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Opening photo: The SMA Group's customers include numerous and renowned manufacturers of industrial vehicles requiring its fuel tanks.



FOCUS ON TECHNOLOGY

Pre-Treatment and Nanotechnology Conversion for Excellent Finishes and High Corrosion Resistance: The Case of SMA Serbatoi

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In the field of hydraulic oil and fuel tanks intended for lorries, boats and other means of transport, it is essential to combine a flexible production process with a high quality product to meet the diverse needs of customers: some of them give more importance to the products' functional aspects, but others equally focus on aesthetics. That is why leading manufacturers should possess the best skills and tools to meet both these requirements. On the one hand, these tanks should be highly resistant to corrosion and to mechanical stresses because of their intended use; on the other

hand, the appearance of their finishes becomes crucial if, for instance, they are considered by the client as an integral part of the bodywork of an industrial vehicle. As a consequence, as well as the coating process, their pre-treatment stage is of high importance, since it should adequately prepare the surfaces of the workpieces by giving them excellent paint adhesion properties and a good barrier effect. SMA Serbatoi S.p.A. (**Ref. opening photo**) is a company specialising in the design and manufacture of metal tanks for lorries, boats, rail vehicles and other means of transport, a leader in Italy and among the

major manufacturers at the European level. It has recently installed a new coating plant at its factory in Belgrade, Serbia, working with Dollmar Spa (Caleppio Settala, Milan, Italy) for the integration of a pre-treatment process that includes the PROMETEUS nanotechnology conversion module.

SMA Serbatoi

SMA Serbatoi S.p.A. started its activity in 1963 in San Prospero di Parma (Italy), where it is still headquartered, thanks to the Rampini brothers. Over the years, this small workshop has turned into a European-level company exporting about half of its production. Today, its staff consists of 170 people and it has a network of distributors and collaborators at the national and international levels.

The SMA Group operates in different production facilities with a total area of over 75,000 m², 16,000 m²

of which are covered. Two factories are located in Italy (in San Prospero and San Secondo, in the province of Parma), on a total area of 45,000 m², and the third one is in Belgrade, Serbia, on a 30,000 m² wide area.

Its production range includes hydraulic oil, fuel, compressed air, oil and diesel, and water tanks. These have been approved by TÜV Bayern, the Italian Ministry of Infrastructure and Transport, ASME USA, Bureau Veritas ICEPI and RINA. The company offers a wide range of standard tanks available in stock as well as all tank components.

“Our tanks for fuel and hydraulic oil (Fig. 1) are produced in three materials: steel, stainless steel or aluminium,” says Umberto Maria Bertolucci, the Production Manager of SMA Tanks. “Our compressed air tanks

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for the pneumatic systems of means of transport such as industrial vehicles and trains, on the other hand, are exclusively made of aluminium. The size of our products varies greatly depending on the industry for which they are intended: the hydraulic oil ones have a capacity of 50 to 250 litres, the



Figure 1: Standard hydraulic oil tanks manufactured by SMA.

nautical sector ones can reach 1600 litres and the ones intended for industrial vehicles of 50 to 1000 litres. Our customers include Iveco for its trucks, Volvo for its bulldozers, Manitou, Azimut - Benetti Group and Ferrovie dello Stato.” SMA Serbatoi also deals with all the accessories that, depending on the

agreements with the customer, are often supplied already assembled to the tanks, such as fixing systems, plugs, filters, floats and level indicators.

“The manufacturing of our products starts with a stamped sheet that is folded to create the shell,” states Bertolucci. “Then, we build the side walls and bulkheads, perform a longitudinal welding and assembly bottoms and lids to close the tank. We check the seal of all our products and we follow all the regulations concerning their approval.” The production of the different SMA Serbatoi plants is diversified. “In San Prospero, we only produce tanks for fuel and oil, while in San Secondo, as well as manufacturing tanks for compressed air, we have located our Italian coating and logistics departments. Since we paint all our products – in special cases, due to the clients’ aesthetic needs, even the stainless

steel ones – also the components manufactured in the first plant are sent to San Secondo,” says Bertolucci.

Currently, the pre-treatment system used in San Secondo includes as follows: an alkaline degreasing stage; two rinses; a heavy iron phosphating stage; and two further rinses, one with recirculated demineralised water and one with pure demineralised water, used only once and then disposed of. With aluminium workpieces, an organic passivation

stage is added. Subsequently, after the drying oven, there are two liquid coating application booths, which use acrylic and epoxy paints supplied by Inver-Valspar, and a polymerisation oven. The tanks are then sent to the warehouse for mounting the accessories.

SMA doo Vršac: maximum flexibility and quality

With the goal of making the Serbian factory completely independent, SMA doo Vršac, opened in Belgrade in 2010 for the production of carbon steel tanks for oil and fuel, was equipped towards the end of 2016 with a new coating line, whose concept, however, had taken its first steps in San Secondo.

“The pre-treatment process is fundamental for us, we need our parts to achieve an optimal cleanliness degree before coating, since any contaminant would compromise the finishing results. In some cases, when the tanks are installed in visible parts of the vehicles and not within the chassis, our customers demand that the coating reaches the same aesthetic quality level required in the automotive industry, the pre-treatment process is important because we have to give our products excellent corrosion resistance and paint adhesion properties in an effective and efficient way.”

