



White goods take on color

New powder coating line increases production flexibility while reducing costs

BSH Electrodomesticos España S.A.

Performance by design

 **Nordson**

Quality, Flexibility, Efficiency

BSH Electrodomésticos España replaces a 30-year-old powder coating line and switches to dense phase technology with positive impacts on quality, flexibility and profitability



Refrigerator, stove, dishwasher, washing machine: For a long time, these (major) household appliances were hidden behind screens or banished to the basement. In today's open living spaces and kitchens, the design monotony of "white goods" is now a thing of the past. A modern refrigerator often in a noble anthracite or a dazzling red matches the carefully crafted ambiance and color scheme of a new kitchen.

BSH Electrodomésticos España in Spain powder coats appliances under brands of Bosch, Siemens, Neff and Balay. The company recognized early the trend toward color diversity and installed a state-of-the-art powder coating system with dense phase technology.

BSH Hausgeräte GmbH of Munich, Germany, a 100% subsidiary of the Bosch Group since 2015, looks back over a 50-year success story since it was founded in 1967. The company was established in 1967 as a merger of the household appliance divisions of Bosch and Siemens. By bundling that expertise, the new company sought to withstand the serious market crisis occurring at that time and to prepare itself for the emerging European market.

Beginning from the mid-1980s, BSH drove its internationalization into growing European, Asian and American markets by entering in to joint ventures with strong regional brands or acquiring them.

As a result, in 1988, it acquired two of the industry's long-established companies: the Balay-Safel Group of Spain – and along with them, the then still new production facility in Esquíroz, which had been producing refrigerators since 1987.

In the mid-2000s, the Spanish construction and real-estate boom caused demand to soar. To meet that demand, coating operations were outsourced. But then when the housing bubble suddenly burst, the Spanish economy plunged into a serious crisis and the demand for such goods collapsed.

In 2008, the company resumed its in-house powder coating operations. At that time there were two single-color booths where, day in and day out, the components were coated in unwavering white and metallic silver. However, the need for more colors and greater color change flexibility was pressing. Jose Luis Castillo Fernandez, responsible for manufacturing engineering dishwasher at BSH Electrodomésticos España, reported also that the old booths accumulated too much powder, creating greater demands on maintenance and safety concerns.

With the goal of being able to offer its customers a greater selection of colors and higher finish quality, in 2015 BSH decided to expand its facilities and invest in a new powder coating line. The company set their goals for their new system high, with the top 6 priorities being:

- **A dramatic increase in coating capacity, in order to cover production peaks and handle increasing demand for doors and top panels**
- **Coating quality optimization and elimination of rework**
- **Maximum operating flexibility – spray any product, any color, on-demand.**
- **Maximum automation and process control for quality and powder savings**
- **Significant reduction in energy consumption**
- **Compliance with the strictest ecological standards**

Dense Phase Technology recommendations

José Luis Castillo inquired within the industry and heard of several recommendations for the dense phase technology from Nordson. Other users reported high application efficiency and low maintenance delivered by this technology. Mr. Castillo contacted Nordson and visited several coating lines already in operation in the region.

During the visits he was impressed by the quality of the coatings and the high production rate. The high level of color change and coating application automation were also of key interest. "All of these were strong arguments for dense phase technology," explains José Castillo, "but what really excited me was the ability to make a complete color change in under 10 minutes with minimum effort on the part of the operators!"

Back in Esquíroz, the decision was made to invest in new powder coating systems from Nordson, kicking off the implementation stage of the process where close collaboration between the companies would be vital. In December 2016, the first of the two powder coating lines went into operation.

The powder is applied by four spray guns per booth side mounted on long-stroke reciprocators. Specifically designed for dense phase technology, the Nordson Encore® HD spray system delivers powder to the products with minimum air resulting in a soft spray and high application efficiency. "At a maximum line speed of 2.80 meters per minute, we achieve a coated area of 530 m² per hour – on both sides. That's excellent value that illustrates the performance of our system," says José Miguel Lopez Alzorriz of BSH Electrodomésticos España.

The Nordson ColorMax³ powder coating booth, Encore HD powder guns and Spectrum® HD powder feed center form the powerful color change solution, so highly demanded by BSH Electrodomésticos España in its project specifications. All system components are easily accessible, making color changes faster. In order to meet the customers required high surface finish standard, both the recycled and fresh powders are screened through a 200 micron ultrasonic sieve.

Precision digital control

Integrating the control software of a machine into the higher-order control system, presents the engineers with a major challenge when modernizing part of a production line. "But not in our case," stated José Alzorriz. "PowderPilot® HD, the Nordson control



 High quality refrigerator doors are powder coated on the new line at BSH Electrodomésticos España.



 Compressed air and energy consumption is monitored via Sentron PAC3200 and the BSH Wonderware ERP system.

system, was connected to our BSH “Wonderware” production control system without any problem whatsoever. Our fears that this step might cause delays were unfounded.”

Conclusion after the first construction phase: We're on the right track!

