



ILB Industriellackierung Biedermann

When Bernd Biedermann, a trained mechanical engineer and painter, co-founded the company in 1991, the start-up was still coating by hand.

In the years that followed, however, Biedermann invested steadily and turned to automation at an early stage. In 2003, the company succeeds in developing an automated process for powder coating, which is also enthusiastically accepted by the automotive industry. With the entry into contract coating for the automotive sector, ILB further expands its production. The Thuringian company now employs around 100 people, 25 of whom work in coating.

When coating thickness becomes functionally relevant:

ILB relies on coating thickness measurement technology from OptiSense for the best quality assurance

What started in 1990 as a small garage company with manual powder coating has since developed into a state-of-the-art, fully automated coating centre with huge production halls. Above all, ILB Industriellackierung Biedermann recent investments in wet chemical pre-treatment, an innovative wet paint centre, its own laboratory and an ultra-modern powder coating complex make the Saalfeld-based company the top address when it comes to coating.

With its new powder coating plant, the coating company meets even the most demanding quality requirements of the automotive industry. A high degree of automation and OptiSense layer thickness testing enable the plants to be operated in a resource-efficient manner, deliver top quality and save costs at the same time.

Best quality for highest standards

Today, ILB Industriellackierung Biedermann coats many millions of parts a year that are used worldwide – both with wet paint and with powder. "It was obvious that only the complete automation of the coating process could ensure highest quality," explains company founder Bernd Biedermann, "and we also needed first-class quality assurance." Hardly any other industry places such high demands on coating quality as do automotive manufacturers. In addition, car parts are exposed to extreme stres-



To ensure that the quality is right even for the most demanding powder coating jobs in the automotive industry, ILB relies on OptiSense coating thickness testing systems for all its systems.

ses over a long period of time due to heat, cold, wetness, stone chipping, salt and UV radiation. At the same time, sheet metal and plastic parts often cover complex components beneath the flawless outer skin.

In order to avoid expensive, time-consuming processes such as overcoating, the stripping of incorrectly coated parts or disposal, it was necessary to measure the coating thickness directly after the powder coating application, even before curing. The advantages were obvious: ILB was able to optimise the coating parameters, avoid errors and increase quality. "Since coating thickness is a function-critical parameter, all kinds of coating defects such as uneven powder application, scratches, cracks or trapped particles must be reliably detected," explains Biedermann.

Wanted: an innovative coating thickness testing system

So ILB searched the market for coating thickness measuring systems. At that time – in 2005 – almost all were contact-based systems that need to touch of the paint layer. "So we could have measured only after coating, because only then the powder coating is hard enough. But the conveyor belt that the parts travel while being cured is extremely long. Until a contact-based measurement finally delivers results,

there would be far too much scrap. That's why we really needed a non-contact coating thickness measurement," Biedermann recalls.

“The PaintChecker coating thickness measuring system already worked perfect in the test phase and was immediately used in the line.”

Bernd Biedermann,
ILB Industriellackierung Biedermann

However, short cycle times and very confined space posed very special challenges for this project. Sensors for this demanding measuring task were hardly available from any of the suppliers on the market. After intensive research, ILB became aware of the photothermic PaintChecker models from OptiSense and got in contact with the manufacturer in Haltern am See.

"This was an exciting new task for us," says Georg Nelke, Managing Director of OptiSense. "We agreed to implement a suitable system for ILB immediately. But the configuration proved to be a

complex task. "Small parts with curvatures that had a diameter of just 20 mm and were only 10 mm high were to be inspected. And all this within half a second," Nelke describes the challenges.

"In addition, there was hardly any space available for our measuring system in the line – this made it difficult to set up a robust and reliable measuring station, which could endure multi-shift operation. But we solved this quickly and successfully with our many years of experience."

Let action speak: from the first test run to permanent installation

Biedermann was under extreme time pressure at that time because the customer was in urgent need of the parts. There were just three months from the first contact to the commissioning of the coating thickness measuring system. Therefore, the project details and data exchange were organized immediately in an on-site meeting.

In order to test the reliability of the non-contact PaintChecker measuring system, a pilot run was carried out. "The system convinced us immediately: a reliable and fast coating thickness measurement solution which could be safely controlled and automated," says ILB senior manager with satisfaction. This is essential because special requirements apply to the powder coating and inspection of

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Thanks to the briefing by OptiSense and the meaningful documentation, the system conversion was a pleasant hand-in-hand operation – virtually a piece of cake.

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Bernd Biedermann,

ILB Industrielackierung Biedermann



*Picture left:
"30 years of constant innovative spirit"
is how company founder Bernd Biedermann,
who has since handed over
the reins to his son Stefan,
succinctly sums up his entrepreneurial success.*

*Picture below:
When painting the membranes of parking
sensors, the tolerances
of the coating thickness must be exactly
matched due to the corrosion protection and
functional requirements of the parts.*



cover caps, such as those used for parking distance sensors.

PDC sensors as a challenge

An electronic parking aid is standard in almost every vehicle today. The PDC sensors (PDC: Park Distance Control) consist of an ultrasonic transducer and transmission and measurement electronics, which are covered by a protective cap in the colour of the car. The function of the sensitive parking sensors can be affected by even the smallest deviations in the paintwork.

