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Opening photo: Tecnolaser is a company specialised in the processing of sheet metal for machine tools, textile machines, earth moving machines, and accessories for the industry



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Collaboration Between Specialists for the Versatile, Integrated, and 4.0-Oriented Coating of Light Carpentry Components: Tecnolaser's Success Story

Barbara Pennati **ipcm**®

Tecnolaser, based in Curtarolo (PD, Italy) and specialising in the processing of sheet metal, was established in 1986 as a production department of Officine Facco & C. Spa, a manufacturer of plant engineering solutions for the poultry farming and breeding industry.

The advent of automatic machines, which have facilitated some mechanical processes and reduced production times, then led Tecnolaser to expand its production capacity and acquire new customers. That is why it moved to a new larger site, suitable for hosting its new work cycles (**Fig. 1**).

“The intensification of our activities and the increase in our turnover forced us to change our logistics. In the late Nineties, we decided to move our company headquarters and build a first plant devoted to machining, assembly, and welding. Coating was entrusted to contractors,” explains Gian Maria Tonin, TecnoLaser’s quality system manager (Fig. 2). “However, we experienced various quality problems with the finishing of our products, not so much due to the coating process itself as related to transport. Light carpentry components, made of carbon steel, coil galvanised or electro galvanised steel, and structural steel (Fig. 3), are easily damaged if not carefully handled, and we often found damaged workpieces that resulted in an increase in waste and production times (ref. Opening photo).” “Besides these quality issues, we also needed to support our customers during the whole sheet metal treatment process, from our co-design service in the components’ development to the supply of end products,” says Tonin. “We installed our first powder coating plant in 2009, which enabled us to meet our clients’ needs in terms of quality and delivery times.” “When one of our important customers closed its production plant near Padua, a part of its processes was entrusted to TecnoLaser. However, the finishing quality requirements, i.e. 500-hour salt spray resistance, where higher than those met by our coating plant,” states Gian Maria Tonin. “While searching for the best suited passivation system, we came into contact with Dollmar (Caleppio di Settala, Italy). The tests performed with them led us to integrate a multi-metal pre-treatment process with the final nebulisation of a nanotechnology passivation product,” he says.



Figure 1: TecnoLaser’s plant in Curtarolo (PD, Italy).

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Figure 2: from left to right, TecnoLaser plant manager Filippo Tonello, TecnoLaser quality system manager Gian Maria Tonin, and Alessia Venturi from ipcm.

The first coating plant

Thanks to the implementation of a pre-treatment nanotechnology, TecnoLaser could make a qualitative leap in terms of finishing performance. However, the ever-increasing workload and the small size of its coating system limited the versatility and quality of its service. “We performed over 70 colour change operations per month but, since we had a one-rail conveyor, the plant downtime negatively affected our production rate and forced us to double the shifts,” says Gian Maria Tonin. “Moreover, although the strength that distinguishes us on the market is our ability to handle medium-low volume production batches, our reduced space, the impossibility to integrate a second spray paint booth, and the increase in the number of orders led us to make a second important investment. We built a new adjacent building of about 4500 m², where we installed a new coating plant that could finally meet all our needs, ensuring also we had the possibility and the space for any future implementations.”

The new coating plant

“In order to design the new system, we set up a roundtable with Dollmar, as the sole supplier of pre-treatment products; Costabeber, as the plant engineering company; Gema Europe, for the installation of the new coating booth; and Futura Convogliatori Aerei, for the installation of the conveyor and of the 4.0 management software,” states Tonin. The new coating line, in operation since December 2017, includes a multi-metal



Figure 3: Tecnelaser treats parts in carbon steel, coil galvanised or electro galvanised steel, and structural steel.

no rinse pre-treatment process performed as follows: acid phosphodegreasing with products from the Dollphos range; 3 rinses with mains water; 1 semi-osmotic rinse; a pure flash of osmotic water; a nanotechnology passivation through nebulisation; and a hot air drying stage.

“Aware that one of the main process variables is the substrate quality of sheets, which cannot be controlled, we relied on Tecnelaser’s previous experience to solve the old plant’s critical issues and fully meet their needs. That is why we implemented technologies that could improve



Figure 4: The pre-treatment tunnel

their process versatility and quality level,” explains Gherardo Minotti, Dollmar’s Products Division Business Development specialist. “The current tunnel (**Fig. 4**) is 62 metres long, of which 9 are devoted to the first phosphodegreasing stage. Its

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Figures 5A and 5B: The new Gema MagicCylinder coating booth with a quick colour change system

dimensions are based on the longest workpieces treated by Tecnelaser, which are 5 metres long. The cleaning tanks are equipped with pH and conductivity control probes, integrated into the level control system and featuring a dedicated interface to constantly monitor the process and avoid any lowering of cycle performance.” “The Soft Level system, besides optimising water consumption, can communicate with Soft Rain Advanced. This system enables to apply an osmotic water flash,



Figure 6: The new Gema OptiCenter.

therefore free of the pollutants present in the tank due to dragging, which ensures optimal product preparation before the nanotechnology passivation stage. This is carried out with Dollcoat SA 115, already used in the first plant. The Dollcoat SA product range is based on synthetic oligomers containing organically functionalised silanes, able to enhance the properties of the silanes themselves and ensuring excellent paint adhesion and corrosion protection. The nebulisation action ensures that a fresh product is always applied on parts for maximum treatment quality, avoiding any contamination due to dragging or to the presence of reaction by-products," states Minotti. "At the moment, we have opted for an acid phosphodegreasing stage because it ensures excellent results on both carbon and galvanised steel, the two most treated types of metal by TecnoLaser. However, the plant is ready to switch to an alkaline degreasing process in future."

