





Alumero: An Investment in the Coating Quality of Aluminium Profiles

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The biggest problem that many manufacturers from different sectors face when it comes to finishing, if it is outsourced, is related to quality consistency and to the possibility to obtain different quality levels for products with different intended uses. This is especially true in industries where surface treatment products and technologies evolve so rapidly that contractors do not always manage to keep pace with innovations and their related investments.

Let us consider the aluminium profile sector. With the banning of Chromium VI, the introduction of the REACH chemical substance monitoring register, and the increase in performance requirements, which more and more often must comply with the Qualicoat 2 specifications for architecture, keeping control over the quality of coated profiles is a challenge for the manufacturers that chose to entrust their finishing treatments to third parties (ref. Opening photo).



Figure 1: The new powder coating plant installed by Euroimpianti Srl of Valeggio sul Mincio (VR).

"In the last five years, we had found an increasing number of quality issues in our suppliers' coated parts," states Boris Šlamberger, the plant manager of Alumero d.o.o. This company, based in Bistrica (Slovenia) and belonging to the Austrian Group ALUMERO,

specialises in the design and construction of customised aluminium structures. "Such problems were due partly to the big changes occurred in the formulations of chemical products and powder coatings to meet the more restrictive environmental regulations, and partly to our difficulties in maintaining constant and timely control on the work of our providers. That is why in 2017 we decided to insource all our coating

activities, installing a technologically advanced horizontal line," says Šlamberger (Fig. 1). "Alumero's coating quality level is too important to accept even the slightest defects. We paint both profiles and sheets for doors, curtain walls, fences, and so on. Coating

aluminium sheet components, especially if intended for private homes, is even more difficult than treating profiles: they require the highest aesthetic quality level possible. For all these reasons, we decided to install

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Opening photo: Application of powder coatings on profiles at Alumero d.o.o of Bistrica (Slovenia).



Figure 2: In the wide range of Alumero's products, indoor and outdoor doors are very important.

a coating line able to ensure maximum quality: Euroimpianti, the Italian company we have chosen to support us in this insourcing project, did not make any compromise during the design phase. We can now safely state that the installed line was the best solution for our quality and production needs," says Boris Šlamberger. "The analysis, design and creation process of the final layout of Alumero's plant was very long and complex," states Dean Bassi, the East Europe sales manager of Euroimpianti. "We revised the initial project over twenty times, precisely because we were required to avoid any technical

compromise that could jeopardise quality. This was one of the most difficult plant design projects handled by Euroimpianti in the last few years. The final solution was the result of a precise joint work between the customer and the supplier. Alumero

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Figure 3: The 7-stage pre-treatment tunnel.

The Alumero Group

The Alumero Group is a complete partner for the design, development and production of aluminium structures: curtain walls and components, windows, outdoor doors, roofing systems, sunblinds, fences, and even profiles for furnishings and kitchens, for solar panels, and for the industry (Fig. 2).

Established in 1990 by Manfred Rosenstätter in Seeham (Austria) the Group now includes a branch in Poland, an

extrusion company in Helmond (Netherlands), and the branch of Bistrica (Slovenia), which has recently inaugurated the Group's first in-house coating line.

Alumero specialises in the machining of precision profiles with thicknesses down to 0.4 mm, cross sections up to 500 mm and lengths up to 15 m. In its four sites, it vertically integrates the whole profile production process: extrusion, machining, and coating, as well as the processing and painting of aluminium sheets intended for curtain wall doors and panels.

"The Bistrica plant coats the entire Group production," says Andreja Kurež, the

general manager assistant. "We receive extruded profiles from different suppliers and we machine them with 3, 4 and 5-axis CNC centres, weld them with various technologies, and assemble them. Assembly occurs after coating. Our customers are architects, construction companies, and final consumers."

Improving quality: an imperative for Alumero

The primary reason that lead Alumero to install a horizontal profile coating line was the need to improve its products' finishing quality and resistance levels. "After a careful assessment, we concluded that we had to invest in quality in order to grow on the European profile market," says Boris Šlamberger. "At the same time, we noticed that our contractors had not invested in new technologies for years: this prevented them from improving the quality of their surface treatments. Therefore, the only possible solution was insourcing our coating stage. The Slovenian plant was chosen to accommodate this new process phase."

