



# The Key Role of Sheet Metal Preparation in the Manufacture of Coating Systems and Outdoor Structures

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In our industry, attention is rarely paid to the processes related to the manufacture of plants and equipment intended for paintshops; specialised magazines understandably focus on divulging information about the characteristics and performance of such devices. This article, however, offers us the opportunity to deepen some aspects related to the preparation process of the sheet metal used to build surface treatment plants as well as other metal structures requiring high durability and resistance to external agents (**ref. Opening photo**).

We have visited Colortec (Volpiano, Turin, Italy), a coating contractor owned by Eurotherm and specialised in the construction of complete industrial coating lines for over fifty years. "We acquired Colortec in 2009," says Paolo Ghiazza, the owner of Eurotherm. "At that time, the company was located in Avigliana, about 40 km from Volpiano, and specialised in liquid coating. Our management was looking for a solution to the difficulties experienced in the pre-treatment and coating of our own plants' components. Until that moment, we had always outsourced these two phases. However, it was almost impossible for us to find companies

able to adequately treat the surfaces of our plants' parts, made in different materials and with varying (and sometimes large) sizes and to achieve the quality and functional results we required. That is why we acquired Colortec. In 2011, we solved a critical logistic issue by moving the company



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to a new plant near Eurotherm's base, in Volpiano, equipped with new plants built and installed by us. Then, we optimised both its pre-treatment process – with the collaboration of Chemtec, a Milan-based company specialising in the production of industrial surface treatment chemicals – and its application phase."

## The completion of the coating line

As well as coating Eurotherm systems' components, Colortec performs contracting treatment and coating operations on iron, steel, aluminium and galvanised sheet structures primarily intended for the sectors of machine tools and outdoor furniture and architecture. The original layout of the coating line designed for the Volpiano plant included a cleaning booth featuring a pressure washer for manual pre-treatment and a water recovery system, two application booths (one for liquid and one for powder coatings), and a curing oven. "When we started production, however, we immediately detected a few problems related to the handling of large-sized workpieces," says Ghiazza. "We solved this bottleneck by expanding the building and equipping it with a large central storage buffer for incoming and outgoing workpieces, with a capacity of 23 load bars (**Fig. 1**). We also integrated the line with an automatic single-chamber tunnel for parts up to 6 m in length (**Fig. 2**), devoted the manual cleaning booth to components with maximum dimensions of 7.5 x 4 x 3 m (**Fig. 3**), and added a drying oven. At this point, our pre-treatment and coating line was complete (**Fig. 4**)."

**Opening photo: Parts coated by Colortec, ready to be unloaded.**



Figure 1: The central storage buffer for the loading and unloading of materials.

### Doubled rinses for better pre-treatment

“Another issue,” says Ghiazza “was immediately detected in the pre-treatment cycle. The management of an automatic one-chamber cleaning system is not easy and we had to experiment a lot, before Chemtec’s intervention allowed us to find the most suitable process solution. The first cycle tested was composed of three stages: an alkaline degreasing process and two rinses; the cleaning results were optimal,

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but the coating adhesion ones were not. Therefore, we replaced the alkaline product with a slightly aggressive phosphodegreasing one; this solution proved to be effective for some time. In 2014, however, we turned to Chemtec to optimise our pre-treatment cycle. They supplied us with an acid



Figure 2: The entrance to the automatic cleaning tunnel for parts up to 6 m.

phosphodegreasing agent that ensures a more intensive cleaning process, especially suitable for galvanised and steel sheets (Fig. 5).”

“We provided Colortec with a phosphodegreasing product with two components: a phosphating chemical and a degreasing agent for intensive cleaning,” explains Tommaso Giovenzana, the Technical Manager of Chemtec. “One of the main advantages is that, in the first pre-treatment tank, it is possible to dose the two agents (phosphating and degreasing) as needed.”

The one-chamber spray cleaning system used by Colortec also has the drawback that the contaminants removed from both the workpieces and the walls and then collected in the water recovery tank can be dragged, thus increasing the general contamination level (Fig. 6 and 7). “In order to solve this problem,” says Giovenzana, “we doubled the number of rinses in the cleaning tunnel. We therefore switched from a 3-stage to a 7-stage process including as follows: phosphodegreasing, pre-rinse, rinse, pre-rinse no. 2, rinse no. 2, spray rinse with osmotic water, and nanotechnology passivation.

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### The nanotechnology passivation system ORGASIL®

“Compared with passivation through conversion, requiring an abundant rinse,” says Ghiazza, “nanotechnology passivation through nebulisation ensures a decisive advantage in terms not only of quality performance, thanks

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Figure 3: The inside of the manual cleaning booth with a pressure washer.

