

Optimised enamelling thanks to new application equipment: ELBA Italy's breakthrough

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Enamelling versus powder coating: two different worlds, two approaches to metal protection and finishing. Recently, cooking appliance manufacturer ELBA Italy has optimised its electrostatic powder enamelling process thanks to new application equipment supplied by Wagner S.p.A., capable of ensuring uniformity, precision, and superior aesthetic quality. Characterised by higher baking temperatures and greater film thicknesses than traditional coating, this is more controllable and efficient, with a significant reduction in rework and defects.

Powder enamels, also known as porcelain or vitreous enamels, are a widely used solution for protecting and enhancing metal surfaces. They are obtained from inorganic materials, such as silica, metal oxides, and vitreous compounds, which are melted at temperatures between 810 and 850 °C to form a hard, glassy layer that not only acts as a surface deposit but also gives structure to the treated metal by becoming an integral part of it. Silica forms the basis of these coatings, whereas metal oxides determine their colour, mechanical strength, and chemical resistance properties. Their formulation can be enriched with pigments, matting agents, and surfactants, mixed and ground with precision to obtain specific finishes, from matte to glossy or semi-glossy and from durable to waterproof. The process results in an aesthetically pleasing coating that is resistant to corrosion and high temperatures, but it presents some critical issues:





the need for high temperatures for melting, the necessity to handle fragile materials, and the challenge of controlling the layer's thickness and uniformity. Precisely these characteristics distinguish enamelling from traditional powder coating, which is based on organic polymers and requires lower curing temperatures. Although the physics of electrostatic deposition are similar, powder enamel behaves very differently: transfer efficiency is lower (around 40%), resulting in increased overspray and the need for specific filtration systems; the application thickness is greater,

between 150 and 200 microns; and the process is much more sensitive to environmental conditions. At the same time, the advantages of electrostatic powder enamelling remain in line with those of powder coating and primarily derive from the benefits guaranteed by the automation of modern application systems: recovery of excess powder, precise control of film thicknesses, coating uniformity, better edge coverage, and smooth and shiny finishes after baking.



Top left: oven cavities entering the pre-treatment tunnel.

Top right: oven cavities waiting to be enamelled.

Opening photo: in the ovens and cookers manufactured by ELBA Italy, refined design and high performance are enhanced by high-quality finishes obtained through enamelling (mainly in black) and powder coating.

Left: an overview of the powder coating plant.



The inside of the Wagner enamelling booth for cavities.



In the foreground, the 6-axis robot coating the 'ceiling' of an oven cavity.

For the most part, electrostatic dry powder enamelling is employed in the large domestic appliance sector. In recent years, the increasing automation of processes has improved result repeatability and production efficiency, also contributing to cost containment, and R&D on chemical formulations and powder grinding technologies is continuing to optimise application parameters and reduce defects. To better understand the characteristics of this technology applied to the field of household appliances and see how the use of advanced application equipment, such as that of Wagner S.p.A., can streamline operations, we visited the premises of ELBA Italy in Borso del Grappa (Treviso). This long-established company, now a part of the Haier Group and employing over 400 people, is celebrating seventy-five years in business this year: starting out in 1950 by offering enamelling services, it is now one of the most recognised brands in the smart cooking sector, thanks to its attention to detail and a fully integrated production cycle.

ELBA: when “Made in Italy” refers to more than just good food

“ELBA originated from one man’s initiative, the founder Elio Baggio, who year upon year interpreted the demands and tastes of family life, surrounding himself with partners who shared his values and were able to bring projects to fruition,” the corporate profile reads. “Attention to detail, passion for technology and talent led the company to become an integral part of the ‘Italian economic miracle’ of the post-war period, now called Italian Style.” The ability to translate customer desires into attractive, functional, and easy-to-use appliances soon took the fame of the ELBA brand beyond Italian borders, from the Middle East to Africa and into the Far East. Its products can now be found in the homes of millions of consumers worldwide.