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Inaugurated on October 19, 2017, this horizontal powder coating plant for aluminium profiles and sheets required an investment of almost 2 million Euros, aimed at enhancing the added value of the firm's products and completing its manufacturing process. “Buying a coating plant is not like buying a car: you must speak the same language as the supplier, carefully assess all the machines included in the line, and above all finding a partner that listens to your needs. Euroimpianti ticked all the boxes,” states Boris Šlamberger. “We required a tailor-made plant and wanted to actively contribute to its design, especially to verify that our requirements were always met and our goals always considered. The design phase lasted over a year: not many companies are willing to invest so much time on a potential customer.” “Once the goals were established accurately, Euroimpianti showed Alumero the way to reach them,” says Dean Bassi, “providing them with all the support possible.”



Figure 4: Entry of the pre-treatment tunnel.

“**Alumero required a tailor-made plant and wanted to actively contribute to its design, especially to verify that the requirements were always met and the goals always considered. The design phase lasted over a year.**”

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Plant features

Whereas the first requirement of the new plant was a high treatment quality level, the second one was flexibility: Alumero coats profiles with very different sizes and thicknesses, as well as plates and fences requiring different technical choices than profiles. “The spray pre-treatment tunnel was designed to easily achieve the Qualicoat 3 and GSB 3 certification levels. It currently includes 7 stages, but it is ready for the

introduction of a further stage in future to increase the line productivity (Fig. 3),” says Dean Bassi from Euroimpianti to describe the constructive characteristics of the plant. “The cycle uses chemicals provided by Alufinish GmbH and it includes the following stages (Fig. 4): acid attack, pre-cleaning, a rinse with mains water, two rinses with demineralised water, nebulisation of a chrome-free no-rinse passivating product, and nebulisation of demineralised water. The pre-treatment



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Figure 5: The power&free conveyor supplied by Futura Convogliatori Aerei of Robecco Pavese (Pavia, Italy).

plant also includes a demineralisation unit and a chemical-physical water treatment system for continuous discharge; this ensures constant concentration and pollution levels in the baths during plant operation, without changing the quality of the pre-treatment results."

The pre-treatment tunnel is followed by a blow-off station and a drying oven.

As for logistics, Alumero had initially chosen a one-rail conveyor. It then opted for a power&free one that could provide the line with greater productivity, flexibility and treatment accuracy. Futura Convogliatori Aerei developed this power&free conveyor in order

to strategically create several storage buffers, used for optimising the colour change times and, above all, ensuring

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maximum treatment quality for every workpiece during both pre-treatment and polymerisation (Fig. 5).

The colour change operation has an impact of 10 to 20 minutes on productivity, compensated for by two storage buffers

– one after the drying tunnel, also used for cooling the parts, and the other after the coating booth (Figs. 6 and 7). Another storage buffer is located inside the polymerisation oven to compensate for the different curing times of products (due to different sizes and thicknesses – Fig 8).

The coating booth is the machine with the highest colour change automation offered by Gema, featuring a conventional Venturi



Figure 6: The storage buffer before the coating booth.

application system and 10 automatic guns (Fig. 9). It is also equipped with two double pre- and post-retouching stations to ensure perfect coverage of workpieces with any shape (Fig. 10). The automatic guns are adjusted by the system management software, which changes the coating parameters depending on the input received during loading without any operator intervention. In theory, every load bar on the chain could be automatically coated with different parameters.

The polymerisation oven located afterwards features a powder gelling pre-chamber. "Instead of an oven dedicated solely to gelling, with consumption values sometimes almost equal to those of polymerisation ovens themselves, we chose to create a pre-chamber exploiting the energy recovered from the oven to gel the powder. Only one load bar at a time stays in this pre-chamber, in order to avoid any colour contamination between parts," explains Dean Bassi from Euroimpianti. "This design choice ensures minimum energy consumption for gelling the coating at almost zero cost." Alumero's production flow is based on the FIFO (First In-First Out) principle; therefore, the first part of a workpiece

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to enter the oven is also the first to leave it: this ensures uniformity of the polymerisation time for the whole length of each profile. "With a conventional U-shaped oven, on 6-7 metre long profiles there may be a polymerisation time difference of up to 1 minute," says Bassi. "The Z-shaped oven we installed in Alumero eliminates this problem. This is the only possible choice for a company seeking the highest level of finishing quality, since, as is well known, an excessive polymerisation time causes colour issues whereas too short a time creates film resistance problems."

