The drying racks in different colours for which Gimi is famous all over the world.

FOCUS ON TECHNOLOGY

Effective Passivation at Room Temperature: The Pre-Treatment Innovation that Convinced Gimi

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FHP Monselice – Freudenberg Household Products, former Gimi Spa, a long-established household goods manufacturer, was one of the first firms to use the nano ceramic surface conversion products developed by DN Chemicals. The aim was providing excellent paint adhesion performance, good anti-corrosion performance, and low sludge production, while working at room temperature for the entire process.

A segment of the conveyor.

Drying racks are among the most commonly used everyday items: a simple object created a long time ago as a practical solution for hanging laundry, first outdoors and then indoors in homes with increasingly small areas and no outdoor spaces or with limited terraces and balconies – and, precisely because of these dual characteristics, not easy to manufacture.

Gaudenzio Preti, the Engineering Manager of the company, which is a long-established producer and distributor of household products, confirms it: "Clothes drying racks have always been considered outdoor products, although their industrial differentiation has led to the development of different solutions. We distinguish between outdoor and indoor racks, but the latter, although designed for indoor use, must still guarantee a five-year outdoors use without corroding." This has an impact on the choice of the most suitable materials and coatings.

"Gimi's drying racks are made of mild steel, with a few exceptions made of stainless steel or aluminium and some accessories made of plastic. These products need to be able to withstand a high moisture degree due to continuous contact with wet clothes, so perfect adhesion of the powder coating to the substrate is essential. This explains why we turned to DN Chemicals, a Group specialising in the provision of surface pre-treatment solutions, which is already a supplier to other Freudenberg's divisions. We urgently needed a solution for the pre-treatment of steel that would guarantee higher paint adhesion and, at the same time, simplify the management of our process and the maintenance of tanks by reducing sludge formation."

Gimi, a brand that is present in every home

"Want to bet we're already in your house?" was the claim of Gimi's advertising campaign a few years ago – a bet certainly won by this firm based in Monselice (Padua, Italy), given its brand's worldwide

The pre-treatment tunnel.

Different components entering the pre-treatment tunnel.

reputation and staggering figures, thanks to its million drying racks produced per year. "Our company was founded in 1970 and it quickly established itself in the household product sector," explains Preti. "The turning point came in 2016, when Gimi was acquired by German Group Freudenberg, whose Home&Cleaning division, of which we are a part, has 16 plants worldwide." The acquisition by Freudenberg brought about a radical change in both Gimi's production management and sales target. "Earlier, Gimi manufactured about 1,600 different items, which were becoming increasingly unmanageable in terms of production. Fortunately, we were able to reduce them to 'only' 400."

A never-changing product with an ever-changing structure

Drying racks have remained unchanged since they have been devised. "The materials with which they are made have changed and, in the course of their industrial development, they have been joined by electrical devices such as dryers, but no product has ever been able to replace them completely. Today, we can see them in the most diverse forms and structures: from the most common, traditional floor-standing ones to the extendable, balcony, tower, vertical, and garden ones, with one or more levels." In the Monselice plant, production starts with the steel coils from which tubes are profiled and then welded and cut. "One of the added values of our production is the in-house processing of around 380 km of tubes per day. The convergence of these two production lines creates semi-finished products, which, once loaded onto the conveyor, travel along a 3,8 km-long loop through the cleaning, coating and assembly departments."

Finding the most effective pre-treatment solution

The difficulties faced regarding the adhesion of powders to the tubes' surfaces were the main reason that pushed Gimi to look for a new pre-treatment solution. "We want to provide our customers with objects that are impeccable in terms of corrosion resistance as well," states Preti. "We are aware that our products feature a few critical areas in terms of paint adhesion, such as the holes we use to hang the semi-finished products onto the conveyor's racks and the tubes' joints. Indeed, in order to check our paint adhesion performance, we carry out rigorous tests in a humidistat and a salt spray chamber: it was during these tests that we realised that the results could be improved. Out of the suppliers which established a partnership with Freudenberg, we chose DN Chemicals, as it was already operative in the plant in Mombello Monferrato (province of Alessandria). Their innovative products convinced us not only because they achieved perfect adhesion results in our tests, but also because they guaranteed a process that was considerably more sustainable than our previous one, as well as facilitating system maintenance and reducing operating costs."