The ultrasonic sensor can only work if the membrane made of piezoelectric ceramic is acoustically decoupled from the sensor housing. If the permitted paint thickness range is exceeded, oscillation behaviour changes and incorrect signals are sent to the vehicle electronics. The distance reported to the driver is either too far or too close. If the ultrasonic sensor is part of a parking aid, this may have fatal consequences. It does not matter how many PDCs are installed. If only one is not working properly, the entire system will fail.

Since even minimal deviations have far-reaching consequences, all car manufacturers issue technical specifications regarding the painting of parking sensors, which include the painting area, powder coating thickness, maximum

curing temperature and much more. "And these must be meticulously adhered to. That's why we have such high quality standards," explains the senior boss.

A big machine for small parts

The ILB powder coating process for cover caps of PDC sensors can be roughly divided into pre-treatment, powder application and curing. All process steps are linked in an industrial production line by automatic conveyors and robots.

The parts are wet-chemically pre-treated in a no-rinse process, thus preserving for the environment. After pre-treatment, the parts of the surface not to be coated are automatically partially masked. Then the actual coating takes place.

In the coating process, it is crucial to achieve the "right" coating thickness. Therefore, as soon as the caps leave the booth, the coating thickness of each individual cap is immediately checked. "At this point, the cover caps still look like they have been dusted," the senior manager describes the soft, sensitive powder layer.

The measuring system in the center of the process

The OptiSense coating thickness measuring system consists of a controller as the central unit with sensors connected via cables. The PaintChecker controller is docked directly to the powder coating booth. Each of the tens of millions of freshly coated parts travels on a conveyor belt through the inline measuring station before curing. The measuring

"The innovative OptiSense technology for industrial environments not only ensures seamless quality control, but also provides valuable information for further process optimisation."



Bernd Biedermann,
ILB Industrielackierung Biedermann

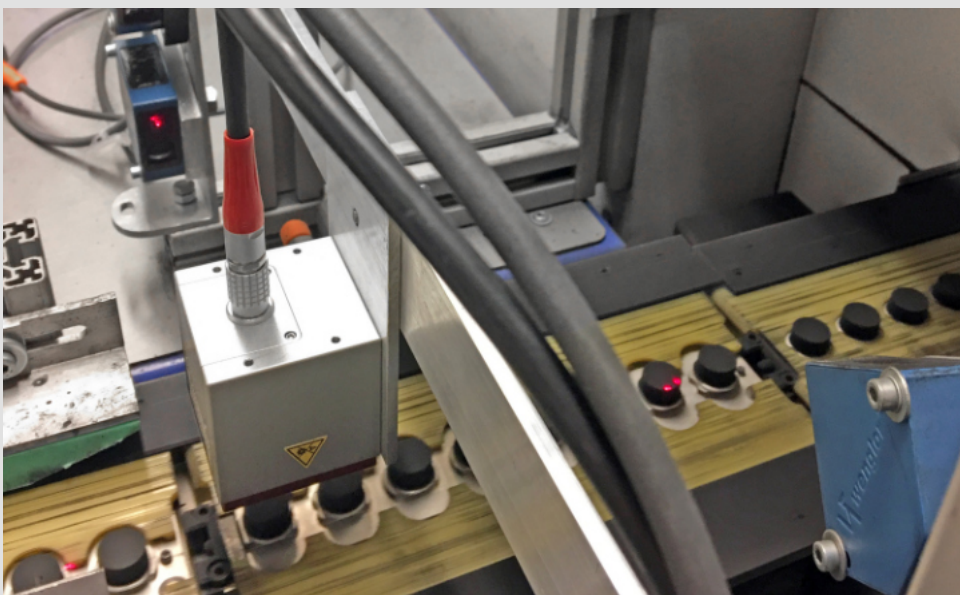
system can be relied on: around 150 parts per minute are checked. Day after day.

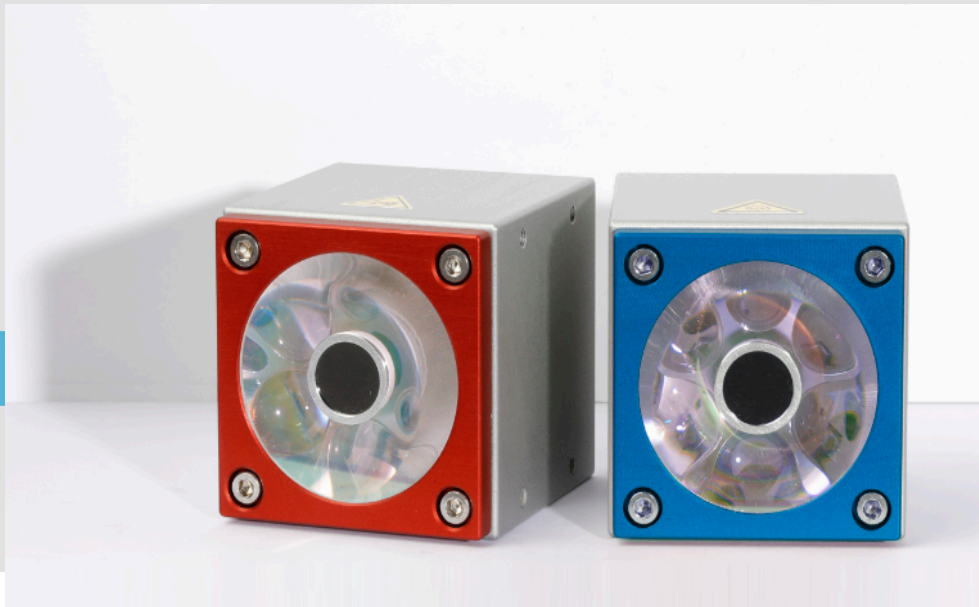
For software integration into the production line, the PaintChecker features interfaces to higher level PLCs. All measurement equipment is directly connected to the ILB database and the complete process data is transferred in real time to the ILB analysis software. This then performs validation and visualization of the data. All process information is digitally recorded and all machine parameters are displayed graphically on a large monitor wall.

