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Opening photo: **Panoramic view of the vertical coating line of AluK Belgium.**

AluK: Revamping as a Technological Development Strategy

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"Revamping" is a term derived from the railway sector. It is used to indicate general renovation work on machines or systems to recondition and update them to state-of-the-art technology, thus extending their service life and improving their performance level while avoiding making higher investments for their sudden and unplanned replacement. The revamping solution is the ideal choice for companies that need to upgrade their production plants to maintain competitiveness but, at the same time, cannot cease operations for as long as necessary. Coating contractors are an example.

"The aluminium market puts a lot of pressure on firms as regards three key factors: lead time, price policy, and product quality. Indeed, these three elements qualify a supplier of aluminium systems for architecture," says Birger Vandevenne (**Fig. 1**), the Operations Manager of AluK Belgium and AluK Netherlands. "When AluK Belgium found itself having to update its coating system, we opted for a revamping project, planning a series of gradual investments that would not have forced us to stop our line for more than two consecutive months. For a company like AluK Belgium, serving the entire

Benelux market, it was unthinkable to stop for the six to eight months needed for the full replacement of a coating line. Until now, we have changed our two application booths together with SAT (Verona, Italy). In the future of our coating plant (**ref. Opening photo**), there will be other technological updating steps that we are already defining with SAT. The goal is to have a completely updated coating system within two years, without ever ceasing to provide our customers with our profile painting service."

From extruded profiles to door and window frames: a fully integrated cycle for the Benelux market

AluK Belgium was established in 2016 with Italian AluK Group's acquisition of a local Belgian company with four production plants in Europe (Great Britain, Belgium, Holland, and Poland). AluK had already acquired its British and Dutch factories in 2012 (the year in which AluK France was also established) and in 2014, respectively. The Group is now a global leader operating in major countries in Europe, the Middle East, and Asia. It has more than sixty years of experience in supplying systems for high-performance aluminium door and window frames and curtain walls for many of the most innovative and prestigious buildings in the world (**Fig. 2**).

The AluK Group's general strategy is making sure that each production site has its related coating unit. That is why, with the acquisition in Belgium, AluK also took over the coating contractor Colors in order to transform it into a paintshop at the exclusive service of its Belgian and Dutch offices and markets. "In October 2016, we started to reshape the operational model of AluK Belgium, which manufactures products and accessories for both the national and Dutch markets, as AluK Netherlands is a production and distribution hub for our roofing range", states Birger Vandevenne. "We receive extruded profiles from various European suppliers. Here, we process them, assemble them with thermal breaks and accessories, coat them, and prepare them for shipping. We have created a community of work groups within the AluK Group, each dedicated to a different production phase, which focus on the analysis of best practices for the whole group with a mutual exchange of knowledge and experience. In the past, each branch was much more focused on its own business, whereas now the goal is to create synergies and exchange know-how."

Figure 1: **Birger Vandevenne, Operations Manager of AluK Belgium and AluK Netherlands.**

"The aluminium market puts a lot of pressure on firms as regards three key factors: lead time, price policy, and product quality. Indeed, these three elements qualify a supplier of aluminium systems for architecture. When AluK Belgium found itself having to update its coating system, the company opted for a revamping project, planning a series of gradual investments that would not have forced it to stop the line for more than two consecutive months."

The first revamping phase: two cutting-edge booths

"Colors was a coating contractor in the aluminium sector with a three times higher production volume than that of AluK Belgium. This firm had four coating lines: an automatic vertical one, an automatic horizontal one, an express one, and a line finishing accessories. Aware that its volumes would have been too low to feed all these lines, AluK's first intervention was dismantling two of them, the express one and the one devoted to accessories. The strategic goal was having a paintshop that only met the internal needs of AluK, without any room for contracting," says Vandevenne. "In 2017 and early 2018, we remodelled the operational flow here, increased our stock, and decided to start a renovation project in which the coating line played a crucial role. We chose SAT as our partner in this revamping project because