"Our old pre-treatment plant," indicates Gimi coating department manager Michele Melloni, "included a metal phosphating operation. Due to our high production volumes, this created a huge amount of sludge to be disposed of from our tanks of about 35,000 litres and required high energy consumption. Thanks to the solution offered by DN Chemicals, we now use a degreasing

The outside of the pre-treatment tunnel.

Workpieces drying after pre-treatment

One of the coating booths with a Lesta articulated robot.

process with a mixture of surfactant products operating at room temperature, thus avoiding the formation of foam. The process then includes a rinsing phase in mains water and a conversion phase based on zirconium salts to prevent oxidation."

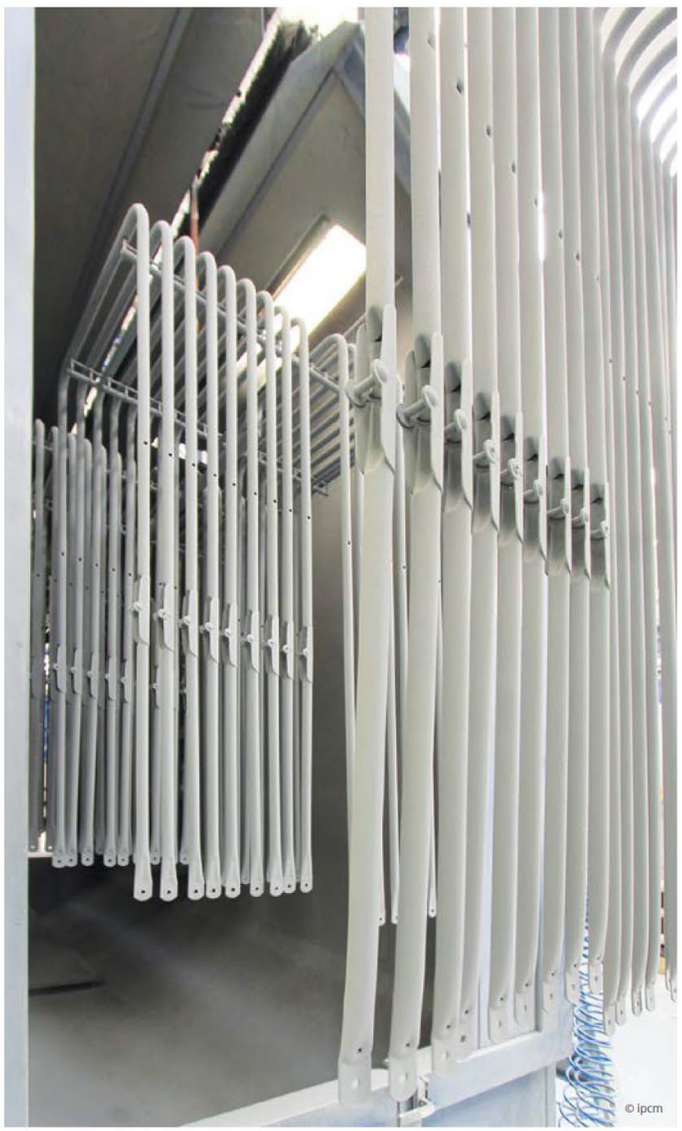
"The product supplied is called Dollcoat ZR 114 and it falls into the category of nano ceramics," notes DN Chemicals sales executive Roberto Rebuffo. "Gimi was one of the first companies to use this particular product, which has the advantage that it can be used at room temperature. The potential of this innovative technology is interesting especially for surfaces that are not heavily contaminated by oils, calamine, and other difficult-to-remove pollutants, as is the case here. This innovation will certainly see further important developments in future, especially if used in conjunction with surfactants to be added to the degreasing solutions that provide excellent performance at temperatures above 15 °C."

