Revamping ETA's Powder Feed and Colour Change System Made Coating Switchboards Easier, Faster, and More Efficient

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Appearance matters even in the field of enclosures for industrial applications. With a coating process borrowed from the automotive sector, ETA was the first company in the industry worldwide to introduce a cataphoresis + powder application process to provide its wireless switchboards with both protective and cosmetic finishes. To meet the demands of a market that is focussing on ever greater production automation and placing increasingly demanding requirements, it has recently upgraded its coating line by integrating a SuperCenter EVO powder feed and colour change system and two latest-generation IPS systems developed by its long-standing partner Wagner Spa.

When designing a production plant, choosing the electrical cabinet to protect the machinery's most critical components, such as control elements, circuits, cables, and switches, against dust, humidity, water, and extreme temperatures is probably the last but indeed not the least important phase.

ETA was the first company in its industry worldwide to implement a cataphoresis + powder application process for its wireless switchboards.

The slightest error in its configuration can not only change the project's technical characteristics but also compromise the operability of the entire system.
Antonio Turati, the Production Manager of ETA Spa (Canzo, Como, Italy), specialising in the design and construction of wireless enclosures since 1978, introduces us to this sector by explaining that "although it was conceived as an accessory element in the industrial automation landscape of the boom years, this simple product has become indispensable, in an industrial scenario where companies can no longer do without automated production to stay ahead. For those who design and manufacture switchboards, it is first of all essential to identify the environment in which they are to be placed, ensuring that they are protected against dust and humidity, if they are intended for sheltered and enclosed facilities such as factories, or from corrosion and atmospheric agents, if they are installed outdoors.
"That is why, in 2017, for the first time in this sector, we developed and implemented the E DUP (Double Layer Protection) treatment in our paint shop. Combining cataphoresis with powder coating, it proved to be a success. More recently, as our production throughput continues to grow, we have upgraded our powder feed and colour change system by installing 3 new powder centres, i.e. 1 SuperCenter EVO and 2 IPS plants. The latter is the only powder centre on the market to enable a true automatic colour change operation without manual intervention. It was recently developed by Wagner Spa, with which we have been

Components entering the pre-treatment tunnel installed by Tecnofirma SpA in 2008.

Silvi revamped the pre-treatment plant in 2017 by integrating 2 additional stages.

The cataphoresis tank and the double-pass through UF cleaning tunnel made in 316 stainless steel.

collaborating since our coating plant was built in 2008. To date, this also integrates a two-tier power & free conveyor from Futura Convogliatori Aerei, a pre-treatment tunnel and drying and curing ovens from Tecnofirma, and cataphoresis plant installed by Silvi Srl in 2017."

ETA: 45 years of high-quality enclosure for industrial automation

Established in 1978 by the heirs of Turati Antonio, the company now sees the involvement of the family's third generation while continuing to be run by two of its founders, Aldo and Luigia, joined by Samanta and Antonio some years ago. "Thanks to the know-how acquired over more than 45 years in the machining of sheet metal, stainless steel, and aluminium extrusions, ETA is a benchmark manufacturer in the international enclosure industry, recognised for its high quality standards and ability to provide solutions for both the industrial automation and IT worlds," explains QHSE Manager & ATEX Specialist Andrea Re. "Our company is governed by values inspired by the concepts of sustainability, quality, innovation, and flexibility, which are reflected both in our daily actions and in every aspect of our workflows: from design to sheet metal machining, from coating to assembly, up to dispatch."

"In recent years, we have focused a lot on customisation even for small batches and on product diversification. In this almost half-century of company history, the other major change that has enabled ETA to distinguish itself from its competitors has indeed been the development of new switchboards for harsh environments, low-voltage power distribution, and servers and data centres. "ETA's mission is to create a link between hardware and software through technologically advanced products, and this is reflected not only in the solutions we offer to our customers but also in our production processes. At the same time, in line with our scrupulous policy for

The PLC controlling the cataphoresis process, interconnected with the company's management system and the drying oven from Tecnofirma SpA.

the protection of the environment and our surrounding area, all our investments are subjected to an environmental impact assessment beforehand. We have installed two photovoltaic plants on the roofs of our factories, i.e. our headquarters in Canzo and the building in Albavilla, a few kilometres away, which supply electricity for about 1 MW. We also use recycled materials, and we always select machines with low CO_2 emissions, such as the latest ones acquired for laser cutting and welding. Finally, it is worth mentioning that we supply flat-pack solutions to optimise shipping costs and volumes."