If ‘Made in Italy’ has become a truly global label, it is thanks to two key factors: superior quality and distinctive design. To meet both these requirements, ELBA has chosen to keep its entire production of built-in

The evolution of ELBA: Italian excellence since 1950

The history of ELBA began in 1950, when Elio Baggio founded a small factory in Marostica, in the province of Vicenza (Italy), focusing on enamelling and the production of wood and coal stoves. Over time, the company specialised in the enamelling of components for stoves and cookers, as well as bathtubs, sinks, and other bathroom furnishings at the request of leading manufacturers in Northern Italy, such as Zanussi, Zoppas, and Fargas. By the end of the 1950s, the post-World War II reconstruction had been completed, and the following years were characterised by enormous demand for basic household appliances such as cookers and refrigerators.

Ten years later, the company moved to Bassano del Grappa and officially launched the ELBA brand (an acronym of the founder’s name), which quickly established itself on the national market for its freestanding kitchens. By the mid-1960s, ELBA’s products had already crossed Italian borders. In the following years, production grew rapidly, with exports accounting for the majority of sales. The end of the 1970s marked a further step forward with the introduction of built-in appliances, which opened the doors to major European markets such as France, the United Kingdom, and Germany.

In 1987, ELBA joined the De’Longhi Group, strengthening its industrial capabilities. A few years later, it moved to its current site in Borso del Grappa, where it was able to expand its production area (50,000 m²), install an additional enamelling plant and two coating lines, and redesign its factory layout, thus significantly increasing its production capacity.

Another milestone was the acquisition by Fisher & Paykel in 2006, which boosted its technological development and international expansion through innovative synergies in research and design. In 2010, as the company’s presence expanded further into the Middle East, its position was consolidated with the introduction of new built-in products with gas technology. In the same year, the tagline ‘Talent for cooking’ was launched, which has been a part of ELBA’s identity ever since.

Finally, in 2021, the company became part of the Haier Europe Group, expanding its range of household appliances to include refrigerators, dishwashers, coffee machines, and microwave ovens. Today, with a presence in over seventy countries, ELBA continues to be a symbol of Italian creativity, quality, and innovation, a brand that has transformed tradition into global recognition.

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ovens and freestanding domestic cookers in its own factory, managing all stages from the receipt of sheet metal coils to the assembly of finished products in-house. Thousands of parts leave this plant every day, thanks to nine lines dedicated to ovens and freestanding cookers, and five to classic and induction cookers. The enamelling department alone coats an average of 700 oven cavities per day in a single shift – a figure that immediately gives an idea of the strategic role of this process within the production chain.

**At the heart of production:
ELBA's enamelling department**

The factory's area devoted to surface treatments houses two different application technologies: a traditional line supplied by Euroimpianti (Valeggio sul Mincio, Verona, Italy) with a Wagner powder application booth, which is used for oven casings, front panels, and rear components, and an enamelling system for treating cavities, sheet metal parts, drip pans, and side panels.

"Cavities are undoubtedly the components that are the most difficult to enamel," explains Luca Ferello, the Enamelling Process Manager. "We use DC04 steel or titanium sheets that we form, bend, and assemble by spot welding; assembly with the other oven components only takes place after enamelling. Sheet metal parts, on the other hand, require a single riveting operation."

Before enamelling, all workpieces undergo a surface preparation

cycle in three stages: cleaning with cold mains water, degreasing with demineralised water at 60 °C, and drying.

Enamel application takes place in two dedicated Wagner booths, designed respectively for oven cavities and sheet metal parts. Installed in 2023 to replace the previous powder coating system, these have made the process faster, more efficient, and more economical, also thanks to the simultaneous upgrading of the conveyor, cleaning tunnel, and baking oven. Once enamelled, the workpieces are manually transferred to the conveyor that takes them to the oven, where they are baked at approximately 850 °C. At this temperature, the vitreous enamel chemically bonds with the metal, forming a hard and resistant coating that is ready for the following production stages.