The advantages of the new pre-treatment technology

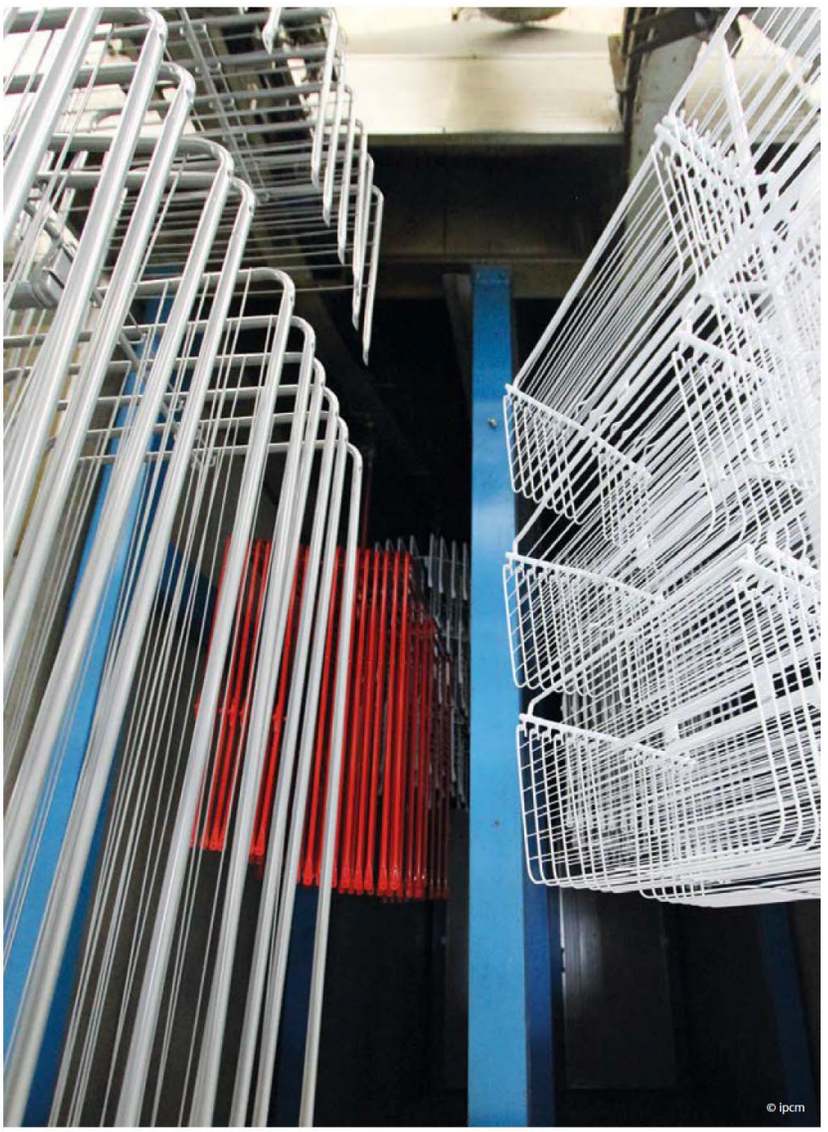
"Already four years ago," says Melloni, "we abandoned phosphodegreasing. Thanks to this nanotechnology pre-treatment process, we have now been able to reduce energy consumption in this delicate production stage while obtaining higher quality results. This is proven by our salt spray tests, where we achieve 200-hour values, the 50% reduction in sludge production, which avoids frequent change over of our sedimentation tanks, and the extension of our pre-treatment baths' service life from 6 to 12 months. This, in turn, reflects on the system's maintenance, which has become less frequent and easier to manage.

