



From Craftsmanship to Contract Coating: the Metamorphosis of a Contractor through Targeted Investment in Technologies 4.0 and Human Resources

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Building a large-sized contract coating company is the objective of HVL Color, a business specialising in powder surface treatments that hit its own turnover record in 2020, thanks to a revamping and industrialisation 4.0 project involving its whole production plant and careful training of its employees.

Changing mindset is never easy, especially when it comes to work routines and systems that are customary not only within one's own factory, but throughout the industry. HVL Color (Italy) specialises in the contract powder coating of components of which 80% are intended for the air conditioning, heating, and electrical switchgear fields. A few years ago, it began a process of enhancement and improvement of its operational structure that has led it to make the decisive transition from a small craftsman business to a structured industrial company. What made a difference was its targeted investment in plant technology 4.0, automation, and highly

skilled human resources.

"The economic crisis of 2008," recalls Antonio Olivieri, partner and General Manager of the company, "was a clear dividing line in the history of HVL Color, founded only ten years earlier. Until then, our production was limited to meeting the demands of a small number of customers and remaining competitive thanks to reduced costs. When our customers turned to other suppliers to cope with the crisis, we found ourselves in difficulties. Therefore, we decided to change perspective by aiming at raising the quality of our production and by leveraging the relationship with our new customers, among the world

The headquarter of HVL Color in Casalmaggiore, Cremona (Italy).





Overview of the new powder coating installation designed and installed by Silvi Srl.

leaders in the HVAC sector, which have always believed in us and have supported us in this growth phase. The high technical specifications and quality performance levels required for the components we coated gave us the motivation to continuously improve over time. Once we achieved a good level of customer satisfaction, we thought of offering a complete service by integrating our production departments with assembly and packaging operating divisions. The resulting significant increase in our business volume then led us to reassess our whole plant structure, which we found inadequate in terms of performance and in need of an upgrade and possible replacement of older machines. This explains the huge intervention project that we started in 2018.”

The strategic improvement of coating equipment

HVL Color is currently equipped with two coating systems, a static semi-automatic and a fully automatic one, which was installed more recently. The semi-automatic line was revamped during the renewal project and it is now used for special processing and to treat oversized products with maximum dimensions of 6000x2000x2000 mm.

“About three years ago,” says Olivieri, “when we decided to install a pre-treatment plant on our coating line, we turned to Silvi Srl, a company specialising in the design and installation of surface treatment systems. It supplied us with a 3-stage machine with a built-

in drying station, which has enabled us to properly pre-treat and clean our components. This was also the starting point for developing the concept of our new coating line, which is now equipped with a 6-stage multi-metal pre-treatment plant. The cycle, designed by Chemetall, includes an alkaline stage at the beginning and a final nanotechnology passivation from the Oxilan range. Chemetall’s process enables us to treat a wide variety of materials, from iron to hot-dip galvanised and electro-galvanised steel, with excellent performance.”

Also as regards the coating application systems, HVL Color chose to continue working with the same provider as before, Gema Europe, which installed two booths – one in 2015 with Venturi application pumps and the other in December 2020 with the dense phase technology. Each booth includes a double manual post-retouching station and an automatic pre-retouching one, each of which is fitted with a robot provided by Lesta Srl, a company designing and building articulated robots specifically for coating applications.

“On the occasion of the purchase of our second booth, in the framework of the Industry 4.0-oriented reorganisation project that was concerning our whole production plant, we involved Gema Europe also in the revamping of our already-existing booth. The aim was integrating a last generation powder management system and interfacing it with the software package that controls our entire production flow. We took the opportunity to revise its casing and dimensions as well, thus complying with all safety standards,



Top left: The loading station.

Top right: The entry of the pretreatment tunnel (on the left), the drying oven (in the middle) and the curing oven (on the right).

The pretreatment tunnel is totally made of AISI 304 – 316 stainless steel with vertical pumps.

expanding it and making it harmonious with the other booth, also in order to create enough space to avoid the potentially dangerous proximity of operators to the robots during the pre-retouching phase. The overspray filtration system was also automated: both Gema booths can perform the automatic withdrawal of waste, which is conveyed to a big bag with a weighing system. This also gives us an accurate figure for powder coating waste, which we did not have before."