Figure 2: **AluK has more than sixty years of experience in supplying systems for high-performance aluminium door and window frames and curtain walls.**

"The plant was already equipped with two booths that operated simultaneously," says Corrà. "We maintained the previous spraying equipment, which had been recently renovated. It includes an Opticenter OC03 powder management unit with Gema AP01 dense phase pumps (**Fig. 4**) and 18 guns for each booth. However, thanks to technical support and excellent coordination with Inplasco, the Gema distributor for Belgium, it was possible to optimise the guns' arrangement while adapting it to the new booths. Indeed, we implemented a configuration that allows maintaining a high line speed even when coating complex-shaped profiles (**Fig. 5**)."

"Until now, AluK Belgium has changed two application booths together with SAT (Verona, Italy). In the future of its coating plant, there will be other technological updating steps that it is already defining with SAT. The goal is to have a completely updated coating system within two years, without ever ceasing to provide the customers with an profile painting service."

some of my colleagues, who already worked for Colors with the previous owners, knew this company well. In 2012, it had actually installed a SAT-patented revolving door on our curing oven, thus enabling to turn off the IR pre-gelling oven and guaranteeing considerable energy saving."
"For this revamping project, we supplied two new generation booths that implement a different application technology, with the guns arranged at the two sides (**Fig. 3**)," says SAT General Manager Alessandro Corrà. "The two booths installed are characterised by the V shape that distinguishes the SAT technology and they are bigger than the standard machines in order to accommodate a greater number of guns and profiles with a larger section. In addition to the booths, we also replaced the reciprocators, the cyclone, and the final filter, thus completely changing this customer's powder coating system."

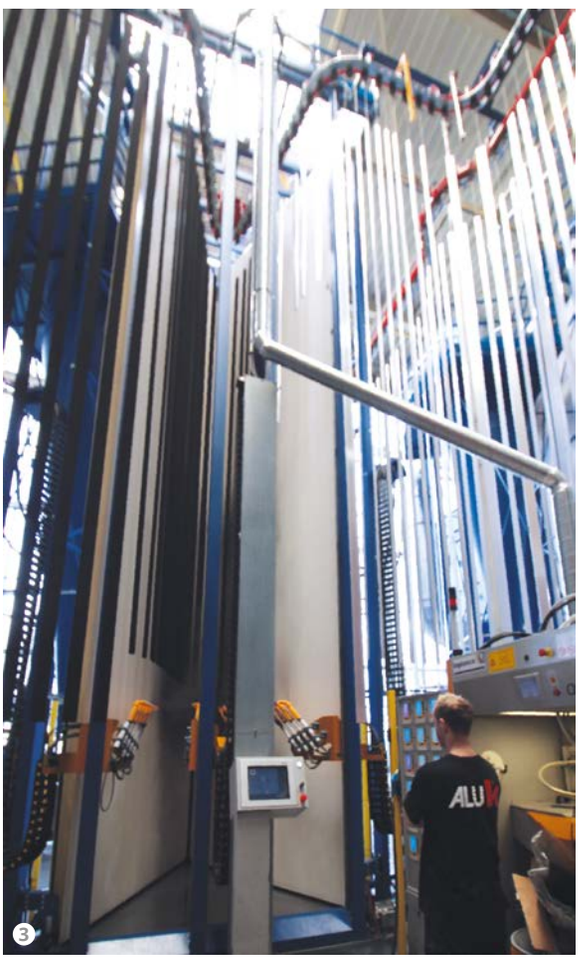

Figure 3: **The two new booths supplied by SAT implement a new generation technology, with the guns arranged at the two sides.**

"We opted for SAT's V-shaped booths with these features because, although the total coating volume had decreased, the variability of profiles and colours had remained the same. We therefore needed to perform more colour changes within the same time," states Birger Vandevenne. "The biggest advantage we have achieved with this revamping project is the possibility to apply black and white coatings one after the other in the same booth. With the previous plant layout, one booth only applied dark tints and the other light tints only. However, there is a great disproportion between the demands for the two shades in the Benelux market, as about 70% of orders require dark colours, and therefore production organisation was complex and inefficient."