"A further energy-saving step has been taken with the introduction of nano ceramic passivating products, which guarantee excellent performance while operating at room temperature. Finally, in order to

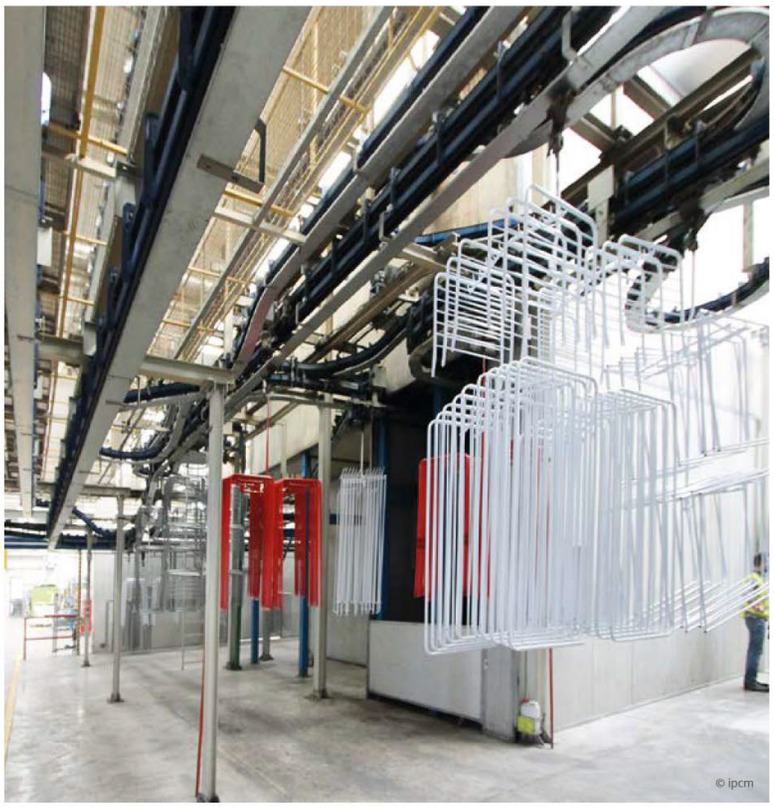
optimise waste water management, about four months ago we installed a filter press supplied by Water Energy (San Pietro in Casale, Bologna, Italy), a company specialising in water treatment solutions with which we have worked for a long time."
"It is a fully automated solution designed to keep the phospho degreasing bath continuously filtered during the working activity," explains Water Energy owner Tommaso Ponara, "while, at the same time, enabling to perform one-off filtering operations on the entire waste water volume to keep it perfectly purified. The semi-automatic system provides for the automatic forward and backward movement of the hydraulic cylinder by means of a hydraulic control unit and control panel. Opening and emptying is controlled by the electrical control panel in both automatic and semi-automatic modes.
"During daily operation, the pre-set waste water flow is constantly filtered and then returned to the treatment tunnel. In this way, most of the sludge created during the work cycle is immediately removed from the phospho degreasing bath. Then, at the weekend, a pump is activated to transfer the entire waste water volume into a suitably sized, truncated cone-shaped tank from which, after a certain period, the liquid is returned to the bath through the filter press. The residual sludge in the conical part of the tank is then also removed. The final filtration stage is controlled by the differential pressure switch. The safety guards consist of photoelectric curtains applied on both sides of the operating area."



Frames exiting one of the 5 one-colour booths.

