Powder Coating 4.0

Maximizing process control by means of dense-phase technology

Case Study

RITTAL GmbH & Co. KG

Performance by design

Nordson

Electrical cabinet manufacturer Rittal offers insight into their production

Rittal is one of the world's leading system suppliers for enclosures, power distribution, climate control, IT infrastructure and software & services. This global player based in Herborn, Germany, offers insights into the configuration and processes of its state-of-the-art powder coating systems.

In all markets, in countless industries, and in nearly every company, "Industry 4.0" is the next big thing: but does the investment in new equipment really pay off? What conditions have to be met and what changes must be made in order to manufacture high-quality products that satisfy customer requirements cost-effectively today?

Machinery and equipment from Germany are a calling card of local industry and in high demand the world over. Wherever electronics have to be protected, the chances are good that the enclosures for the equipment control system, power distribution or climate control come from Rittal. Headquartered in the German state of Hesse, Rittal is a genuine global player employing over 9,300 people and operating 13 production facilities worldwide.

Millions of square meters and intelligent standardization

"Our goal is to use standardized products to meet customer-specific requirements faster and on a more timely basis. We are in the process of creating the conditions to achieve this, especially in the coating systems area," admits Heiko Denner, Project Manager for Surface Finishing Technology at Rittal, during our meeting in the company's own Rittal Innovation Center, "and we're doing so despite the fact that the total number of square meters of powder coated surface area per year measures in the millions!"

ColorMax[3] powder booths are ideally suited for all our applications, no matter whether we run a single color in a shift or have to change colors frequently.

The very consistent operation of the HDLV® pumps provides ideal conditions for uniform processes, transporting the powder very carefully from our 400 kg big bags to the powder center and to the guns and then returning the overspray back to the system again – thereby keeping the material stable over an extended period.

In addition to Rittal's standard Light Gray RAL 7035, many other colors approved by Quality Assurance are available as serial production to satisfy customer wishes.

"For anyone offering such a broad variety of colors, an intelligent, extremely flexible booth concept is absolutely vital." Rittal relies here on the highest standards of Nordson ColorMax[3] booth technology, with special booth floor material and highly automated cleaning cycles that enable extremely fast color changes. "ColorMax[3] booths are ideally suited for all our applications, no matter whether we run a single color in a shift or have to change colors frequently," says Denner.

It is often the coating that serves to fulfill specific customer requirements of an enclosure. Those requirements arise, for example, from the installation site of an enclosure for photovoltaic or wind turbine systems, in the production halls of automotive suppliers, in the food and beverage industry, or in a data center.

Heiko Denner, Project Manager for Finishing Technology at Rittal

Along with the design possibilities of Rittal enclosures, the company started already from an early stage to develop specific solutions for an extremely wide range of applications. For the food and beverage industry, for example, which is subject to uncompromising hygiene requirements in all areas. Here the right housing design can help save cleaning and disinfectant agents, improve cleaning results and reduce the risk of contamination. Other examples include wind turbine and photovoltaic systems, whose outdoor housings must withstand wind and weather to protect sensitive control technology from extreme temperature fluctuations and moisture. In much the same way, applications in IT, transportation technology, and – in extreme cases – machinery construction and process industries also impose special requirements.

Once installed, an enclosure usually then stays in its place for many years – where aggressive environments are not uncommon. That means a powder coating must function reliably – and also look good – for a long period and under adverse conditions. "Our products can achieve that only because we consistently apply the highest quality coatings," says Heiko Denner, returning to the subject of surface finishing.

What matters to him here is not only the quality of the finished surface, but also the efficiency of the coating process. "To enable us to deliver uniformly high quality – shift after shift, day in and day out, and totally independent of personnel – we defined our processes precisely and they are continuously monitored and adjusted."

And nothing is left to chance.

Maximizing process control by means of dense phase technology

"We measure and record our powder consumption very precisely, of course – but the same also goes for air and energy consumption, as well. All consumption parameters are then calculated not just for the batch, but rather right down to the individual part – which enables us to achieve an extremely high level of transparency."

The data collected in this way helps us adjust the system efficiently using key parameters. At the same time, however, they also serve as the basis for further process optimization measures: Large quantities amplify even the smallest potential savings.

"We have already been relying on dense-phase technology for years now," says the Project Manager. "Today the very consistent operation of the HDLV pumps provides ideal conditions for uniform processes, transporting the powder with extreme care from our 400 kg big bags to the powder feed center and to the guns and then returning the overspray back to the system again – thereby keeping the quality of the material stable over an extended period."

"Moreover, the low flow velocity and high powder content generate a 'soft cloud' that allows the powder gun to work very close to the workpiece. Together with low back corona discharge, that significantly increases the application efficiency while also providing the benefits of deep penetration, even with more complicated housing geometries."

The uniformity with which this technology distributes powder across the coated surface is apparent even to the naked eye. "Sometimes in the past we used to see the so-called 'picture frame' effect," recalls Denner. "That was a small border right next to an edge. Today with the low powder consumption, the coating layer distribution is so uniform that this no long happens, so now we meet Rittal QA standards."

Achieving that level of uniformity takes great care. Even the fresh powder is sieved into the Spectrum® HD powder feed center, for example, because after extended storage or transport time, freshly supplied powder has been observed to form extremely fine clumps on occasion. "That could cause our sensitive processes to malfunction – and sieving eliminates the possibility of this happening."

The “human factor” still matters!

“Anyone who imagines that the highly automated systems of a state-of-the-art powder coating plant reduce production operators to mere extras couldn’t be more wrong,” assures Project Manager Denner, comparing their situation with that of a pilot in a modern cockpit. “Even the slightest anomaly demands a fast reaction – and the right one!” Consistently high-quality, efficient production therefore not only requires machine operators to be extremely vigilant and reliable, but also necessitates continuous advanced training. “It might sound like a contradiction,” explains Denner, “but the simpler a system’s operation looks, the more complex the processes behind it. And our operators must have a clear understanding of those processes in order to be able to take the right action when necessary.”

Experience shows the importance of informing the employees early about changes and bringing them on board right from the start – an approach followed systematically by the Friedhelm Loh Group, to which Rittal belongs. Recognized in 2018 as one of Germany’s Top Employers for the tenth consecutive time, this family-run business places a strong emphasis on continuing education.

“When it comes to specialized knowledge of the kind we need here in the coating area, we’re glad to take advantage of training courses at Nordson’s technical center,” reports the project manager. “Our employees enjoy training under real conditions like that because it’s so much better than a dry classroom seminar.”

Operators also get a fortuitous motivational boost from a completely different source, however: From the coating system’s PowderPilot® HD touchscreen control. “Many of the employees today experience a full-blown enhancement of their job when they use these modern terminals to perform their monitoring and control functions,” knows Heiko Denner, who immediately cites yet another benefit of this system: “Especially for our situation, the icon-based user interface has also proven very convenient. With an international workforce made up of employees from more than 100 countries, language-independent system operation is clearly the most intelligent solution!” And when the system guides operators through even complex procedures like color changes clearly and safely, their enthusiastic feedback comes as no surprise.

Rittal has a 50-year tradition of success, and customers have long valued the quality of the products. “Our industrial coatings meet their specifications – on land, in the air and on the water. Some of our enclosures are installed on super-yachts,” grins Denner, “that not only look great, but also withstand harsh sea air.”

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