TecnoLaser's customers generally choose the coatings. They can be epoxy, polyester or epoxy-polyester products. Their application is carried out in two booths. "For cost efficiency reasons, we decided to keep the first plant's booth and add a new MagicCylinder booth (Figs. 5a and 5b) with the new OptiCenter system (Fig. 6) featuring OptiSpray dense phase application pumps (Fig. 7)," says TecnoLaser plant manager Filippo Tonello. "One booth applies the dark colours and the

other the light ones, in order to avoid any contamination. They both have pre and post-retouching stations, used only if the workpieces' shape requires it (Fig. 8). "Thanks to the new plant layout, including a Futura two-rail overhead conveyor (Figs. 9a and 9b), we can now also perform two-coat processes. In this case, we lower the polymerisation oven temperature in order to avoid complete gelling of the primer and we

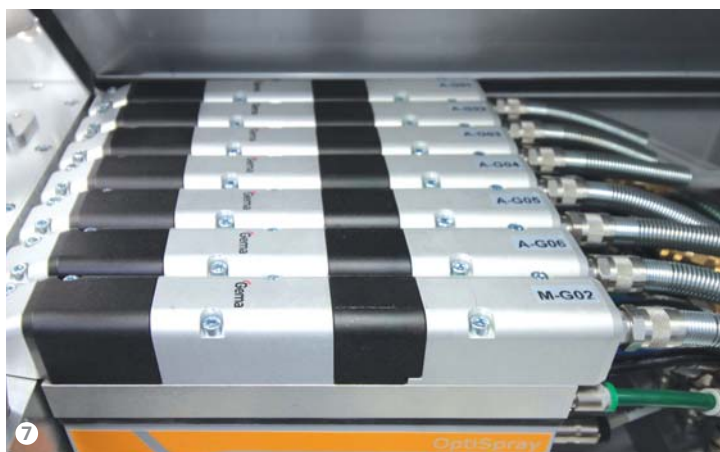


Figure 7: Gema OptiSpray dense phase pumps.

return the parts to the booth selected for the application of the second layer through a priority route." "We carry out around 5 colour change operations per day. Thanks to the storage buffers (Fig. 10) strategically

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Figure 8: Both booths are equipped with pre and post-retouching stations.



Figures 9A and 9B: Futura Convogliatori's two-rail conveyor.

positioned along the two-rail conveyor (in front of the pre-treatment tunnel, after the drying oven, and in the two unloading areas, as well as some 3-bar mini buffers at the booths' entrance and exit), plant downtimes have decreased and our production and delivery processes are no longer slowed down," states Filippo Tonello.

A software package 4.0 for the integrated management of the plant

The new coating plant is totally managed by a software developed by Futura Convogliatori Aerei and integrated with Tecnelaser's factory management system (Fig. 11). "The whole production flow is organised in "colour chains", identified by a unique code that is applied to all load bars with parts requiring the same coating process. During processing, the system collects plant data – times of entry and exit from the various stages, pH parameters, oven temperatures, unloading times, and so on. The data are then stored and, once a "colour chain" is ended, they are automatically integrated into the internal database to update the production data related to coating," explains Gian Maria Tonin. "The automation of the whole



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Figure 10: Futura Convogliatori's two-rail conveyor.

process and its integration with our internal system enables us to carry out activities such as updating production orders with no human intervention. Moreover, since the system and the software communicate with each other, we can trace the different colour batches and intervene promptly in case of any problems.”

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Conclusions

“Since we are required increasingly different types of coatings and effects, it has been crucial to equip ourselves with a plant enabling us to efficiently meet the needs of the market in terms of both quality and delivery times,”

states Tonin. “Our active collaboration with Dollmar, Futura, Costabeber, and Gema, as well as the technical suggestions received, have allowed us not only to improve the quality level of our production, but also to solve the handling and delivery problems that we encountered with the old plant layout. The new line offers us optimal flexibility thanks to the strategic positioning of storage buffers and the creation of priority routes for materials to be delivered urgently, made possible by the two-rail conveyor, but also thanks to the two spray paint booths that enabled us to perform a two-coat cycle and make improvements in terms of overspray and consumption. For the future, we are considering the integration of a third coating booth, working simultaneously to the two already in use, and the connection of the plant to another transport line that takes the workpieces directly to the subsequent assembly phases, thus achieving a complete and 4.0-oriented automation of production,” says Gian Maria Tonin. ○



Figure 11: The new coating system is managed by integrated software 4.0.