Service Provider Automates the Coating of Mass-Produced Parts

From Manual to Robotic Coating Processes

Until recently, the coating solutions provider Welco coated motorcycle parts only by hand. Now the company applies the primer or the base powder coat fully automatically in a new spray booth with two robots. These, together with a state-of-the-art dense phase application system, produce consistently high quality results and lead to a significant reduction in powder consumption.

Welco’s objective was clear – to move away from the process of coating mass-produced parts manually. On the one hand, the company’s customers were calling for consistently high coating quality. On the other, experienced coaters are increasingly hard to find. In addition, the powder consumption levels in the four manual spray booths were very high. In response to these challenges, Welco decided to move away from manual coating and to fully automate the process of applying the primer or base coat to large batches of parts.

Welco GmbH & Co. KG in Bruck specialises in applying designer-quality coatings to car and motorcycle components. To most closely meet the specific requirements of the OEMs and their component suppliers, Welco is constantly improving its processes, including the application of powder coatings.

Complex parts

Early on in the planning phase, it became clear to the team at Welco that the use of robots was unavoidable because the motorcycle parts, such as frames, engine components, rear axle housings and handlebar bridges were too complex for coating with just reciprocating automatic spray systems. There were no reference installations that Welco could use for guidance, because of the unique complexity of parts coated by Welco. Tests in Nordson’s technical centre in Erkrath using HDLV (High Density, Low-Velocity) dense phase systems convinced Welco that this application technology was the best choice due to the highest degree of process control and reduced powder consumption.

Individual solution

Nordson was selected as the new powder booth supplier based on the favorable test results and the ability to develop a customized solution. The booth had to provide as much freedom of movement as possible for the robots, while fitting into an area of only 20 square metres in the existing building. To achieve this, Nordson worked with the robot manufacturer Stäubli to produce a simulation of the booth design. After three months of preparations and planning, the contract for the coating booth was awarded in July 2015. The installation was another challenge as it had to take place without interruption to the ongoing plant operation. In December 2015, the booth was ready for mass-produced parts. Since the end of February, the automated powder coating system has been in full three-shift operation. The parts that are being coated are made of aluminum, steel or magnesium. They are transported to the spray booth by a power & free conveyor and are masked if necessary.

The Nordson ColorMaxE booth is a customised, quick-colour-change system specially designed for robot appli-
cation. It can accommodate parts with a maximum size of 1200 x 600 x 600 mm.

The ideal combination – robots and dense phase application
Two robot-mounted HDLV spray systems are used for efficient powder application. Additionally, large-capacity HDLV pumps are used to return powder recovered in the cyclones back to the feed centre. The Spectrum HD powder centre houses the automatically cleanable powder hopper, all the HDLV pumps, and the ultrasonic sieve. The integration of the sieve into the feed centre allows for the screening of both fresh and reclaimed powders for high finish quality.

The soft powder cloud delivered by the HDLV spray system greatly enhances the coating of complex parts. The easy coating of recesses and high application efficiency also disallow the development of back ionization further enhancing the finish quality. The uniformity of the coating thickness on the products is also improved for lower overall powder consumption.

The use of robots and dense-phase technology on this and other projects showed the unique advantages of this combination where precise robot movement and high application speed are supported with accurate powder metering and high application rate of HDLV spray systems. Welco reports hardly any visible overspray and nearly 25% reduction in powder consumption.

A Windows-based, PowderPi lot central system controller is used to manage all operating parameters of the booth and spray systems. Through the collaboration between Nordson and Stäubli the robot control functions were also integrated into the central controller.

Reliable process with two robots
Two highly compact, offset, ATEX-certified, seven-axis robots replaced manual operators. The robots are programmed using the point-to-point procedure. In comparison with previous robot models, programming the latest robots is quick and easy.

Welco has around five colour changes per 3-shift working day. The color changes are initiated with a push of a button after which the process runs with high degree of automation. Only the booth and the robots have to be blown clean by the company’s employees. The air ducting and floor extraction system are designed to prevent powder accumulating on the booth floor. Each colour change currently takes just under 15 minutes. With more practice, shorter color change times are realistically achievable. The user-friendly, intuitive control system with prompts guiding the operators through the process is very helpful.

The powder is recovered via a twin-cyclone with convenient inspection doors at ergonomic height. The afterfilter with airflow capacity of 12,000 cubic metres per hour is fitted with easily accessible nano filter cartridge filters.

Requirements successfully met
The booth, the application system and the robots have so far proved to be highly reliable. Given the size of the booth and its additional openings for the robots, the challenge of creating a laminar airflow has been successfully met. The requirement for a maximum booth height of 2.5 meters without a substructure was also met.

Welco is currently investigating further improvements through the installation of the extra precautionary measures to prevent faults caused, for example, by deformed hangers or incorrectly hung parts. In addition, the parts holders on the hanger-frames need to be improved. A system for inspecting the hangers using a test gauge after the cleaning and coating removal by a third party has already been implemented.

For Welco, it was important for its staff to be closely involved from the early stages in the planning and implementation of the new coating booth project. This enabled the employees to understand early on that automation would not lead to job losses and has allowed them to adjust easily to their new tasks.

Welco has invested more than 300,000 Euros in the new powder coating system and the next project is already about to begin. After successfully automating the process of applying the base coat or primer, the plan is to do the same for the top coat. (Ke)