"Anyone believing that such a high degree of automation in a modern powder coating plant degrades the production specialists to mere statisticians is thoroughly wrong," Bernd Biedermann knows and compares the situation to that of a pilot in a modern cockpit: "Every deviation requires a quick response. It may sound like a contradiction," says ILB senior manager, "but the simpler the operation of the plant appears, the more complex are the underlying processes are. Our plant operators need to know exactly what's going on in order to do the right thing in the right moment."

One of the many diagrams on the display shows the layer thickness. A digital tolerance band indicates whether the layer thickness is within the "green range". The graph usually runs in the middle of the tolerance range. "But coating thickness sometimes moves towards the limits of the tolerance band. Not erratically, but our system operators can recognise an early trend and will take immediate countermeasures," explains Biedermann.

On the left, the test setup of the new, tiny cube sensor





Components that are not coated correctly are quickly selected, cleaned and returned to the line. On one hand, this process facilitates troubleshooting; on the other hand, the coating is fully documented. Finally, this data also serves as proof of quality to the customer. Thanks to a central data acquisition, the system is Industry 4.0-ready and the data can be further reused, e.g. for detailed resource management.

And what happens next in the coating process? After powder coating and thickness verification, a robot takes the caps from the coating belt and places them on a part carrier that moves the caps through a baking oven. Here, the powder coating melts and turns into a smooth layer. Finally, a robot places the coated components on a tray and the cover caps are ready for shipping.

While leaving, Bernd Biedermann mentions with a smile: "I have enjoyed the OptiSense technology right from the start. Not only for the cost savings but because of the absolute process control allowing to achieve an extremely uniform coating quality. Recently, a request for coating thickness measurement came from a well-known automotive group in China.

I simply could not help but recommend the Opti-Sense systems to my collea-

gues from the Far East to achieve an excellent, very uniform coating result. The Chinese manufacturer, by the way, was really enthusiastic about the quality."

Quality assurance with OptiSense as a future-proof decision

The extremely successful first use of the PaintChecker systems was only the beginning of a long-term cooperation between ILB and OptiSense.

In the meantime, OptiSense measuring systems are in use for all three production lines. The PaintCheckers measure and measure and measure – although they are now getting on in years. "Amazing! After 15 years of continuous use, we only had to replace a single circuit board," says ILB's senior manager, "I'm very pleased with the low-maintenance and robust measuring systems.

Today, the 4th generation OptiSense devices have long been available – with ever more optimised components for even more flexible and accurate measurements. And of course Bernd Biedermann was curious to learn more about the brand new PaintChecker Cube. Especially since the new measuring systems are based on LED technology. "Laser safety officers and protective measures will be a thing of the past. This

The LED sensor was given its name PaintChecker Cube because of its miniaturised cube design. With its robust aluminium housing in miniature format 50 x 51 x 55 mm, the Paint-Checker Cube is significantly smaller than the popular Rubik's Cube rotating puzzle.

in turn saves time and costs," Biedermann emphasizes the advantages of the new technology.

The simple switch from laser to LED sensors

The new LED sensors have a larger measuring spot than the laser models and are particularly suitable for rough and powdery surfaces. Depending on the coating material, models with infrared or UV excitation are available.

The LED sensors need less than half a second per measurement and monitor the process seamlessly and reliably. Thanks to the semiconductor light source, the new LED sensor stands for maximum service life, energy efficiency and vibration resistance. "In addition, the PaintChecker industrial Cube with its weight of just 150 grams is optimally suited for robot assembly" introduces

Georg Nelke the OptiSense sensor. And thanks to the miniaturised cube design, the new LED industrial sensor can be easily integrated even in extremely cramped production environments.

Together into the future

ILB recently started a test run with the PaintChecker Cube, initially in parallel with the previous sensor technology. And the visualisation software has already been adapted to the PaintChecker Cube.

"Of course, there are now other suppliers, but our experience with OptiSense has been very good. We are looking forward to work with them again in the next generation of coating thickness measurement. OptiSense remains for us the competent, creative partner for solving measurement tasks", Bernd Biedermann sums up.



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