“**ORGASIL 01®** is a heavy metal-free nanotechnology product and a valid eco-friendly alternative to the microcrystalline or tricationic phosphating ones based on compounds of zinc or other metals, because it does not create toxic-harmful waste. This product deposits a thin uniform and continuous nanometric layer on the metal substrate. Formed by organic silanes, this coating makes the film highly hydrophobic, so as to ensure excellent corrosion resistance and good adhesion between metal and paint.”



Figure 4: A bird's eye view of the booths in the paintshop.

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**Figure 5: Parts in different sizes and materials entering the cleaning tunnel.**

to Chemtec's new passivating product ORGASIL 01®, but also of reduction in the amount of water that cannot be recycled since final passivation uses disposable water. In fact, the closed-loop system enables the liquid coming from the demineralised water rinse to be reused in the last tank to compensate for any water loss due to evaporation. Finally, the new system has enabled us to reduce our energy consumption and its related costs."

Giovenzana states: "ORGASIL 01® is a heavy metal-free nanotechnology product and a valid eco-friendly

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**Figure 6: The inside of the cleaning tunnel.**

"ORGASIL 01® maintains its stability within a certain pH range (5 to 10): if the pH value falls outside this interval, the organic silanes irreversibly hydrolyse and they are no longer available for the creation of the nanometric coating; it will therefore be necessary to change the bath. That is why it is necessary to make sure that the pH of the bath is as stable as possible. This can be done through some precautions, such as the increase in the number of rinse stages to avoid the dragging of products that

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**Figure 7: Workpieces inside the automatic cleaning chamber.**

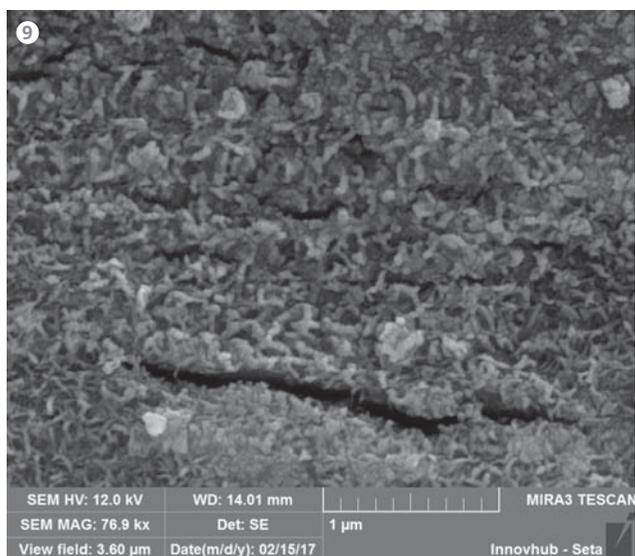
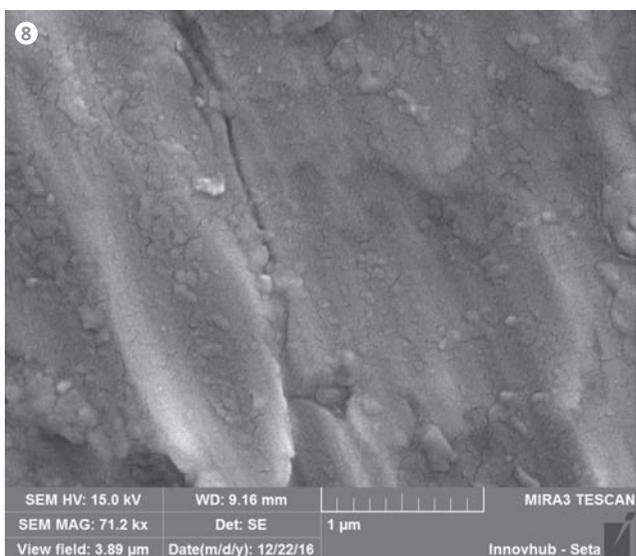


Figure 8 and 9: The SEM analysis shows the 1 micron-thick surface of a standard steel sample before and after treatment with the ORGASIL® process developed by Chemtec.

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### New Eurotherm systems integrated into the coating line

Following the adoption of Chemtec's process, Colortec decided to eliminate all liquid coating operations and replace their related application booth with a powder coating one (Fig. 10). Recently, it has also integrated the layout of its paintshop with a manual shotblasting system using metal media (Fig. 11). For a decade Eurotherm has also been manufacturing manual shotblasting cabinets and compact suction sandblasting systems with a rotary table. The new plant is intended to treat structures that will be placed outdoors and therefore require the performance of a two or three-coat anti-corrosion process including shotblasting, zinc primer application and topcoat application.