The new coating line built in record time

Silvi's team was responsible for the design and installation of the 6-stage spray pre-treatment tunnel, the coating plant (except for the two booths), the air-vein drying and curing ovens, and the switchboard. "We are very proud of the work done for HVL Color," states Silvi Srl owner Daniele Fumagalli, "not only in terms of quality and efficiency of the installed structure, which is totally made



of AISI 304 – 316 stainless steel, but also because the entire line was built in just one month's time, from 13 December 2019 to 13 January 2020, including masonry work and the dismantling of the previous installation: a record-breaking timeframe for any coating contractor."

The project also included the recovery of some parts of the old plant, such as the one-rail box-type conveyor built by Se.po. (Olginate, Lecco, Italy), which, thanks to a new towing unit, can now handle 150 load bars/hour with a pitch of 800 mm or 38 load bars/hour with a pitch of 3200 mm and a speed of 2 metres per minute. The pre-treatment tunnel includes the following stages:

- alkaline degreasing
- 2 rinsings with mains water
- rinsing with demineralised water
- nanotechnology passivation
- rinsing with demineralised water
- final blow-off.

"Both the drying and the curing ovens are equipped with a series of electric fans with inverted blades of our own design for heating air circulation," explains Fumagalli. "A plenum is located on the entire base of the oven for uniform distribution of hot air directly onto the workpieces to be dried. Suction adjustment is achieved through adjustable shutters placed on the bottom of the machine."



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The inside of the pretreatment tunnel.



Application of the powder coating with dense phase technology.

“The air diffusion and modulation systems developed by Silvi,” says Olivieri, “have proven highly efficient and practical. The pre-treatment tunnel is heated by a stainless steel-plate heat exchanger, which prevents the formation of scales through its direct exchange operation: after one year of operation, the machine is in fact completely free of them. For our curing oven, along with Silvi’s staff, we opted for the total recirculation, air-vein combustion technology with two 300,000 Kcal/h burners: a solution that definitively breaks with the past. The ovens’ air distribution system with no direct channelling to a single point, as was the case with the previous plant, guarantees uniform and adjustable air diffusion according to our needs. This is an advantage in terms of consumption, thanks to the guarantee of constant temperature.”

HVL Color’s Industry 4.0-oriented approach: perfect harmony between human and machine

“As happens in every company,” notes Olivieri, “when we started looking at the possibility of integrating robots into our production flow, we could sense the concern of our employees. Personally, I have never thought that an artificial mind and arm could replace human ones. Instead, I am convinced that the optimum is reached through their perfect harmony. Indeed, the number of booth operators has remained the same as when we were coating manually, but now they have more time to spend on process management and control, rather than on practical operations. The robots and, in general, the machines we have chosen to achieve an organisation 4.0 are self-managing: once trained, they continue their work unattended. That is not a minor benefit at a time of generalised

health risk such as this one, when it is possible that labour may be lacking for even long periods.”

Unlike some of its competitors, HVL Color has chosen to optimise its pre-retouching phase with Lesta articulated robots to avoid, where possible, having to intervene on the workpieces already coated by the reciprocator. “This is due to the type of parts we treat,” explains Olivieri. “They are mainly panels, whose inner edges are the most critical areas in terms of coating application. Moreover, the presence of a robot in the pre-retouching phase allows avoiding any human errors due to excessive coverage, which causes cosmetic defects such as build-up and dripping. Automatic application guarantees consistency and uniformity and, managed by a control PLC, it integrates seamlessly into the entire line’s system 4.0. Together with the commercial flexibility of Lesta, which offered us flexible purchase options, this was one of the factors that convinced us to invest in this automation intervention.”

HVL Color also invested heavily in its general management software. The whole production flow is digitalised, paperless and traceable, and outgoing material labelling and order scheduling have been implemented, with the ultimate goal of offering a perfect and efficient service to customers.

The flexibility of the application system

Not many coating contractors embrace both application technologies currently available on the market, i.e. Venturi pumps and dense phase. “Although these two systems are usually opposing,” says Olivieri, “for our production they are complementary. In case of emergency, we can use either one booth or the other without having to stop production, because they both have management software that can interface with our general software program.

We have implemented Gema’s dense phase application system OptiSpray AP01.1 with SIT technology (Smart Inline Technology) only recently and



One of the two powder centres by GEMA and, on the right, the articulated robot by Lesta for the pre-retouching installed at the entrance of the dense phase coating booth.



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The second powder coating booth equipped with traditional Venturi technology and a second articulated robot for the pre-retouching operations.

we are now starting to appreciate its excellent results in terms of finishing and consumption.