"AluK's first intervention was dismantling two of its lines, the express one and the one devoted to accessories. The strategic goal was having a paintshop that only met the internal needs of AluK, without any room for contracting."

Higher quality, higher productivity

"The two new booths only came into operation in mid-February, but we have already found greater paint penetration, greater general quality of the coatings, higher profile density along the line thanks to the smaller average hanging pitch, and, as a result, increased productivity with the same chain speed (**Fig. 6**). 80% of the complex-section profiles that we used to paint on the horizontal line (as it was equipped with a touch-up station) are now automatically coated on the vertical system. This will soon enable us to also dismantle our horizontal line, concentrating our whole production on the vertical one (**Fig. 7**)," says AluK Belgium Maintenance Coordinator Kurt Passemiers. "Moreover, the cleaning cycle is much shorter than before: reducing our colour changing times was one of the main objectives of this revamping intervention, because we had to increase the total number of daily colour change operations. The cleaning process can surely be further optimised, but we have already

Figure 4: **The Opticenter OC03 powder management unit with Gema AP01 dense phase pumps.**

Figure 5: **Each booth has 18 guns, implemented with a configuration that allows maintaining a high line speed even when coating complex-shaped profiles.**

"In 2017 and early 2018, AluK remodelled the operational flow, increased the stock, and decided to start a renovation project in which the coating line played a crucial role. The company chose SAT as its partner in this revamping project because some of colleagues knew this company well. In 2012, it had actually installed a SAT-patented revolving door on the curing oven, thus enabling to turn off the IR pre-gelling oven and guaranteeing considerable energy saving."

observed a marked decrease in the required times. Finally, we also expect to find a reduction in our consumption of powders, although we cannot quantify it yet because the booths went into production only a few weeks ago and we are still adjusting our spray parameters to the new and more efficient technology.

"Having the possibility to apply any colour in any booth, we had decided to start with a prudent approach and wait a few minutes from the beginning of the application of each colour before switching to "recovery" mode. However, we verified that there were no contamination problems with neither the new booths nor the new cyclones, and therefore we have already minimised or even eliminated this delay in switching modes. This resulted in a further reduction of our powder consumption. In general, I can state that all objectives presented to SAT have been or are in the process of being achieved."

"In the first four weeks of production, we performed an average of 18 colour change operations per day. In the past, we had to stop at 10-11, whereas our goal is reaching 20-21 changes in a work shift (7 hours and 40 minutes) and a daily productivity of 3000-3100 m^2; this equals to about 2000 profiles/day, 85% of which with a length of 6.5 metres, 10% with a length of 7 metres, plus a 5% of various lenght" says Birger Vandevenne. "When discussing our revamping needs with SAT, we had asked them to reduce our 18-minute colour changing time. Now, our total cleaning time is 10-11 minutes, with a reduction of almost 50%. We aim at reducing it to 8 minutes."

"Our work environment is very clean, proving that the booths' air suction system is excellent, whereas it was a critical issue with our previous plants," explains AluK Belgium Quality

Officer Timo De Clercq. "There is no contamination or powder dispersion, even when we are coating in both booths. When we started coating with the same parameters used in the past, we immediately noticed that the applied thicknesses were higher, i.e. our powder transfer efficiency was greater thanks to the new booths, all other conditions being equal. The higher the transfer efficiency, the greater the amount of fresh powder compared with the recovered one in the application mix and, therefore, in the deposited powder layer – and, as is well known, the use of recovered powder is always a critical issue. As for quality, we expected greater edge coverage: the fact that now we can also coat profiles that previously required a manual application process proves that we have achieved this goal." As further proof of their excellent performance level and, in particular, of the advantages of the their "dynamic" suction system, able to adapt to operating conditions, the two V-shaped booths are arranged in a particular way within the factory: they are placed side by side without any separation barriers or containment structures and they are located in front of a glass window, which remains perfectly clean (**Fig. 8**).

