

# Non-Contact Measurement for Resource-Efficient Production

Coating thickness measurement processes have to meet a wide variety of requirements and depend on a number of different criteria. As a result, choosing the right measurement method can present a challenge. The specialist coating company OFTM opted for a mobile measuring device that makes quick, non-contact measurements.

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The thickness of coatings is measured during the application process to ensure that the coatings provide the necessary corrosion protection, resistance to abrasion and insulation. For this reason, the measurement procedure must be reliable, reproducible, simple, fast and non-destructive. In the past, contact measurement methods involving magnetic induction were widely used, but these are only suitable for dry coatings and the

roughness of the surface after production results in a relatively large variation in the measurements.

In order to overcome these disadvantages, coatmaster has developed a measurement procedure based on advanced thermal optics (ATO). This is a non-contact process which makes it possible for the coater to measure the thickness immediately after applying the coating while it is still wet. The process also provides the

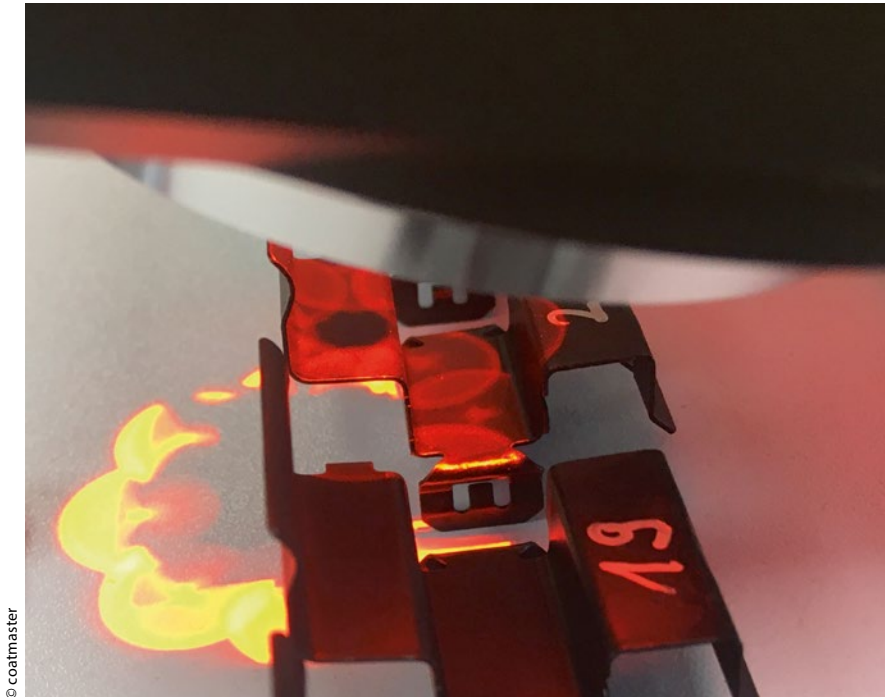
accuracy and reproducibility necessary to allow for effective process control.

## Thickness is the key feature of a coating

Using modern coating methods to improve the properties of components and protect them against corrosion is one of the core competences of the Scherdel Group. Its subsidiary Scherdel Ober-



Mobile device for non-contact coating thickness measurement.



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Positioning the measuring point on small parts. The shadow (top left) acts as a guide for positioning the measuring area.

Property	EN ISO 2808	Existing measurement task
Substrate	Ferromagnetic/non-ferromagnetic/metallic	Weakly magnetic, corrosion-resistant steel (1.4310), substrate thickness 0.4 mm
Coating material	Inorganic, metallic/organic	Organic coating (Delta-Protect VT600)
Coating thickness measurement range	From a few $\mu\text{m}$ up to m	< 30 $\mu\text{m}$
Measurement process	Destructive/non-destructive	Non-destructive and preferably non-contact because of the shape of the parts
Measurement location	Laboratory/in-line, during production	In-line, during production

**Table 1** > Summary of the selection criteria based on EN ISO 2808 and the current measurement task.

flächentechnik (OFTM), which is based in the town of Marktredwitz in Germany, has been coating components with products supplied by Dörken MKS Systeme using a variety of application methods. Monitoring and recording the properties of the coatings are among the company's day-to-day activities and form part of its integrated management system. The thickness of a coating is one of its key characteristics because it affects both the physical and chemical properties of the surface.

In the middle of 2019, OFTM found itself with the task of evaluating a measurement procedure for a new range of parts. Standards such as EN ISO 2808 and EN

ISO 3882 give a good overview of the widely accepted measurement processes for coating thickness. The criteria summarised in **Table 1** play an important role in selecting the right process.

The requirements of the new components narrowed down the choice of a suitable measurement method. Beta back-scattering and X-ray spectroscopy processes could be dismissed immediately because of the properties of the coating. Magnetic/magnetic inductive and eddy current methods were rejected after numerous complex test series as a result of the properties of the substrate. The repeat accuracy and reproducibility of these methods could not be guaranteed across

several batches of material and the measuring equipment failed to meet the basic requirements of the automotive industry.

### Mobile measuring device replaces complex process

The photothermic measurement process developed by coatmaster and the mobile version of the system (coatmaster Flex) proved to be the ideal solution for this measurement task. The process uses pulses of heat to warm up the measurement area. An infrared detector then measures the coating as it cools. The calibration values and measurements are stored in the cloud, which means that they are not restricted to a single measuring device but are available to employees throughout the company.

The capabilities of the device allow it to be used both for the final inspection of the goods before shipping and during the production process for the purposes of statistical process control (SPC). As a result, it has replaced the complex and time-consuming in-line microscope measurements.

Because the control loops are now faster, the coating process can be monitored more effectively. Focusing on the centre of the tolerance range results in a resource-efficient and cost-effective manufacturing process and avoids the risk of falling below the lower tolerance limit for the coating thickness, which is critical to the function of the component. As Martin Bogner, quality manager at Oberflächen-technik Scherdel, explains: "The calibration and measurement methods are so simple and straightforward, even for parts with complex shapes, that coatmaster Flex has become an important part of our coating process." //

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