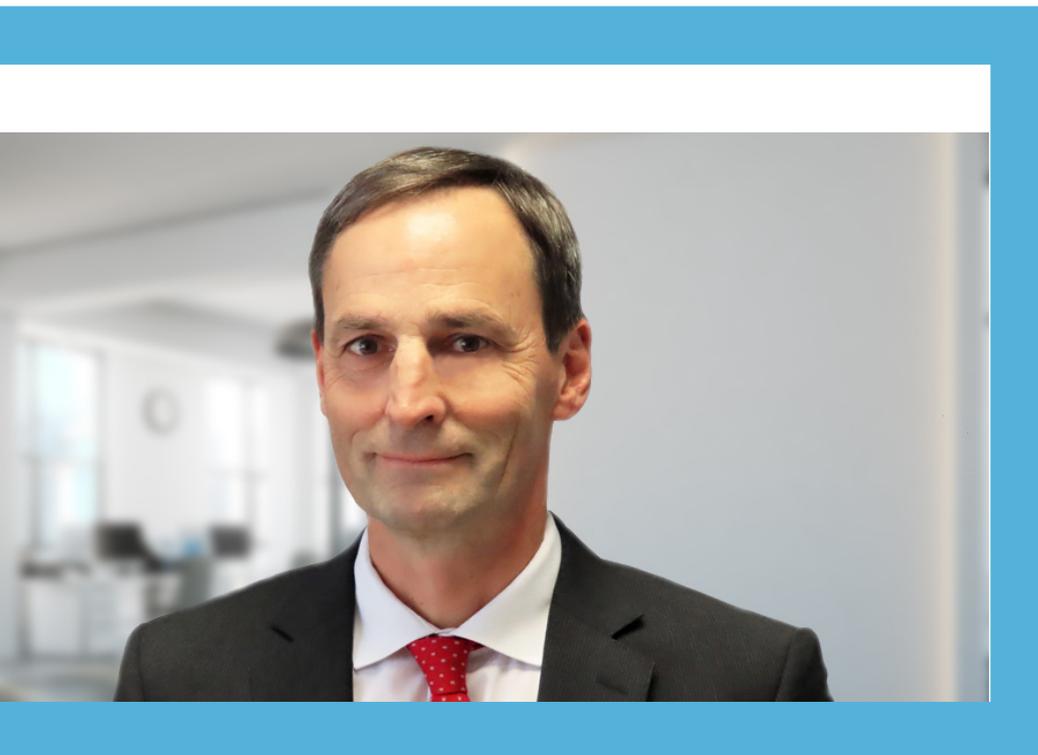


Coating thickness testing – quo vadis?

Cosmetics packaging, machine housings or automotive parts – products with an attractive and individual appearance can be found in practically all industries and spheres of life. Often, these products become highly resistant to external influences or have special functional properties only when given a particular coating. Current trends and changes are posing ever greater challenges to both painting and powder coating specialists.

Here, we're going to discuss the direction in which coating technology and thickness testing are heading with Georg Nelke, Managing Director of OptiSense, the leading supplier of photothermal measuring systems.



GEORG NELKE

has a degree in physics and has been in charge of product development at OptiSense for almost a quarter of a century.

Interviewer: Which trends will have a major impact on the coating industry in the coming years?

Georg Nelke: Miniaturisation is definitely one of the megatrends. Every new car already has 70 to 100 miniaturised sensors to ensure safety, comfort and low fuel consumption. But it's not just airbags and ABS: pacemakers and mobile phones are also inconceivable without microtechnology. Many devices, vending machines and other types of equipment are already using miniaturised technology that can only be seen under a magnifying lens. And as new applications emerge, there are no limits to what can be imagined in terms of miniaturisation.

Of course, this trend is also taking hold in our industry: if I compare the first generation of sensors used in the measuring of coating thicknesses with our current miniature cubes, not only has their size decreased exponentially, but their weight is just one hundredth of what the prototypes weighed back then.

Interviewer: What other trends – besides miniaturisation – are important?

Nelke: Automation will advance rapidly – even in small and medium-sized companies. The reasons for this are higher process reliability, process reproducibility, the resulting low reject levels, and the corresponding cost savings. With both wet painting and powder coating, companies are faced with the challenge of meeting increasing demands in terms of coating quality, resource efficiency and productivity.

Interviewer: How can you meet the increasing demands?

Nelke: Regardless of whether you are coating complex workpieces, producing large numbers of items or checking each part individually, process-integrated coating thickness measurement technology is a cornerstone of future industrial production. This means that information gathered during production can be used to monitor and optimise individual steps in the process.

Interviewer: Some system manufacturers predict that processes will soon be so stable that measurement technology will no longer be necessary...

