

A coating system using nitrogen for finishing frames

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Introduction

We have already reported the results obtained with the adoption of the new coating system using nitrogen in the finishing divisions of CFZ (Friul Intagli group), for coating profiles and moldings (VdL 152/2007).

We have seen the system working also at an important company in the field of frame making, which is involved in international markets.

The system promoted, industrialised and commercialised in our sector by Cancellier Dino Impianti di Verniciatura in Brugnera (PN, Italy), is known by the name of *Nitrothermospray*.



1 – Inside of the drying tunnel for the frames.

The nitrogen line

The manufacturer of frames (windows and doors) that we visited, coats all the pieces produced on its lines. It has 2 different coating lines, one for windows (fig. 1) and another for doors (panels). All the components are coated with waterborne products. As far as products for the

2 – The main module of the *Nitrothermospray* system (Cancellier Dino Impianti di Verniciatura). The nitrogen is produced in continuation through the selective permeation of the air through hollow fiber membranes.





with nitrogen is employed in the outdoors line, where the top coat is sprayed on.

In traditional systems, the coating is transported to the gun and pulverised, coming out of the nozzle, with low or high pressure filtered compressed air (according to the type of product applied and other requirements of a technical or aesthetic nature).

This new system, however, uses 99.5% pure nitrogen as a vector fluid, obtained by selective permeation of the air through hollow fibre membranes.

This is a modular system, so the arrangement of each machine grows in relation to the number of sprayguns that you want to control, starting with the single gun up to a maximum of 8 delivering at the same time, in the event that you have to feed more lines or automated machines (figs. 2, 3 and 4).

The technology – we were told during our visit – was proposed by the technicians of Cancellier in a meeting where the benefits were analysed when applied to the usual frame coating process. A process that is well-known today, which has some

3 – The nitrogen tank absorbs the variations in the requirements of the guns.

outdoors are concerned (especially windows), the changeover of technology was decided back in the 1990's and has revolutionised the protection and finishing technologies of the woodworking for the outdoors throughout the whole of Europe. Also the line for doors uses a low environmental impact cycle, from the paints (applied with a rotary coating machine)

to the roller UV acrylic primer, to the waterborne finish with curtain coating.

The main supplier to the company we visited is Renner, which makes its labs available also for the periodic durability tests of its finished supports. For interiors, the waterborne products are supplied by a small local company.

The application system

4 – An important optional.



recurrent problems that all frame manufacturers have to deal with, and which later on are reported in the experiences gained with the nitrogen process.

Cancellier was willing to carry out industrial tests in the work environment, something judged to be very important both for the supplier as well as the user. The same technicians of Cancellier were interested in checking the nitrogen system in a typical application for a frame: the nitrogen system has already been used in coating other types of items (moldings, for example, as mentioned earlier), but a waterborne coating cycle for the outdoors has a specific character, both because of the nature of the products applied (they are high viscosity and high molecular weight systems), and also because of the amounts used (a large thickness and a marked "verticality" are required).

The finish cycle

The finish cycle for frames is by now considered a "classic":

- impregnation
- application of the primer
- application of 1 or 2



5 - The *Top Spray* module: it heats the nitrogen and helps further improve the formation of the film.

coats of top coat, or also more in the case of lacquered frames, applied with the electrostatic system.

After a test period of about 2 months the company decided to buy the *Nitrothermospray* system (figs. 5 and 6).

The results

The nitrogen system has been assisting the appli-

cation of the top coat since April 2006. The process of evaluating the technology – those in charge of frame production emphasised – is quite complex. The company has an endless range of colours, so to carry out tests and arrive at conclusions is really not easy.

In any event, the first and extremely important result, which can be seen with the naked

6 – The unit for the electrostatic application of the coatings, inside the insulated cage.



eye, is the considerable improvement in the transparency and even spread of the film that has been applied. In this case, it is sufficient to compare two pieces, one coated with a traditional system and the other with the nitrogen system, and the difference can be clearly seen.

A microscopic analysis of the hardened film shows up the very low presence of the classic microscopic air bubbles that form and remain entrapped when the film is forming. This is a very important characteristic, not just for improving the appearance but also because it improves the strength of the film. The presence of air in the dry film can eventually over time lead to the film itself breaking, compromising the durability of the fixture itself.

The first comparative tests carried out at the coating supplier's labs showed a drop over 50% in the air inside the film (but of course to reach a complete solution to the problem other factors have also to be resolved: wood by nature contains a certain amount of air).

This considerable reduction, in any event, gives you a film that is

more transparent and smoother, and which has a more even covering: a result that even by itself – which is the user's opinion – justifies the cost of the equipment, which is actually quite low.

Another advantage that those responsible for the making of the frames noticed was the amount of product that is applied. To obtain the best results, which are long-lasting, normally 300 μm of product is applied, with more than one coat. The nitrogen system lets you have thicknesses of up to 500 μm with just a single coat, without sagging. The possibility of applying large thicknesses of coating is without doubt a significant advantage for this type of application.

The production in the case in question is vast and incredibly complex; colours are changed even ten times a day, and pieces very different to each other are coated. In time also the economic benefits of the system can be assessed, for example the reduction in the time needed to clean the booth.

Currently, the benefits that were intended to be evaluated and which have been observed concern the quality of

the finish and the potentiality for future development of the nitrogen system: this technology provides the opportunity for exploiting future developments in coatings. For example, there are systems with a very high solid content, aimed at eliminating the intermediate sanding stages, so as to finally arrive at a complete in-line process for the frame, with the automated application of just two coats of top coat: a simplification of the cycles that would provide a decisive improvement in the efficiency of the process, and a huge improvement in competitiveness.

Conclusions

In conclusion, after just under a year of use – which is the conclusion of the user – there is already satisfaction with the decision made, both for the benefits obtained and for future potential developments.

The installation of the nitrogen system has not involved any modifications to the machinery. The old airless and airmix guns were replaced.

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