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Opening picture: The vertical plant in operation.



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SPECIAL ALUMINIUM



Chromium-Free Pretreatment at ELVIAL. A Review of 18 Successful Years

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Even as early as the 1990s, Alufinish developed the first chromium-free ENVIROX pretreatment systems which were successfully approved by the GSB International and Qualicoat quality communities. One of the earliest practical applications

in Europe was at the ELVIAL company in Kilkis, Greece in 2000. ELVIAL is one of the leading aluminium extruders and finishers in Greece who develop, manufacture and market coated systems for a wide variety of architectural requirements as also industrial purposes. The company's

success story started in 1990 as a manufacturer of profiles for the industrial sector. Production is now carried out on three aluminium presses with an annual capacity of more than 25,000 tonnes. Thanks to continuous advancement, plant modernisation and automation with



Figure 1: The new production site of ELVIAL, built in 2005 in Kilkis (Greece).

robotic systems, the company is today able to fulfil even the most individual wishes of their customers. Besides extrusion lines, ELVIAL currently operate two coating lines (one horizontal and one vertical unit), both Qualicoat-Seaside class certified.

The first chromium-free application using Alufinish products was implemented in a horizontal spray unit at the former production site in Kilkis. The Alufinish products used at the time were a simple combination of alkaline pickling and degreasing solution (Alfinal 273 – Alfisid 12), acidic pickling bath (Alfideox 74), and chromium-free pretreatment (Alficoat 748/3) (Table 1). This plant is still in operation.

Process	Products
Alkaline cleaning and pickling + rinsing	Alfinal 273 – Alfisid 12 + circular spraying nozzle, process water
Rinsing	Process water
Acidic pickling + rinsing	Alfideox 74 + circular spraying nozzle, process water
Rinsing	Demineralised water
Chromium-free pre-treatment, no-rinse	Alficoat 748/3 (ENVIROX NR process)
Draining and drying	

Table 1 - The first chromium-free application using Alufinish products, implemented in a horizontal spray unit at the former production site of ELVIAL.

From the start in 2000, excellent coating results were achieved with this process. At the same time, Alufinish had the opportunity to gather valuable experience in dealing with the still new chromium-free technology. Based on their successful achievements with Alficoat 748/3, it was hardly surprising that ELVIAL again relied on this technology when building their new production location in 2005 (Fig. 1).

The facilities that have since been built on the almost 40-acre site owned by the company include modern, vertical pre-treatment plant with surge technology in addition to robot-controlled transportation engineering and a large profile warehouse. The vertical line is made completely of 316 stainless steel. It is designed in tunnel form, has 12 process stages (Fig. 2) and is capable of pretreating around 15 tonnes of aluminium profiles per shift.



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The pretreated goods leave the long tunnel after the chromium-free pretreatment and are then dried in the retained water drier. This vertical installation is designed to allow maximum flexibility and currently has three acidic process stages. Cleaning and pickling are carried out simultaneously in zone 1 using Alfideox 74 and Alfsid 14. In zone 4, the same Alfideox product is used again for acidic post-pickling. The two-component product consists of Alfideox 74 – a pickling component with fluoride content – and the cleaning intensifier Alfsid 14. This method is particularly interesting whenever it is necessary to remove thicker oxide layers. Instead of having to implement the requirement in a single zone, entailing a high consumption of chemicals, the necessary removal of the oxide layer has been divided between the two zones. In the event that the cleaning efficiency in the first processing step is inadequate, the option is provided to intensify the cleaning performance in zone 4 by the addition of Alfsid 14.

However, this variant is usually only needed for material which has been contaminated with oil and is not generally necessary. Further to that, in order to have the ability to speed up the line without losing the etching rate the system provides another acidic process stage in zone 8 in ambient temperature this time. In theory, the entire line could also be operated with an alkaline pickling and degreasing step in zone 1 and one or two acidic pickling steps in zone 4 and/or 8. At least two rinsing stages between the processing steps were planned by the plant manufacturer, ensuring sufficient rinsing efficiency, even in different operating modes. The combined alkaline pickling and degreasing (Alfinal 276 and Alfsid 12, for instance, would be conceivable) and acidic pickling pretreatment (Alfideox) enable optimum cleaning and pickling as they remove residues that are soluble in both alkaline and acidic solutions.

