



Opening photo: Cavalca liquid and powder coats workpieces with any weight and size.



**FOCUS ON TECHNOLOGY**

# **The Single-Stage Cold Pre-Treatment Technology Improves Production Efficiency and Environmental Sustainability**

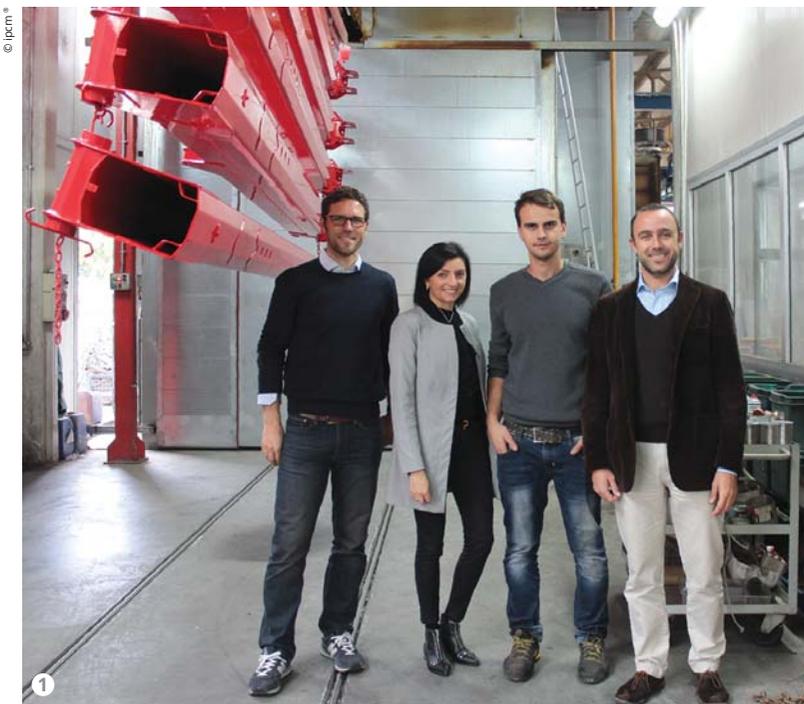
Monica Fumagalli **ipcm**<sup>®</sup>

In any Italian industrial sector, it is not uncommon to meet small or medium-sized companies that manage their production activities by making eco-sustainable choices for ethical reasons, despite the limited resources for updating their plants and although the sporadic careful and effective environmental controls by the responsible bodies may be an incentive to act oppositely.

At the centre of the Emilia Romagna region, in Bagnolo in Piano (Reggio Emilia), we have met a company that has turned its environmental strategy into a winning strategy: Cavalca Verniciature, the business evolution of Carrozzeria Cavalca, established in the 1960s for the repair of motor vehicles. In 2007, the firm converted into a powder and liquid coating contractor specialising in metal (especially steel and aluminium) components mainly intended for the ACE and machine tools sectors (ref. Opening photo). “We mainly treat medium and large-sized carpentry components and complementary small parts using two coating lines, i.e. a liquid and a powder one,” says Riccardo Cavalca, the owner of the firm with his son Gabriele (Fig. 1). “Despite the complexity of the treated materials, we have never stopped focussing on the quality of our production processes, on the safety of our employees and of the environment in which they operate, and of course on our end products’ quality. We have been ISO 9001 certified for several years. Cavalca Verniciature is also one of the very few Italian companies with the ISO 14001 environmental certification in the field of industrial coating, proving that

our operations are fully eco-friendly. The “secret” is to invest in proven processes in terms of economic savings and lower energy consumption. For example, when we decided to automate our powder coating line about one

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**Figure 1: From right to left: Chemtec owner Carlo Guidetti, Gabriele Cavalca from Cavalca Verniciature, Alessia Venturi from ipcm®, and Chemtec Product Manager Tommaso Giovenzana.**

year ago, we opted for an innovative solution: a single-stage cold pre-treatment system called Toran 3® and supplied by Chemtec (Corbetta, Milan), which is an effective eco-friendly alternative to phosphodegreasing or to phosphating followed by passivation.”