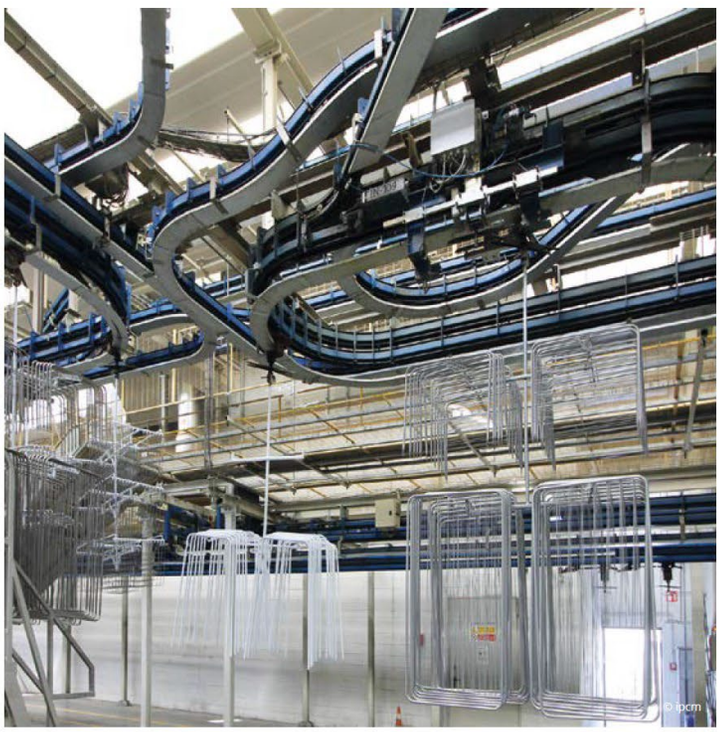


The curing oven.



Handling of parts along the 3,8 km-long loop circuit.

Coated frames.



One of the most complex segments of the conveyor.

The detail of the filter press installed by Water Energy.

Characteristics of the coating plant

The Power&Free conveyor provided by Conveyors Nord Srl (Inzago, Milan, Italy) picks up the parts after the pre-treatment tunnel and it takes them to the coating plant. "Installed in 2001, the conveyor is the core of our production department," says Gaudenzio Preti. "The conveyor handles about 630 trolleys, which complete the circuit in around 2 and a quarter hours."
The coating system is equipped with both automatic and manual booths. These latter ones are usually used for complex-shaped parts.
"When production was transferred to the current plant," explains Melloni, "we installed two 6-axis LeBot A6 series robots and one 5-axis R500 series robot produced by Lesta (Dairago, Milan) for coating the simplest components, such as the drying racks' legs; the remaining parts are coated automatically. Each booth is equipped with 14 guns, which we are considering to replace in future. In fact, we are assessing the possibility to implement the dense phase technology, thanks to which we may achieve 20% savings. We use 5 of the 7 booths for monochrome white and grey applications and the other 2 for different tints. The epoxy or epoxy-polyester powder coatings must comply with the parameter of 75-micron thickness. The workpieces are then cured in an oven at 190 °C for 25 minutes and then unloaded and sent to our 3 assembly lines, producing a finished drying rack every 2 seconds."

The future of Gimi

The continuous updating of products and machines belongs to a wide-ranging project designed to maintain the company's production standard up to the reputation by which Gimi is known throughout the world. "The Freudenberg Group has required a technological upgrade of the equipment used in our plant, considered outdated. In view of the huge production volumes that we will have to manage in the coming months, when we expect a strong increase in demand for our more specialised products, we have decided to switch from two to three shifts. In order to do so, we need to equip our entire production department in general and our surface treatment area in particular in the most appropriate way – from the revamping of the conveyor, which attains its minimum speed precisely in the coating area and for which we are planning to switch to the RFDI technology, to the reduction of our powder consumption levels, which currently stand at several tonnes per day."
The intention is also to implement a fully automatic control system for the pre-treatment phase. "In this regard," says DN Chemicals sales director André Bernasconi, "we have offered to Gimi an automatic process control system through data logging. It will thus be possible not only to trace every batch in real time, but also to retrieve any recorded data for the already pre-treated products. Finally, in order to further improve the adhesion of coatings to the substrates, together with Gimi's management we have planned to integrate an osmotic rinsing phase at the end of the pre-treatment tunnel."
"Freudenberg's acquisition also resulted in some changes in our relationships with suppliers," states Preti. "As a multinational company, its management wants to deal with same-level firms. This is also why we started working with DN Chemicals, which has lived up to our expectations and with which we will continue to collaborate by testing their most innovative products."