“The main difference we immediately noticed compared with the Venturi technology provided by the same company is the more uniform film distension all over the panels, which results in a completely different aesthetic outcome. In addition, dense phase pumps operate with a very low transport air flow, which guarantees optimal powder coverage and higher particle penetration capacity due to the absence of rebound effects. Certainly, dense phase pumps are ideal for treating large batches: the applied thickness differs by only a few microns from one spot to another of a panel. Better distension, in particular, jumps to the eye with glossy finishes, ensuring higher aesthetic yield.”

The team of a large-sized company

The last step of the quality leap that has enabled HVL Color to transition from a small business into a structured company was the search for new employees capable of coping with the innovations brought by this Industry 4.0-oriented revamping project. “We aim at becoming a large-sized contract coating company and, in





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order to do so, we need to choose the right people for the right roles. This is something that is usually tied to contingent needs, in small firms. HVL Color has strived to overcome this limitation and invest in qualified personnel not only at the top of the company's organisational chart, but also in its production departments. This factor has also contributed to improve the quality of our production in both the coating and the assembly and packaging departments, which has also been appreciated by our customer base. This, in turn, is growing so much that we plan to increase our work shifts from a 12-hour one to two 8-hour ones in the near future. We are among the few contractors to have a sales manager and a supply chain manager: this is also a choice made to improve quality and customer satisfaction. The areas dedicated to the production process are very large to ensure our customers storage service and flexible deliveries: we work on a 10,000 m² are, of which 5,500 m² are covered."

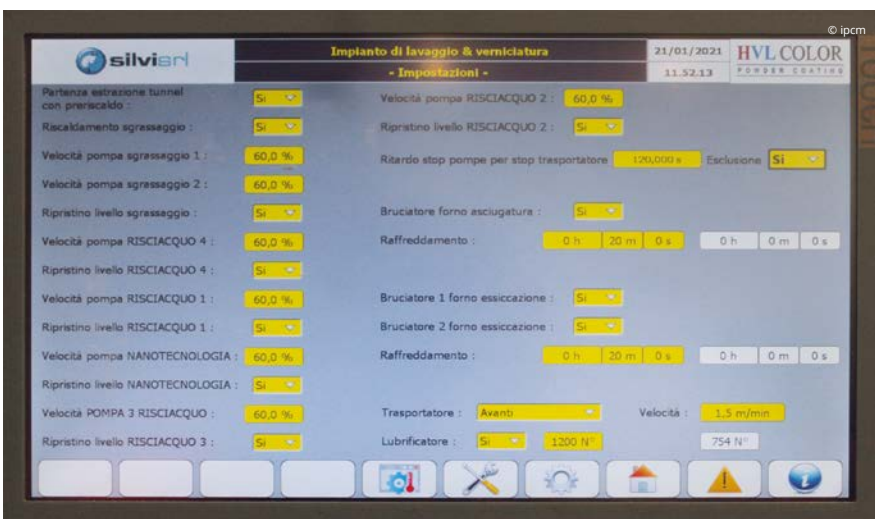
Growing together with its partners

The new coating line has increased HVL Color's throughput by 25% and reduced its defect rate from 4 to 1.3%. Consumption is





The dense phase pumps.



The PLC of the coating line.



Antonio Olivieri, partner and General Manager of HVL Color, with Daniele Fumagalli of Silvi.



Scan the code to view the timelapse of the plant's construction

similar that of the old system, despite the increase in the number of heat pumps from 3 to 6 and the installation of 3 thermal electric-power stations. "Thanks to the complete automation of the line, well-devised plant design, and the working teams created by both us and our partners," states Olivieri, "we can now offer to our customers not only optimal results – in our laboratory, we currently obtain salt spray resistance values of 720 hours for iron products, and even higher values for galvanised steel, HDG steel, electro-galvanised steel – but also the peace of mind guaranteed by a production line that never stops. During the early 2020 lockdown, we have been among the few companies in the sector that never stopped production within the limits imposed by the law to permitted activities: our customers who could continue working did not have to stop their business due to a missing key link in their supply chain. This was very important and the results obtained are proof of this: in 2020, HVL Color achieved record turnover since it has been in operation. "We have also been fortunate to be joined by several professional partners, ready to take immediate action either in person or remotely, no matter how small the problem may be. Their help has been fundamental to get here and their collaboration will be the lever to strengthen our presence not only in Italy, but also abroad, particularly in France, Switzerland, Austria, and Germany, where companies such as ours, designed to become contract coating hubs, are highly valued."