In addition to the two production sites in Canzo, where the first processing phases are carried out, and Albavilla, taking care of the final production phases, the ETA Group also includes a production site in Romania for small and non-standard switchboards; three foreign sales subsidiaries in the UK, France, and Poland, soon to become four with the opening of a new division in the US; and a widespread sales network throughout Italy and in over 40 countries worldwide.

ETA's diversified production

The Canzo site is equipped with 2 production lines: one for processing stainless steel parts – which are rubberised, i.e. a polyurethane gasket is applied to prevent external elements from penetrating the switchboard, assembled, and packaged at this plant – and one for processing carbon steel parts – which are then coated, rubberised, and assembled at the Albavilla site. Ultimately, all of ETA's products are shipped from the Albavilla plant, which was established in 1998 precisely as a logistics hub: the finished stainless steel components are also transported here for this purpose.

"In the past, we were supported by an external coating contractor," notes Giovanni Desantis, the Paint Shop Manager. "However, in 2008, we decided to insource this process by creating an ad hoc department. The investment in the related line was made to support the company's development: it was undoubtedly oversized compared with business volumes back then, but it was designed with a view to growth.

"To do this, we started a project to renovate our Albavilla plant, previously only used for shipping, including the construction of a new paint shop on the factory's first floor. On the ground floor, we receive panels with a maximum size of 3 x 2.5 m or pre-assembled box profiles with a maximum depth of 500 mm, which are tracked by PLCs along the entire production route from the loading area (where a lift takes them to the first floor) to the 4 unloading areas (which they reach via a lowerator after passing through the paint shop). Once they reach the upper floor, depending on the required colour, they are distributed among the pre-treatment and cataphoresis plant, the drying oven, the 3 Wagner booths (1 single-colour and 2 multi-colour), and the curing oven. The power & free conveyor that runs along the two floors of the building and the elevator and the lowerator that serve the loading and unloading bays were designed by Futura Convogliatori Aerei (Robecco Pavese, Pavia, Italy). The conveyor has a total length of 7 km and features 250 load bars hanging on 3 m-long frames with a load capacity of 500 kg."

The Double Layer Protection treatment

The E DUP (Double Layer Protection) treatment consists in the application of an epoxy resin primer in the cataphoresis tank and of a thermosetting polyester powder top coat. The choice of this process, implemented here for the first time in the electrical cabinet sector, resulted from several analyses and tests to find the optimal solution.
"Eventually, we opted for this combined cycle because it produces coatings that have both high aesthetic and performance properties and are suitable for a wide range of environments and applications, while ensuring the degree of flexibility we need to differentiate our products. With oversized parts that cannot be immersed in the cataphoresis tank, we manually apply a zinc-rich powder primer in the booth and then the finishing coat. ETA's cabinets are characterised by a standard colour, the textured ETA RAL7035, but we can apply the entire range of RAL colours upon request, since our customers have also become more demanding in terms of tints.
To integrate the cataphoresis tank into the company's coating line,