**Experience, flexibility, and delivery speed: Cavalca Verniciature’s cornerstones**

As well as its forty-year experience in coating transport vehicles, Cavalca Verniciature’s strengths include a manufacturing flexibility level such as that it can treat every type of workpiece, with any size and weight, with a fast and efficient service guaranteed by its speed in terms of both production and delivery. “Our main target market is the local one,” says Cavalca. “The speed of production flow management and product delivery is crucial to counteract competition. That is why we are equipped to handle both large orders and small quantities, and especially large-sized objects: at the moment, we have a modern powder coating plant that can process components up to 13.20 meters in length, 3.20 meters in height, and 3.20 meters in width. The versatility of our machines also enables us to better manage the most urgent work, in order to deliver in a very short time.”

**Liquid and powder coating processes**

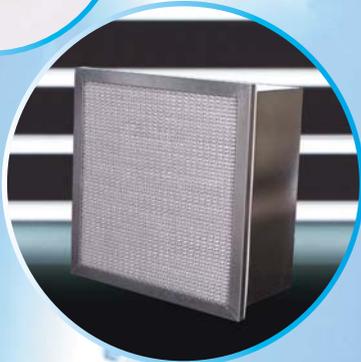
Surface treatments are performed on the two coating lines through manual operations (Fig. 2). “As for liquid coating, we do not have an actual continuous line: we have arranged the different stations in both our buildings in order to make the air drying phase, performed after application with heat exchangers, more flexible. If necessary and at the specific request of the customers, the parts can be subjected to an initial sand blasting treatment

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**Figure 2: The manual application of powder coatings.**

to remove oxidation and calamine residues remaining on their surfaces after machining, thus achieving a roughness degree equal to Sa 2 ½ - Sa 3 (**Fig. 3**). Sand blasting is generally the preliminary treatment for components requiring marine-level treatments (C5-MH): these are special workpieces intended for areas with high salinity, e.g. offshore, or regions characterised by very aggressive atmospheric phenomena. That is why the coating system includes several layers of both the base coat and the top coat, so as to apply an average paint thickness of at least 320 microns. Besides these systems, we also apply intumescent paints, high solid coatings for lower environmental impact, and polyurethane and epoxy paints." "For our powder line, we use epoxy-polyester paint products applied in two layers, a zinc-based primer and a top coat, with an intermediate polymerisation phase (**Fig. 4**). Powder coating," says Cavalca "ensures numerous advantages compared with the conventional one, including lower costs, because the process is faster, and lower disposal



**Figure 3: The automatic shot blasting system.**

“**Toran 3® is a degreasing process suitable for any type of material, which requires only one cold phase and can be integrated on already existing cleaning lines. In the low-pressure spray application tunnel, the contact time between the chemical product and the part surface ranges from 1 to 3 minutes, depending on the contamination level and the pre-set process time.**”

costs. Moreover, in terms of eco-friendliness, powders greatly reduce pollution and avoid the use of solvents. With the modern technologies implemented, we have reached high quality levels even with powder coatings in terms of both aesthetics and corrosion protection. Indeed, we have achieved extraordinary results, with workpieces showing a salt spray resistance value of over 2000 hours.”

The company has opted for Chemtec Toran 3® for the preliminary treatment to the application of powders. “About one year ago, we assessed that in order to be even more competitive we had to further speed up our production phases, especially the cleaning ones,” states Cavalca. “Certain types of workpieces, especially the large-sized and complex-shaped ones, required long cleaning times and complicated handling operations, resulting in higher production costs. Chemtec has solved these two problems while making sure that we clean even the most complex parts in a uniform and optimal, but also eco-friendly way.”

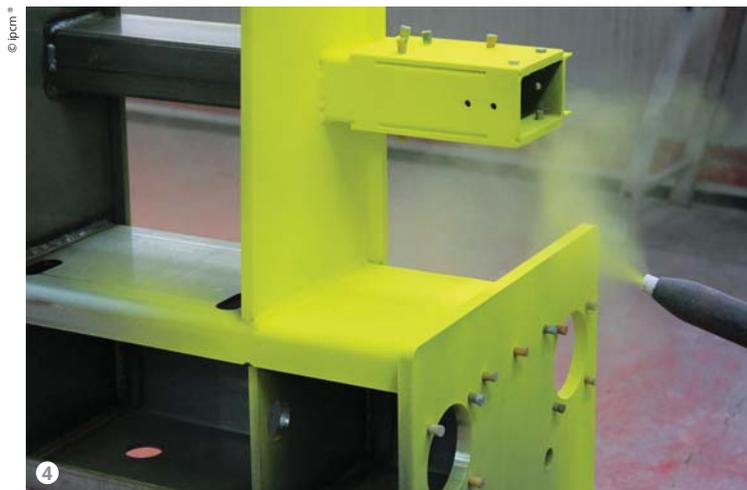


Figure 4: A detail of the result of a powder application process.