**The challenge of electrostatic enamelling:
Wagner's solution**

"During enamelling, the main critical issue with the electrostatic application process stems from its chemical nature, because the electrostatic charge is difficult to apply with an inorganic element, and from the product's weight, which is greater than that of traditional powder," explains Marco Ghirimoldi, Business Development Domestic Appliances at Wagner. "The specific weight of enamel is almost double that of regular powder paint. This results in lower transfer efficiency, the need to use more guns to ensure coverage of complex-shaped parts with recessed and hollow areas, and a greater amount of overspray."



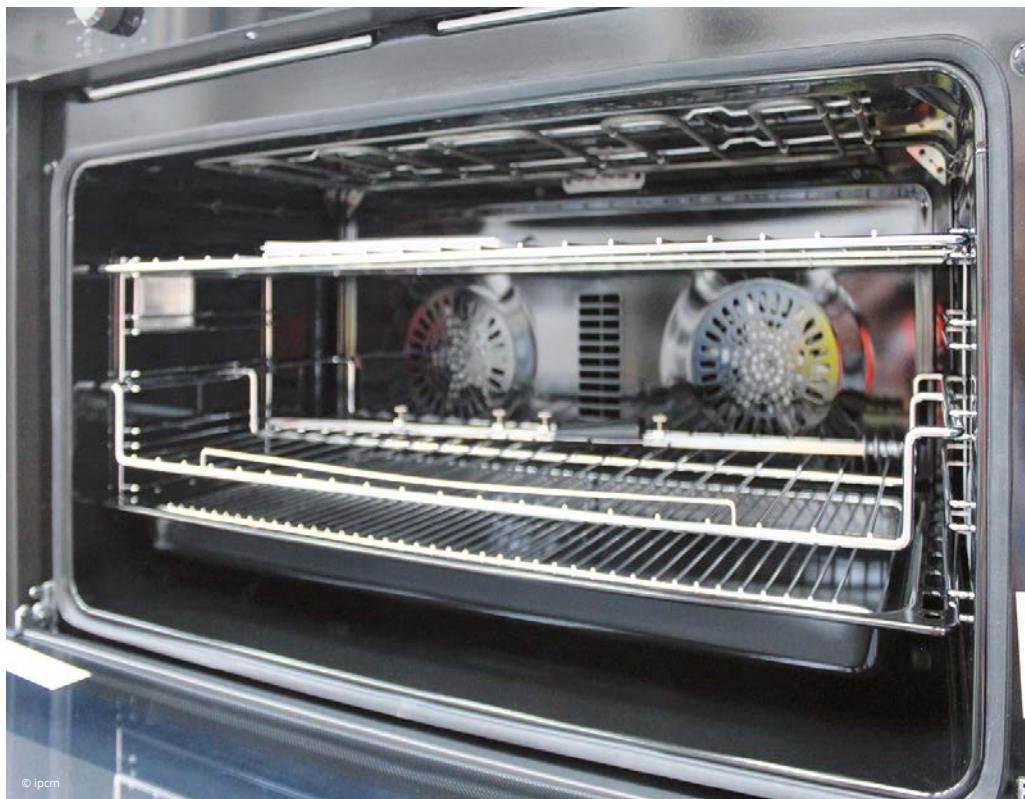
From top left, clockwise:

The loading area for sheet metal parts.

The enamelling booth for sheet metal parts.

The guns installed in the booth devoted to sheet metal parts are equipped with a double head and a dedicated electrode, as well as blowers above the nozzles to prevent powder accumulation.

The baking oven.



From top left, clockwise:

Reworking a cavity.

Enamel applied on metal is not just a layer covering its surfaces but actually integrates into it, giving it structure and robustness.

ELBA Italy is now one of the most recognised brands in the smart cooking sector, thanks to its attention to detail and fully integrated production cycle.



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The enamelling booths installed at ELBA are equipped with PEA C4 series guns, featuring a charging voltage of up to 100 kV and automatic pressure control (AFC) to optimise powder adhesion. To limit the build-up of vitreous enamel on the nozzles' edges, these guns are designed with simplified circuits and ceramic nozzles that are highly resistant to wear. They are also combined Venturi pumps in hardened steel and ceramic inserts (as in the case of ELBA), chosen specifically to withstand the high abrasiveness of the enamelling products, which is why the filtration system also includes special filters.