"In summary, Colortec can currently carry out three pre-treatment processes: manual cleaning with a pressure washer

for large workpieces; chemical pre-treatment for components up to 6 x 2.5 x 1 m; and manual shotblasting. 90% of parts are treated with Chemtec's chemical process, ensuring high cleanliness levels and perfect coating adhesion on metal surfaces." The powder coating phase following

pre-treatment occurs in two manual booths equipped with Wagner guns and managed by two operators (Fig. 12 and 13). Both booths can treat components with a maximum dimension of 7.5 x 5 x 3 m (Fig. 14). A curing phase follows, with a variable temperature depending on the type of material treated (Fig. 15).



Figure 10: The outside of one of the two powder application booths.



Figure 11: Eurotherm's manual shotblasting system.

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Figure 12: A few perforated sheet pieces waiting to be painted.

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“We chose a manual coating process,” states Ghiazza, “due to the variety of shapes and materials to be treated (Fig. 16). We are considering to automate a few production stages, such as shotblasting. Meanwhile, the control software that manages our entire production flow is essential to make the process flexible and coordinate the operators’ interventions.

### Production progress control through a PLC

The case of Colortec proves that the human-machine relationship is still crucial to better manage the material and labour resources available. The Colortec’s operators take charge of the incoming orders and selects the right pre-set treatment programs based on the customers’ requests (Fig. 17). There are different parameters to be set, such as pre-treatment specifications, RAL colours, number of bars, and amount of powder to be used. Once the required data are entered, the operators start the production process following all the parameters selected. They simply need to enter the indicated values on each management device of the plant. When the processing cycle ends, the customer is notified by e-mail that its order has been completed; in case there is any problem or surface defect, the system immediately detects it and the notification is blocked until the issue is resolved.



Figure 13: The powder application phase in one of the two booths.



Figure 14: An example of a large component being coated.

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“The cooperation with Chemtec has encouraged the research and development of a suitable process for one of the most delicate phases of a coating cycle: surface preparation. Following their intervention, Colortec has no longer detected any adhesion issue. The quality and resistance of the coatings are constantly praised by the customers, whether it be the companies installing and using the Eurotherm’s systems or firms entrusting Colortec with the coating of their products.”

### Conclusions

“Colortec,” says Ghiazza, “works in 3 shifts for 5 days out of 7. This results in a sustained production flow, which took time to be optimised and which can certainly be further improved. However, we know that we are moving in the right direction, especially because numerous operators in the sector, above all customers from France and Germany, visit our plant in Volpiano to follow the training courses we offer.

“Eurotherm’s customers are typically representatives of companies that, despite already knowing the peculiarities of the coating process, want to improve their



Figure 15: Components outside the curing oven.

production with highly customised technical solutions: witnessing a coating cycle optimised at every stage such as Colortec’s one enables them to gain the right know-how. This gives them two advantages: they learn how to manage

and profitably exploit the technical performance of Eurotherm’s plants and they understand the appropriate procedures for obtaining the qualitative and functional results required by their clients.

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Figure 16: The manual powder application phase on large-sized workpieces.

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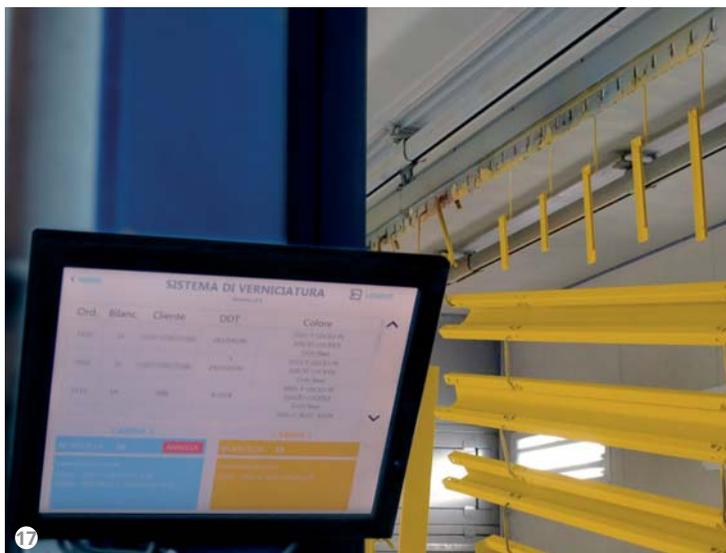


Figure 17: The touch screen of the PLC unit.

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