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**Figure 5: A detail of the result of a powder application process.**

### Toran 3®: a single-stage multi-metal process

“Toran 3® is a degreasing process suitable for any type of material, which requires only one cold phase and can be integrated on already existing cleaning lines,” says Chemtec owner Carlo Guidetti. “In the low-pressure spray application tunnel, the contact time between the chemical product and the part surface ranges from 1 to 3 minutes, depending on the contamination level and the pre-set process time (Fig. 5 and 6).

This is followed by a 5-minute dripping and oven drying phase. The standard drying time is 10 minutes at 130-140 °C; for Cavalca, the temperature is 180 °C, due to the particular shape and size of the workpieces.”

The dripping phase is one of the most problematic: if the part has a particularly complex shape, the product risks not to drain properly, so that a manual intervention is needed (Fig. 7). The pre-treatment tunnel features tilting nebulisation



**Figure 6: The inside of the pre-treatment tunnel.**

bars. These are mounted on a compressed air piston-driven cart that performs an oscillating movement inside the cleaning chamber: on the one hand, this guarantees more homogeneous and uniform cleaning results and, on the other, it reduces the volume of the plant (Fig. 8).

“At the end of the process, after drying,” says Guidetti, “the parts are clean and coated with an organic polymer with a thickness of about 300 nm, ensuring both temporary protection, as the surfaces do not oxidise if left inside the tunnel, and excellent paint adhesion. At the same



**Figure 7: An example of components with a complex shape.**



Figure 8: Workpieces entering the pre-treatment tunnel.

“At the end of the process, after drying the parts are clean and coated with an organic polymer with a thickness of about 300 nm, ensuring both temporary protection, as the surfaces do not oxidise if left inside the tunnel, and excellent paint adhesion. At the same time, this polymer is able to absorb any oily contaminants, turning these pollutants into active components that do not have to be disposed of. This eliminates the rinsing phase, since the process does not require the use of water, but rather of non-hazardous and non-toxic organic fluids.”

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“In this way, the product has a substantially unlimited service life,” says Cavalca. “We do not need to replace the cleaning agent, but only replenish it. This also minimises

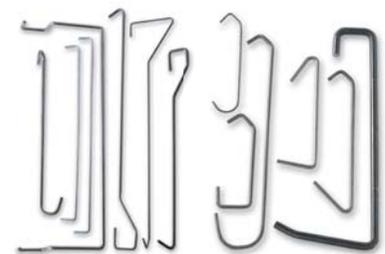
maintenance, limiting the operations to the cleaning of the filter, which is sometimes clogged up by metal micro-particles removed in the cleaning phase. In one year, we have never emptied the tank or cleaned the nozzles. A further benefit is that the cleaning product always maintains excellent performance and consistent process quality levels, so that we do not need to perform daily or monthly analyses: quarterly analyses, on the other hand, are carried out by Chemtec’s staff.”



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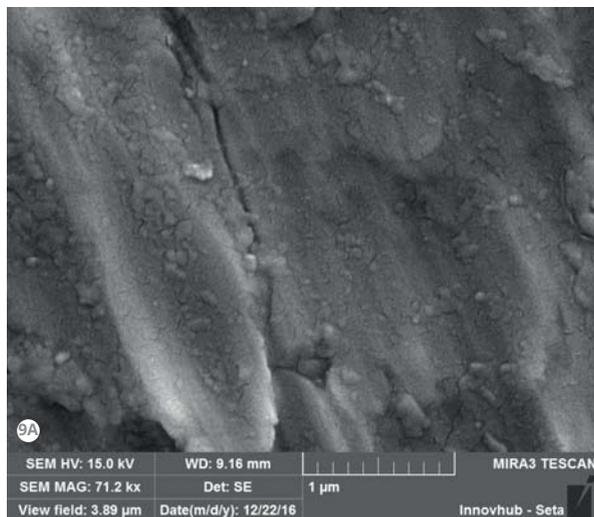
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“The consistency of the chemical’s characteristics, which remain unchanged over time, ensures good powder film adhesion and result repeatability while improving the corrosion resistance of the coating system. Before implementing Toran 3®, Cavalca Verniciature performed some tests: they achieved a 700-hour salt spray resistance value with the epoxy-polyester powders that they usually employ, which is an excellent result for products intended to be exposed in very harsh environments.”

