Powder Coating by Robot
Case Study

OBUK Haustürfüllungen GmbH & Co. KG

Performance by design

Nordson

Full automation ‘Batch 1’ – Powder coating for production of entrance door panels

Conversion from production-line based combination of automated and manual coating to flexible robot coating

OBUK is one of those hidden success stories of which there seem to be so many in Westphalia. It may not be a brand everyone can instantly bring to mind, but this is a company of specialists whose outstanding reputation in its own sector extends far beyond the frontiers of Germany. The company and its 160 employees manufacture entrance door panels in Oelde and has only recently invested in new powder coating plant using the latest application engineering from Nordson. Here is a report on the company’s early experiences with the new powder application.

From a purely technical point of view, the door to a building is something which has to has to fulfill multiple functions at one and the same time. It forms the boundary separating the inside from the outside, protecting the people who live behind it from the effects of climate, noise and unwanted sights, as well as from crime. More than that, though, a door also expresses the aesthetic visions of the builder or owner and acts as a kind of “visiting card” for homes or commercial buildings. Thus the value of a door presenting an individual image has become correspondingly important.

“In effect, every one of our entrance door panels is unique,” explained Henrik Wendt, operations manager at the Oelde factory, and that is no less than the literal truth. “Our door panels are genuinely manufactured to order and then supplied to installers both at home and abroad.” In fact therefore, although OBUK uses the slogan “Doors for life”, they do not produce complete, ready-to-fit doors, but just the leaves, the part of the door that actually swings, and which are fitted into door frames by carpenters on site. “Of course, though, the door leaf itself is a vital design component in terms of the form and function of a door.”

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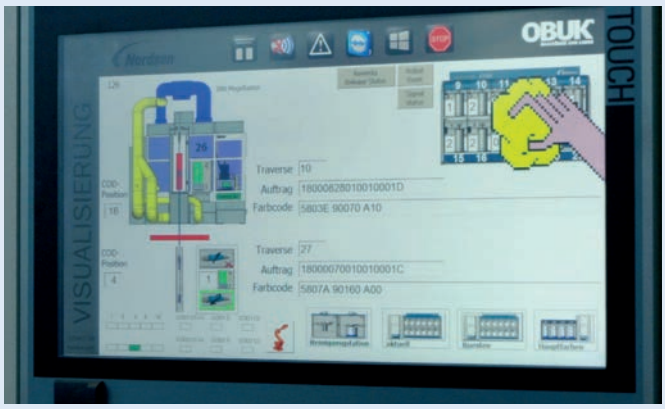

The coating plant is designed for a **three-minute turnaround**. **Two minutes** of that is given over to the **powder coating**, while the **remaining minute is taken up by color changes** and preparation for the next traverse in the robot booth.

Customers set enormously great store by this. “In fact,” Wendt reveals, “‘only’ the normal standards for quality of facade really need to apply to the surface features of a door, but customers actually seek out their door in a well-lit door studio and expect its looks to be flawless, as they would for their car or the glossy surfaces of their kitchens.” Indeed, although more than 40,000 of them are made every year, a very substantial amount of manual craftsmanship goes into any door, be it made of aluminum, plastic or glass, for example, when the glass has irregular light transmitting panels which are framed in delicate stainless steel. “This can only be achieved economically if we make those processes which do not require such craftsmanship as completely and efficiently automated as possible,” as the operations manager knows all too well.

Versatility of product, even down to a production batch of just one item, requires a high flexibility

Faced with the necessity of meeting ever more demanding customer requirements ever more efficiently, OBUK decided last year to replace their powder coating facility with a brand new modern system.

Smart color management
The Spectrum COD powder feed center, which is equipped with 24 small powder hoppers and 8 large ones. The color-on-demand system can provide 8 main colors, 20 auxiliary colors and 4 customizable special colors for the optimum possible flexibility.

“The old coating plant had been in use since 2005, although it was already using dense phase technology,” explained Daniel Hentschel, head of production engineering. “We had three automatic spray guns and one manual one from the first generation and the whole system had run for 12 years without fault. The new robot-assisted version, though, is just so much faster,” he grinned and then added a few more good reasons for the conversion. “We urgently needed some capacity enhancements because, as a successful business, we must respond to our own growth and also need to accommodate seasonal peaks in production. Where we were previously coating about 220 door panels per week, now it is 600, sometimes more!” Operations manager Wendt also added, “At OBUK we consciously focus on flexibility of manufacturing and, for quality reasons, we do not sub-contract to other coating firms during peak times, but complete all our orders in-house. For this reason, with the high degree of individualization we offer, where our customers can even configure their requirements on the internet and we build it as a one-off job, speed and flexibility are essential to our continued existence.

The implementation of the plant was given to a well-known general contractor, and because of their many years of excellent experience with dense phase technology components supplied by Nordson, they even stipulated this in the specifications. The layout and technical requirements for the new plant were worked out in the course of an in-depth analysis and planning phase.