A storage buffer located after the polymerisation oven is used to cool the parts and to completely empty the oven at the end of the work shift; once again, this ensures that the cycle meets the minimum or maximum polymerisation time requirements of each workpiece type.



Figure 7: A storage buffer is positioned after the powder application booth and before the polymerization oven.



Figure 8: A storage buffer is located inside the polymerization oven.

Fully automatic management

The plant is completely digitalised. During loading, the operator selects the complete treatment sequence for each hung part, choosing the type of pre-treatment, the colour of the coating to be applied, the operating parameters of the guns, and the polymerisation times (Fig. 11). In case a colour change is needed, the system management software commands the spray booth to stop the chain. After cleaning, the operator can restart production with the new colour. Thanks to the buffer created inside the polymerisation oven, the system ensures that there is no over- or under-polymerisation, even with parts requiring different process times. Again in order to achieve maximum treatment quality, the plant prevents any load bar to remain inside the pre-treatment tunnel at the end of a shift or in case of any sudden production interruptions. In the same way, the management system prevents any coating process to start on a load bar if there is not enough time for to complete at least the pre-treatment and drying stages.

A green field project

The new coating plant installed by Alumero's Slovenian branch belonged to a green field project: the company expanded its production site by building a new plant devoted only to coating. "The numerous

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Figure 9: The fast colour change coating booth, with the powder centre on the left, is equipped with 10 automatic guns, all supplied by Gema.



Figure 10: The booth is equipped with two double pre- and post-retouching stations.

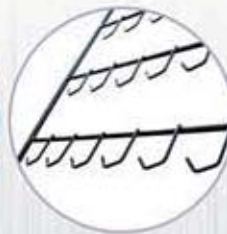
“ Instead of an oven dedicated solely to gelling, with consumption values sometimes almost equal to those of polymerisation ovens themselves, Alumero chose to create a pre-chamber exploiting the energy recovered from the oven to gel the powder. Only one load bar at a time stays in this pre-chamber, in order to avoid any colour contamination between parts. This design choice ensures minimum energy consumption for gelling the coating at almost zero cost.”



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systems described were located in a space perfectly designed for this purpose," states Dean Bassi. "Since this was in a new building, involving further costs for the company in addition to the technology investments, the challenge was to minimise the space needed to accommodate each machine, including the water treatment plant, the demineralisation unit, the compressors, and the quality control laboratory, as well as spaces for the internal and external logistics." "I wanted the new building hosting this plant to have the exactly necessary dimensions, no more and no less," states Boris Šlamberger, "also due to quality reasons: the less the space dispersion, the less the external contamination."

“The plant is completely digitalised. During loading, the operator selects the complete treatment sequence for each hung part, choosing the type of pre-treatment, the colour of the coating to be applied, the operating parameters of the guns, and the polymerisation times.”

The system has been in operation for a few months now. "Currently, we are using about 20% of the plant's production capacity, because we are still in the learning phase," says Šlamberger. "We are very pleased with the work of Euroimpianti. The plant meets all our quality

requirements and it is efficient in terms of environmental impact. In Slovenia, we have one of the most stringent legislations in Europe and controls are constant and frequent."

"Compliance with Slovenian regulations was a true "stress test" for this plant, but we are proud to say that we have passed it," states Dean Bassi, "especially because this is not a zero liquid discharge system: its water discharge is perfectly in line with the legal requirements."

"Euroimpianti supported us not only in terms of design, but also of plant management and operation," says Boris Šlamberger. "Their experience in terms of operating costs enabled us to make a very accurate comparison between different solutions and understand how different technological choices would have affected our investment and management costs." ○

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Figure 11: The loading area with the storage buffer before the pre-treatment tunnel.