"AluK opted for SAT's V-shaped booths with these features because, although the total coating volume had decreased, the variability of profiles and colours had remained the same. It therefore needed to perform more colour changes within the same time. The biggest advantage the company has achieved with this revamping project is the possibility to apply black and white coatings one after the other in the same booth."

Figure 6: Among the benefits of the new booths, besides a greater general quality of the coatings, a higher hanging density with the same chain speed.

Figure 7:
The vertical line allows to coat also complex-section profiles, that before were coated using the horizontal line, as it was equipped with a touch-up station.

Figure 8:
The two booths are placed side by side without any separation and they are located in front of a glass window, which remains perfectly clean thanks to the "dynamic" suction system.

“The two new booths only came into operation in mid-February, but AluK has already found greater paint penetration, greater general quality of the coatings, higher profile density along the line thanks to the smaller average hanging pitch, and, as a result, increased productivity with the same chain speed.”

“Another change brought by the new booths concerns production planning,” says AluK Belgium Production Supervisor Evelien D’Hauwer. “For example, we can now apply a dark colour on a large-sized batch in the booth no. 1 while applying other tints on several small batches in the booth no. 2, without ever changing colour in the first one. Compared with the past, when the minimum batch size had to be 120 m^2 to ensure efficiency, today we can plan the coating of very small, even one-piece batches without losing productivity and efficiency.” “In order to be a qualified player in the aluminium sector, a company must be able to offer any colour required by the market. We tried to channel customer requests into a limited colour catalogue, but we were not successful,” says Vandevenne. “That is why AluK Belgium chose to update its coating line based on technical choices oriented towards market demands. We adapted our system to the market and not the other way around. However, we still offer an 11-tint colour catalogue that we have developed exclusively with Axalta, our main supplier together with Tiger Coatings (**Fig. 9**).”

Technical and aesthetic trends in the Belgian and Dutch aluminium markets

“We only use Qualicoat 1. We have encountered two operational problems with Qualicoat 2 products. The first one is the oven temperature, which must always be adjusted differently than for the other types of paint.
The second one is greater film damage around the thermal break when this is assembled after profile coating,” says Vandevenne. “Currently,

“The major difficulty of a revamping operation is that the plant must be modernised and then immediately restarted in production conditions, which are supposed to be better than the previous ones. AluK is pleased with the collaboration of SAT. Its engineers coordinated the construction site in such a way as to meet the delivery deadlines.”

Figure 9: AluK Belgium offers an 11-tint colour catalogue oriented towards dark shades in the range of greys and blacks, according to the market trends of Benelux.

65% of our profiles are assembled with thermal break after coating. We are working on introducing a new thermal cutting material to change this proportion, but currently using Qualicoat 2 powders appear to be difficult for us. I think that we will start using them when it will be possible to do so without changing all our coating parameters. Surely, these powders are an advantage for users, because they extend the guarantee of durability with a modest price change. There is much space in the market, but as applicators we should be able to use these products without having to continuously adjust operating parameters such as line speed, curing temperature, and so on,” states Vandevenne. “In terms of colours, as I already mentioned, the Benelux market is strongly oriented towards dark shades in the range of greys and blacks, with a few browns, and towards textured surfaces.”

Experience and collaboration to manage the critical issues of this revamping project

“The major difficulty of a revamping operation is that the plant must be modernised and then immediately restarted in production conditions, which are supposed to be better than the previous ones,” says Kurt Passemiers. “We are pleased with the collaboration of SAT. Its engineers coordinated the construction site in such a way as to meet the delivery deadlines. We had planned to end in early December and enter full production by the third week of February. An AluK team conducted the first dismantling phase of the old booths in the second half of December; on January 4th, the SAT team took over to install the new booths. The first sample profiles were hung on February 14th and on February 20th we entered regular production, i.e. two days in advance of the set date.”