“After 13 years of operation, the chromium-free ENVIROX NR process (Alficoat 748/3) is fully established in the vertical line at ELVIAL and provides the consistently high level of surface quality demanded by customers. More than 80,000 tonnes of aluminium have been treated in this installation to date. So, in the case of ELVIAL, one could definitely speak of a chromium-free model for success.”

ELVIAL are currently operating the line solely with acidic processing stages and achieve the required surface qualities in this way. The chromium-free ENVIROX NR implemented here is a single-component no-rinse system that requires no downstream rinsing steps

conducted at the coastal location of Hoek van Holland. Alficoat 748/3 generates colourless corrosion protection layers with titanium content which can be established, both on a quantitative as well as a qualitative level, by means of photometric layer determination and rapid test (staining). At ELVIAL, the product functions in a concentration range of just 4 – 6 g/l and is consequently very economical. Besides this, the continuous partial replacement of the bath solution also warrants consistent processing conditions and a guaranteed pre-treatment quality. In the vertical line (see opening picture), the goods are treated by the surge method. In this case, pumps deliver the relevant process solution upwards into a surge box from which it flows down over the goods in a constant liquid film (surge), thus performing the pretreatment. The surge boxes are variable and can be adapted to the relevant profile sizes. Now, after 13 years of operation, the chromium-free ENVIROX NR process

(Alficoat 748/3) is fully established in the vertical line at ELVIAL and provides the consistently high level of surface quality demanded by customers. More than 80,000 tonnes of aluminium have been treated in this installation to date. So, in the case of ELVIAL, one could definitely speak of a chromium-free model for success. Thanks to flexible plant technology, established from the very beginning, the company is also well equipped for the future and follows the new trends.

A further anodizing process for pre-anodization and chromium-free methods is under construction. The innovative method from ELVIAL, allows to pretreat the profiles with a flash oxide layer (between 3 and 8 microns) ensuring that the aluminium and the coated layer are excellently protected from corrosion. A fully automated and technology advanced process that performs all the steps on the same line. ○

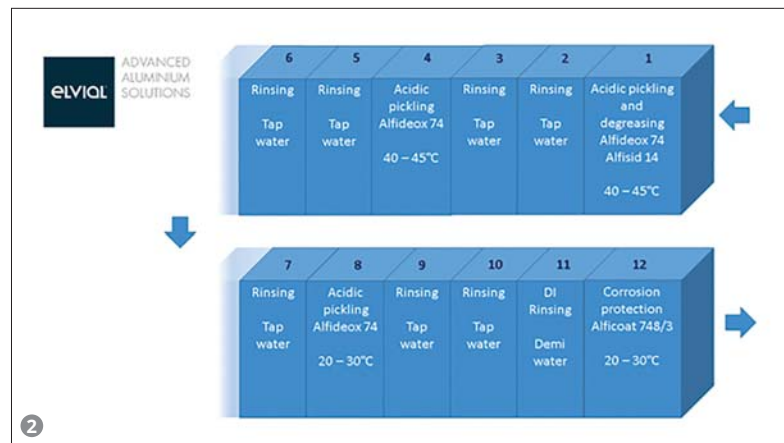


Figure 2: Schematic diagram of vertical line with surge pre-treatment (Zones 1 – 12 are actually located in a linear tunnel).

at all. Despite this, the option is provided to perform posttreatment by means of a water spray unit. The product used is Alficoat 748/3 which has attained all the necessary approvals of the Qualicoat and GSB International quality communities and has also been certified since the beginning of the millennium. The product has also passed the GSB International 10-year outdoor weathering test which was successfully