Configurations vary depending on the type of treated workpieces. "For sheet metal parts, we use double-head guns to split the enamel flow. Each of them has a dedicated electrode and a blower above the nozzle to prevent powder accumulation. In the booth devoted to cavities, on the other hand, a 6-axis Kuka robot applies the enamel on the upper interior, the most critical area, and 3-axis robots complete the coating of the side surfaces. Overall, the booth for enamelling sheet metal parts has 30 guns, 8 of which are fixed, whereas the one devoted to cavities is equipped with 22 guns," continues Ghirimoldi. Finally, the system allows for total recovery of the powder, which is mixed with fresh product and reintroduced into the application cycle. The installation of the two booths, which took just ten days thanks to the work of two teams, was preceded by tests at the Wagner centre in Valmadrera (Lecco, Italy), which specialises precisely in developing enamelling technologies. "These tests also led us to implement a compressed air treatment system, which regulates temperature and humidity according to atmospheric conditions, one of the variables that most influence the enamel application process. This stabilises the fluid beds, keeping the properties of the air in contact with the enamel constant throughout the process," Ghirimoldi emphasises. The booths have been customised according to ELBA's productivity, space, and operational requirements. Their reciprocators can be activated or deactivated depending on the shape of the workpiece or the type of operation (first application or reworking), and the spraying distance can be adjusted to avoid the Faraday cage effect. Thanks to this technological upgrade, ELBA has improved its workflow, application process, and coating quality while reducing the critical issues typical of electrostatic enamelling, which is inherently more challenging than traditional powder coating.

Defects in enamelling

Unlike in traditional powder coating, every defect in enamelling is unique, which means that every day presents a new challenge. "We chose Wagner equipment both for its superior technical performance and because our coating department was already familiar with it. Indeed, it has enabled us to increase production efficiency and manage rework more effectively."

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From left to right: Kevin Busatta, Domenico Cimino, and Luca Ferello from ELBA Italy.



On sheet metal parts, defects can be removed with a grinding wheel. Then, the workpiece is reloaded onto the conveyor for a new cycle, and the operator selects the most suitable configuration so that the Wagner spray guns apply the enamel exclusively on the affected area, thus preserving the surfaces that are already compliant.

For oven cavities, however, the procedure is more complex. After removing the non-compliant coating, the entire surface is wet-coated by spraying a powder enamel specially formulated for reworking and mixed with water. In this case, it is not possible to limit the application to the defective area alone, as the subsequent baking stage at high temperatures would risk compromising the coating's uniformity.

Another challenge for the enamelling department's operators is posed by the innovative solutions in terms of aesthetics and design brought by ELBA's R&D team. One example is an oven without a front panel and with an extremely thin rim.

"This configuration poses some difficulties in the application phase, especially with a complex and invasive process like enamelling, but we have overcome them thanks to the contribution of Wagner's technology," the company points out.

Quality in kitchens around the world

Today, two years after the launch of the new enamelling plant, ELBA has achieved excellent results in terms of coating quality, also thanks to its greater attention to raw materials, whose samples are tested through enamelling trials before processing. This is a complex, difficult-to-manage process. In addition, ELBA's production is very diverse: in a single day, the enamelling department handles up to five batches of completely different components, making it impossible to set stable application parameters for long processing cycles (except for daily adjustments based on weather conditions).

Before starting an application cycle, a trial is always carried out on samples already subjected to adhesion tests to check their conformity. Then, before entering the oven, a preliminary visual inspection is also carried out, which precedes the actual quality control phase. "Reworking is one of the main bottlenecks in our factory," the company concludes. "However, thanks to our partnership with Wagner, we have significantly reduced its frequency and made the process following defect elimination more effective. It is precisely such a high degree of attention to detail that has made our products famous in kitchens worldwide." 