Along with side panels, the new line now also enables BSH Electrodomésticos España to coat the refrigerator doors. Achieving the the highest finish quality while reducing the applied coating thickness required careful optimization of the system operating parameters. On the old line, the products were routinely coated at 200µ, often in two passes, to ensure uniform surfaces. After the upgrade, due to the process control, BSH was able to reduce to 100µ or less, resulting in significant powder savings. The first pass application efficiency was also significantly improved. The coating quality impressed right from the start. Compressed air and energy consumption are monitored both via the Nordson PowderPilot HD and the BSH Wonderware ERP system.

“ The Nordson ColorMax³ fast color change booth, Encore HD powder guns and Spectrum HD powder feed center form a powerful color change system that fully meets the BSH Electrodomésticos España specifications.

Service & Support from Nordson

During start up and commissioning of the new powder coating line, whenever any needs were identified the Nordson team worked closely with BSH to offer solutions. The system could be flexibly and easily fine-tuned to deliver the desired coating and color change performance. “Whenever any area of optimization was discovered, the excellent collaboration and close support by Nordson personal brought a quick and effective solution – without interruption to our normal production.” says Mr. Castillo.”

Second construction phase and completion

With the objective of being able to coat three main colors in parallel, two more ColorMax³ booths were installed in 2018. In order to operate all three booths simultaneously, the capacity of the conveyor also had to be increased. A splitter added to the conveyor system enabled faster conveying and increased production flexibility. Through smart investment and project management, BSH fully fulfilled its need for “any product – any time” production.

The environmental friendliness of the new line was highly important to BSH. For this, the total energy and compressed air consumption are not only monitored and shared between the Nordson PowderPilot controller and BSH Wonderware ERP systems, but also minimized through the implementation of the Nordson “Going green” performance package, which uses intelligent control functionality to dynamically adjust the air and electrical consumption, relative to the production needs.





(left to right) Jose Miguel Lopez Alzorriz (BSH), Sebastian Gonzalez de Zarate (Nordson Area Sales Manager Spain) Jose Luis Castillo Fernandez (BSH)

For BSH Electrodomésticos España’s system, the suspension of product on the chain conveyor in groups of three with separation gaps proved optimal to provide a time window for the automatic cleaning cycle. The resulting gaps on the line are detected by a light barrier and signaled to the control system, which switches the system components to standby mode: the spray systems are switched off, the booth exhaust system and automated floor cleaning are switched to stand-by mode, the gun movers are stopped significantly reducing the energy and compressed air consumption.

In the startup phase of the installation, the standby mode would require the minimum of 30 seconds to activate. For further optimization this time was reduced to 22 seconds for further energy savings.

The bottom line

“The investment in a new coating line has paid off in every respect!” Mr. Alzorriz explains. While discussing the benefits of the new technology, he starts with the improved quality. “Our products are positioned in the upper price segment and the demands our customers place today on the surface finish of a refrigerator are similar to what they expect of their car. Thanks to Nordson dense phase technology, we are achieving that level of quality very easily!

Rework due to the powder coating process is virtually non-existent. That’s one of the most striking differences from the way things used to be,” confirms Mr. Castillo: “Our strict quality

controls are met on the first pass nearly 100% of the time; rework is the rare exception.” Both believe that the reason for this lies in the high degree of process control delivered by the new equipment. “It’s a complex system of course. First you have to get your mind around the principles of operation and their interactions. But then the system offers a wide range of possibilities for fine-tuning the individual parameters and with a little experience you quickly approach the optimal result” says Mr. Castillo. “We continuously monitor the energy and compressed air consumption for example, so we can optimize them further,” states Mr. Alzorriz. “The analysis is done with a tool that provides us with data on the Nordson PowderPilot HD control system and on our in-house BSH Wonderware ERP.”

Another positive aspect of the system is, that energy and powder consumption decreased significantly, even with the gain in production capacity. “Our biggest savings are in energy consumption:” reports Mr. Alzorriz, “they are really dramatic. The fact that we’re consuming far less energy is not only good news for us, but also for the entire BSH Group. We’ve done our part toward achieving the tremendous savings of 25 million kWh overall between 2015 and 2017! We have accomplished all our goals and more,” stated Mr. Castillo.

Along with the qualitative progress, the documented figures already prove a big step forward. The capacity of the new system is about four times greater than its predecessor, and production has already increased as more parts are being coated. “And that’s despite the tremendous increase in the range of products and in the number of colors that we can now process,” says Mr. Castillo. “Color changes are extensively automated and completed in just minutes. This gives us the ability to react very flexibly to our production requirements at all times.”



Objectives
• Increase coating capacity • Flexibility to produce more different parts • Higher surface quality, no rework • Change colors effectively • High degree of automation • Energy savings • High ecological standards

Achievements
• Fast, contamination-free color change • Operating flexibility • Maximum process control for powder savings and quality • High production rate • Highly automated coating line • Energy savings • Controls integration

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BSH Electrodomésticos España, S.A.

Esquíroz, Navarra | Spain
www.bsh-group.com

Nordson Industrial Coating Systems

ics.eu@nordson.com | www.nordson.com/ics



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