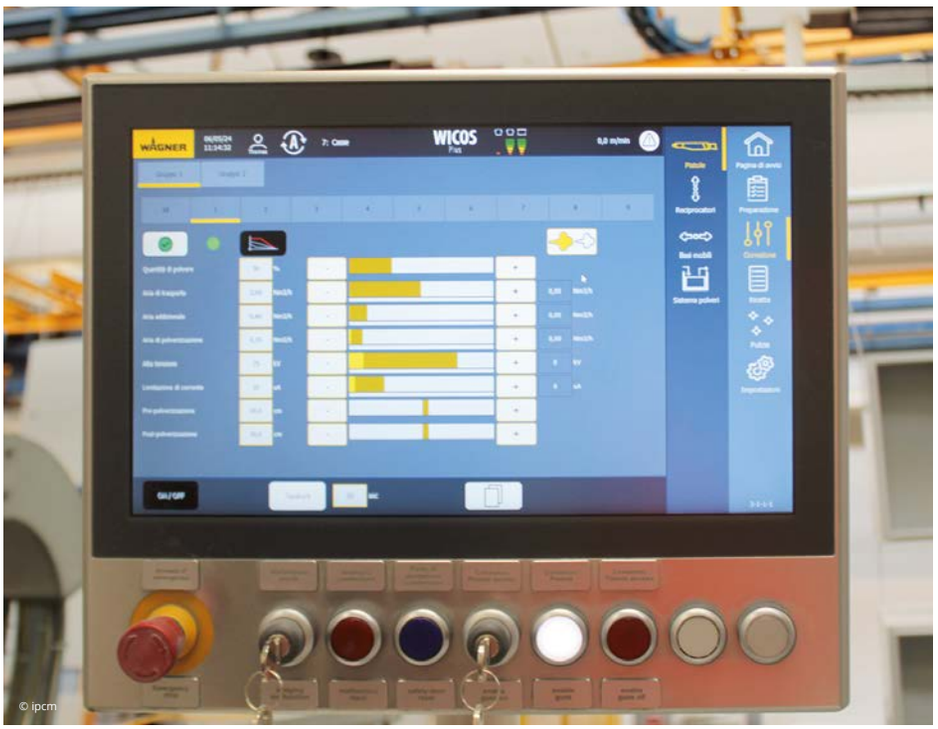
The power & free conveyor and the 3 Wagner booths.

Single-colour paint application in the booth installed by Wagner in 2008 (left photo) and a booth applying different colours.

Silvi Srl (Lesmo, Monza e Brianza, Italy) revamped the existing pre-treatment plant originally built by Tecnofirma SpA (Monza, Italy) in 2008, adding 2 stages after degreasing and rinsing: nanotechnology atomisation and a rinse with demineralised water. The cataphoresis tank has a capacity of 45 m^3 and is equipped with 26 tubular anaphoresis dialysis cells. "Tecnofirma Spa had already designed the 7.5 m-long tank to reduce the paint content in proportion to the parts' size," explains Silvi's CEO, Daniele Fumagalli. "It is equipped with a weir to keep the level constant and ensure the total absence of foam. Finally, it is insulated with an internal 3 mm-thick PVC sheet." After immersion, the parts are taken to the double-pass through UF cleaning tunnel made of 316 stainless steel, also supplied by Silvi, and then to the drying oven. "The cataphoresis plant is managed by a control PLC with a keyboard and a digital panel, interconnected with the company's management system," illustrates Fumagalli.

The revamping of the application system

The 3 coating booths (2 for colour changes and 1 for applying a single colour) were supplied in 2008. "We immediately chose Wagner's application equipment because this company is a leader in the design and installation of that kind of plant and is, therefore, a reliable partner for this delicate stage of the production process. We knew it could ensure the high coating quality we were looking for," states Turati. "We perform 10 to 25 colour changes per day in a 12-hour shift. We needed to upgrade our application system, and the revamping carried out



The user-friendly touchscreen simplifies programming.

by Wagner over a year, between December 2022 and the same month in 2023, enabled us to further improve our operational performance, saving time for gun flushing and streamlining application management for our operators."

"We upgraded ETA's booths to enable it to make a real quantum leap in operational terms," confirms Marco Spada from Wagner. "The 3 booths have the same features. They have 18 (9+9) automatic dosing devices plus 2 manual ones and a scanning system that identifies the incoming workpieces and activates the application system according to pre-set programmes. In order to revamp the system, we replaced the reciprocators and nozzles and integrated our classic SuperCenter EVO system, the first powder centre designed to be in line with Industry 4.0 parameters, in one multi-colour booth and our new IPS system in the other multi-colour booth and the single-colour one. This latter powder centre model is equipped with a twofold fresh powder feeding system, allows powder preparation

The IPS system managing the multi-colour booth: the Smart Boxer can accommodate two boxes at a time and automatically switch from one to the other for continuous-flow powder feeding. On the right,the IPS module for multi-colour powder management.

by ultrasonic sieve, vibration, and fluidisation, and features accurate gun dosing systems; its integrated sensors for weight, flow, pressure, and level and its fully automatic colour change system guarantee high productivity and economic efficiency."