Nelke: No question about it, production quality will continue to increase due to automation. But it would be very short-sighted to skip taking measurements. Quite the opposite! Test systems will play an even greater role in the future in helping companies meet requirements for coating quality, conservation of resources, and efficiency and document these in a traceable manner. Only by thoroughly checking the essential process parameters can companies meet all the relevant standards and the stricter quality protocol regulations.

Interviewer: The documentation requirement presumably leads to enormous amounts of data...

Nelke: Indeed. The question, "What do I do with the collected data?" presents a major challenge. Today, it's a case of trying to extract the information from huge quantities of data that can help make a difference, i.e. by understanding processes better or monitoring and optimising them. In the future, we will measure and monitor changes in materials and products along the entire value chain, i.e. through the entire cycle from raw material through use to recycling – wherever people, machines or the environment are making any kind of changes to materials or products. Behind all of this, of course, is the idea that our tamper-proof measurement technology is fully integrated into the production process. As a manufacturer of measuring systems, we already offer integrated, automated 100% measurements, even when there are multiple robots in a team.

Interviewer: What do you think your customers will ask for in the future?

Nelke: The customer of tomorrow wants a solution that offers added value and that is intelligent – for example, smart sensors that skilfully measure the data and evaluate it so that the right decisions can be made based on the information obtained. This principle applies to every industry, every process and every conceivable problem.

Interviewer: What do you mean by skilful evaluation?

Nelke: In the next few years, it will no longer be a case of just making a good/bad decision. Rather, customers should be given a test system that helps them to optimise their processes. And I don't just mean the classic production process. Maintenance and recycling processes are also included. Intelligent monitoring is a key concept here. In the future, we will not only test, but also characterise and simultaneously monitor, extracting information in the process.

Interviewer: Automation goes hand in hand with Industry 3.0. What is there still to do before we get to Industry 4.0? Digital transformation made in Germany?

Nelke: Implementing Industry 4.0 is a complex project: the more processes the economy digitalises and interlinks, the more interfaces emerge between different players. Uniform norms and standards for different sectors of industry, IT security and data protection play just as central a role as the legal framework, the development of new business models and the necessary research. The good thing is that there are lots of opportunities for companies to use intelligent networking.

Interviewer: If you project tomorrow's industry onto coating thickness testing systems...

Nelke: In the age of Industry 4.0, sensors have to record measured values quickly and, at the same time, deliver very precise results so that reliable quality assurance can be guaranteed. Optical metrology, in particular, is becoming increasingly important in manufacturing and testing processes, as it works in a contactless, wear-free way, regardless of material and surface properties. It is particularly advantageous when used during a production run, where it makes no sense to use tactile measuring technology that cannot cope with measuring points that are difficult to access.

Interviewer: Does this also change the processes used in measuring coating thickness?

Nelke: The future belongs to non-destructive testing, i. e. examining components and products for quality defects without taking them apart or destroying them. Looking to the future, we believe that non-destructive testing will increasingly merge smart sensor systems and intelligent monitoring. New markets will open up and the range of applications for non-destructive testing will expand. Sensors without a controller are still a long way off – but it's an exciting challenge for us...

Interviewer: What other developments are in the pipeline?

Nelke: New and modified materials and combinations of materials are certainly leading

the way. I'm thinking here of biomimetic surfaces, anti-ice coatings, paints for generating solar power or even self-healing coatings.

Interviewer: Self-healing coatings...?

Nelke: Coatings are often exposed to extreme conditions. The combination of environmental influences, internal stresses and ageing phenomena can lead to cracks in the coating. These cause corrosion that must be repaired and touched up – e.g. on ships or wind turbines. This leads to an increased need for repairs and also to considerable cost.

There is a new approach that aims to incorporate microencapsulated corrosion inhibitors into a coating. If the coating is damaged, the microcapsules at that point tear open, releasing the healing reagent which then sets hard in the crack.

Interviewer: And what does that mean for checking "self-healed" coatings like these?

Nelke: After incorporating the microcapsules into the paint system, we apply and check the new layer of paint. It's also important to make sure that the "regrown" microcapsule material adheres sufficiently to the paint matrix. The whole test uses non-destructive measuring technology.

Interviewer: Hand on heart: Can quality control keep pace with these developments?

Nelke: Yes. Absolutely! New solutions for the automated monitoring of process parameters, e.g. the quantity of paint, as well as for logging and evaluating the data, already exist. Innovative developments in process-integrated quality control for all aspects of coated surfaces are also ready to go. Terahertz technology, for example, is able to measure multi-layer designs and output values for the individual coating thicknesses. The top priority for all measurement innovations is to expertly select the ideal mix of measurement procedures and evaluation strategies for the process in question. Measurement procedures are only as good as their integration into the system.

Interviewer: If you had just one wish, which coating trend would you like to see implemented in the world of tomorrow?

Nelke: For a circular economy that preserves resources, I would like to see more surfaces being coated so that they generate energy and therefore promote a more intensive use of solar energy on a variety of surfaces.

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