During this and all other phases of the project, support was provided for operations management at OBUK and for the EAR Rittersbach planning bureau. “Integration – that was the key aspect,” recalled Daniel Hentschel at the end of the conversion phase. “Each of the stations has its own control system. Adapting all of these to the overarching plant control system needed plenty of programming work at the interface points and cooperation between multiple experts. Basically, it did take time before everything was working flawlessly and even the very last intractable error was finally laid to rest.”

That time was used well. Even while the system was being installed, the powder coating technicians, all trained by OBUK themselves, also received intensive training from Nordson.

Faster, better, more efficient: These are the benefits from 12 years of technical advancement

So, when regular operation started and the first components moved along the conveyor belt in the production hall, each accompanied by all its relevant data in bar code form, even experienced plant operators showed themselves not a little astonished at how much techniques have advanced, because much has happened in the field of powder coating over the last few years.

Qualified engineer (Dipl.-Ing.) A. Ritterbach explained about the planning for the plant, “The coating plant is designed for a three-minute turnaround. Two minutes of that is given over to the powder coating, while the remaining minute is taken up by color changes and preparation for the next traverse in the robot booth. This is really important for us, because the concept of single-item job production is no pie-in-the-sky dream of the future, but something we do on an everyday basis,” added operations manager Wendt.

Smart color management is handled by a Nordson “Spectrum COD” powder feed center, which is equipped with 24 small powder hoppers and 8 large ones. The color-on-demand system can provide eight main colors, 20 auxiliary colors and four customizable special colors for the optimum possible flexibility.

The quality of the coating was also noticeably improved beyond the already high level of the previous plant. When the 6-axis industrial robot from ABB sprays its powder through the Encore robot spray gun at close quarters to the workpiece, then the coating, configured by OBUK to an optimal thickness of 70-90 µm, remains extremely uniform, even in recesses and areas of complex geometry. This level of quality can practically be reproduced almost as many times as needed. The strict internal quality controllers only refer a maximum of 3 to 4 percent of coated parts for reprocessing – a hitherto unattainably low level.

“The secret of the especially high powder content in the ‘soft cloud’ is that it is expelled from the guns with relatively little air and actually rather slowly. This means the robot can get in closer, the material has more time to spread over the surface and it has better adhesion there,” explained Hentschel. This optimizes the application of the powder, speeds up the coating procedure and helps save a lot of powder from being wasted.

“Although powder application does still entail losses, it was possible to lower the cost of powder coating per door panel by a considerable amount because the transfer efficiency in the coating process has been markedly improved and unproductive color change periods have also been eliminated,” Ritterbach summed up with satisfaction, because that had been exactly what the prognosis had promised. Powder consumption was analyzed in great detail and has been further improved. In particular, the programming of robot movements still offers major potential. “If you consider that even now a first-pass transfer efficiency of 60% is already being achieved, even though our doors have cut-outs, patterns of holes and similar in the way of decoration, then our experience of many years shows that such results can only be achieved using dense-phase technology,” added Wendt.

For trained, professional staff, a conversion like this is no problem

It is only economically possible to turn out 40,000 door panels a year in the tiniest of batches and with very high quality requirements with the maximum amount of automation and if precisely defined procedures can ensure that production processes are reproducible to the tightest of tolerance demands. It is essential for all components of the plant to offer excellent functional reliability, for them to be easily accessible and for maintenance intervals to be as long as possible in order to keep downtimes to a minimum and ensure that planning can handle the entire production process – especially when multiple coating is involved. Simple, undemanding control, rapid set-up and cleaning and resource-saving operation are the other things that round off the list of requirements for ‘smart-factory’ production.

The new powder coating system at OBUK has only been in operation a few months so far, but the procedures have already settled into place. Ask the operations and equipment managers whether investment of around 2 million euros in the latest, robot-assisted technology has fulfilled expectations and the answers will be many-faceted, but invariably positive.

Production engineering manager Daniel Hentschel emphasizes the ease of operation for what is otherwise a really complex installation. “When you have employees like ours who really know their powder coating, then a conversion like this is not going to faze anyone. On the contrary, the touch screen control for the system is highly intuitive and doesn’t need a lot of training. The way the process is portrayed on the screen is almost self-explanatory.” For operations manager Henrik Wendt the ease of production planning is of key importance. As an example he mentioned the maintenance periods for the HDLV pumps, which undergo heavy stresses. “The pinch valves for the pumps are their only components which suffer from wear and, even in spite of the stresses they have to endure, they are still good for 15,000 color changes. To be absolutely sure, we replace them after 12,500, but then we never have a single one wear out. Even when faults do occur somewhere in the system, the signs are always there in advance.”

More than 15,000 high-quality color changes have already been made since the plant was commissioned at the end of January 2018. Even after a few weeks, trust in the state-of-the art Nordson powder coating system had grown to such an extent that the pre-existing coating system, initially retained as a fall-back alternative, was deactivated entirely. Now it has been dismantled and re-installed at one of OBUK’s subsidiary plants, where it will certainly remain in use for many years. One feature of the old system has been missed by OBUK employees on these cold February days, that being the enormous amount of heat it used to generate. “On hot days in summer, it has been up to 40°C in the production hall, but in winter it was great – the new one is extremely energy efficient and it’ll never match that,” smiled Daniel Hentschel.

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