The advantages of the new IPS system

Marco Spada emphasises that the advantages of the new system are considerable compared with conventional powder feed and colour change devices: "IPS is based on a revolutionary concept for the coating industry because it approaches application equipment as a highly automated machine tool, thus increasing productivity, maintaining high quality standards, making it easy to operate, and consistently reducing colour change times. In addition to lower powder consumption and easier handling, another benefit is the greater coating uniformity achieved by the new dosing devices, which accurately apply around 80 g of coating per minute. Thanks to the reduced amount of powder dispensed and the low flow velocity in the piping, these nozzles require maintenance work to be carried out only once a year. They also feature an advanced dosing system capable of accurately and precisely dosing the paint product – which is what reduces its consumption. Finally, the Smart Feeding Technology (SFT) ensures constant powder feeding even at high flow rates over a long time."

"As well as allowing for uniform application of our standard thickness of 80 microns," says Desantis, "the new paint management system also guarantees excellent performance when we treat cabinets that are intended for exposure to harsh environmental conditions such as marine environments. In addition, the operators can easily set the conveyor's speed from a minimum of 1.8 to a maximum of 3 m/min: this is a huge advantage because, as the 3 booths are working

The conveyor takes the coated parts to the curing oven.

The entrance to the curing oven.

The lowerator is coupled with the workpiece-carrying load bars and takes them to the ground floor.

simultaneously, the storage buffer could get congested before the parts can enter the curing oven. The new system allows reducing the plant's speed to a minimum to avoid this, while reducing the powder flow rate and extending the application times for easier part handling. As a result, after revamping our application system with the latest Wagner technology, the only errors that might arise are those related to cycle programming."

The final phase of the coating cycle

After powder application, the components are taken to the curing oven designed and manufactured by Tecnofirma, where they are first pre-cured with IR panels to fix the powder and avoid contamination between components and then cured at 180 °C for a total of about 18 minutes. At ETA, a standard coating cycle takes about 4 hours, with an average of 400 load bars per day, including unloading on the ground floor.

"Futura also equipped us with a bypass line to speed up the processing of workpieces with absolute priority. In that case, the cycle lasts about 2 hours. The conveyor's layout is functional to our needs. There is only one loading area but 4 unloading bays, one for each different type of product we handle: 1 for box profiles, 1 for accessories, and 2 for panels, allocated according to size to facilitate the assembly and rubberising operations, so that each workpiece is sent exactly where the operator needs to perform the following step."

Innovation through experimentation

Few companies have experimented with innovative technological solutions as frequently as ETA. "We were the first in the industry to install a laser welding system and the first in the world to experiment with the E DUP treatment inspired by the automotive coating process, precisely because our customers demand premium finishes comparable to those found on cars. We were also one of the first Italian companies to implement Wagner's new IPS powder centre when we upgraded our booths," notes Antonio Turati.

"In our Albavilla site, we have also recently installed a fully automated sheet metal processing plant that can read the drawings, activate the necessary mechanical operations,

Cured components in the storage buffer.

Devices controlling the pH parameters of the pre-treatment baths and the cataphoretic paint.

and produce finished box profiles: this is an absolute novelty for our industry, as well as a major investment for our company. Keeping up with technological developments is key to our customers' satisfaction. That is also why, since 2017, we have been collaborating with ETA Next, which is not a mere R&D office but rather a laboratory of ideas where we design products and solutions and develop our customers' plant engineering projects at best."

Such a quest for innovation is reflected in the continuous updating of this company's machine fleet: "To mention just a few of the latest investments we made, in addition to updating the powder application system in the paint shop and replacing the pyrolytic oven with 2 tanks for chemical paint stripping of hooks after each cycle, we have replaced all our rubberising plants over the last two years and, in the last month (June 2024, Ed.), we installed a new packaging machine and completed the connection of the paint shop's management and control systems with the company's general one, in line the parameters of Industry 4.0. Our coating plant is currently operating at 70% of its capacity: we aim to use it at full capacity within a short time, thanks also to the new IPS powder feed technology, which we have trusted from the beginning to confirm the coating phase, which previously was our bottleneck, as one of the added values of our electrical cabinets."