Figure 9A: The results of the SEM analysis: a Q-Panel degraded with a solvent.

### Toran 3®’s advantages

“After the implementation of Toran 3®, we have found significant benefits in several areas,” states Cavalca. “First of all, we have achieved the goal that had led us to install a new pre-treatment system: greater speed and ease of management of the production flow. The single-stage cleaning process now ensures that we always achieve the delivery speed that is one of our strengths, enabling us to be competitive also and above all in terms of costs. The small footprint of the single-stage chamber also allows us to save useful space for faster and easier handling of larger workpieces.

“The cleaning agent has a substantially unlimited service life. It is no longer necessary to replace it, but only replenish it. This also minimises maintenance, limiting the operations to the cleaning of the filter, which is sometimes clogged up by metal micro-particles removed in the cleaning phase.”

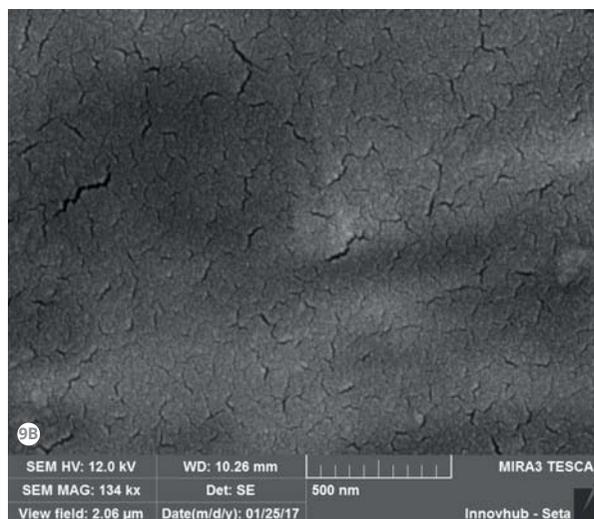
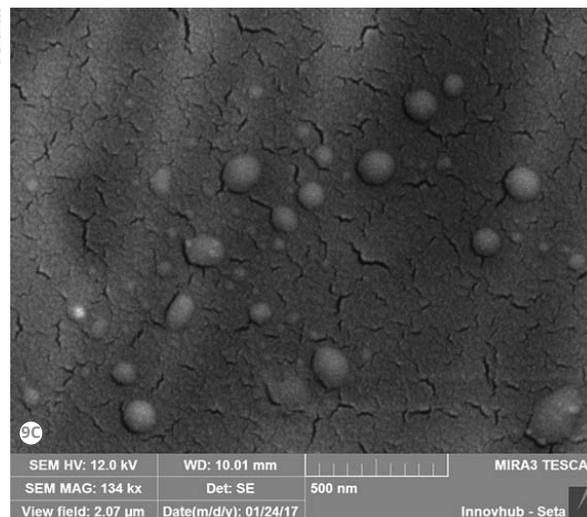


Figure 9B: A Q-Panel treated with Toran 3®.

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Figure 9C: A Q-Panel treated with Toran 3® and polluted with 2% of oil: micro-drops of oil trapped in the polymer can be clearly seen.



usually employ, which is an excellent result for products intended to be exposed in very harsh environments (Fig. 9a, 9b, and 9c).

“The last and the most important advantages are the greater healthiness of our working environment and the lower impact of our production activity on the environment. Indeed, the product used is VOC-free and classified as non-hazardous for man and the environment according to current European regulations. Moreover, there is no waste presenting a high risk of water contamination and our energy consumption has been reduced. Chemtec’s solution has fully met all our expectations.”