“The pre-treatment process is fundamental for us,” Bertolucci states. “We need our parts to achieve an optimal cleanliness degree before coating, since any contaminant would compromise the finishing results. In some cases, when the tanks are installed in visible parts of the vehicles and not within the chassis, our customers demand that the



Figure 2: The pre-treatment tunnel installed at the premises of SMA doo Vršac.

performed some tests with the solutions offered by Dollmar Spa in Parma. Based on the results achieved, the company decided to adopt a system including the PROMETEUS nanotechnology conversion module and the Dollcoat SA 115 chemical. “The laboratory tests, especially the salt spray one – for which

coating reaches the same aesthetic quality level required in the automotive industry; under these circumstances, we also perform scrupulous visual controls. Moreover, the pre-treatment process is important because we have to give our products excellent corrosion resistance and paint adhesion properties in an effective and efficient way.”

With a view to the implementation of this crucial process in its Belgrade factory, SMA

our customers’ specifications have always been increasing in the last few years – have shown excellent results, the same ones that we are now achieving with the plant running,” states Bertolucci.

In order to cope with the flexibility requirements arising from the different shapes of their workpieces and from their different machining times, SMA has opted for a “mixed” solution for the handling of its



Figure 3: Tanks waiting to enter the pre-treatment tunnel.

tanks in the Serbian plant. The components are hung to a chain in the loading area, within manual handling trolleys for a quicker loading operation. Then, they are transferred to a storage buffer and they are finally hung to an automatic two-rail conveyor that takes them into the pre-treatment tunnel (Fig. 2 and 3). The spray pre-treatment process includes a phospho-degreasing stage with chemicals supplied by Dollmar Spa followed by two rinses, one with recirculated demineralised water and one with a ramp with demineralised water coming directly from the osmosis plant (Fig. 4).

At the end of these phases, the parts reach the PROMETEUS nebulisation module for the nanotechnology conversion process (Fig. 5). “PROMETEUS is the name of a range of nebulisation modules created by Dollmar SpA and Dollmar Meccanica to optimise and simplify the application of nanotechnology conversion products after pre-treatment. These systems are characterised by their reduced footprint, their use of high pressure pumps, and their simplified dosing and mixing of the nanotechnology product through the installation of two different tanks for the demineralised water and the nanotechnology solution,” says Fabio Cecchetto, Dollmar Spa’s Technical Sales Specialist. “The PROMETEUS range offers three different solutions¹. The one

installed at the premises of SMA doo Vršac is PROMETEUS nano, a module designed for the production, control and application of the nanotechnology solution only. The solution is prepared and controlled in its central unit even if wastewater is re-used. The modules are provided with stainless steel nozzle ramps that can be installed within the tunnel and, if necessary, with an automatic counter-current system



Figure 4: Tanks inside the pre-treatment tunnel.

“The adoption of this solution has enabled us to make the most of the available space, thanks to its compact size. It has also enabled us to avoid implementing a phosphating stage, resulting in considerable saving not only in terms of plant but also of water and sludge disposal. Since of the Dollcoat SA line products can also operate at the room temperature, finally, it is not necessary to heat large amounts of water, thus saving energy as well”

for the recovery and recycling of the rinsing water according to the process parameters set.”

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¹ “PROMETEUS: a nebulisation technology that breaks the mould”, *ipcm@_International Paint&Coating Magazine* no. 35, Vol. VI, 2015



Other critical issues arisen in the Serbian plant were the final cleanliness degree required and the difficulties posed by the different shapes of the parts. “We pay close attention to the internal cleaning of our products, especially the hydraulic oil tanks. To ensure that the pre-treatment process is carried out correctly, it is necessary to act on the components’ design and to send them into the tunnel with all connections (for sleeves, pipes, filters, etc.) open. Then, an operator takes care of the dripping and drainage of the parts before they enter the drying oven. After the coating process, performed only on the outside of the tanks, their interior is oiled with a protective, antioxidant product.”

At the exit of the drying oven, the workpieces are transferred to another storage buffer where they are manually handled again. The tanks needing it are subjected to masking, blow-off (to remove water from any interstice) and other operations, whereas the others are directly sent to the manual powder coating booth (Fig. 6). “We opted for a powder coating plant to meet the needs of our industry, which prefers this kind of finishes. We apply epoxy or polyurethane coatings depending on the clients’ specifications. Although we currently do not have to perform many colour change operations, we are ready to meet every need,” says Bertolucci.

After the coating station, there is another storage buffer in front of the polymerisation oven,



Figure 5: The PROMETEUS nebulisation module for the nanotechnology conversion process.



Figure 6: The manual powder coating booth.

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to be used in case the latter is full. Finally, the components are manually carried to the unloading and accessory assembly area.

Conclusions

“Our sector demands the highest quality level in terms of both functions and aesthetics,” says Bertolucci.

“We are pleased with the results we have achieved so far in terms of efficiency and effectiveness of the pre-treatment

process and we will continue to monitor them. The stresses to which the tanks are subjected and our customers’ specifications always lead us to search for the best solutions. With a view to continuous improvement and based on the results obtained so far, in future we will consider the possibility to implement this pre-treatment cycle and the PROMETEUS nanotechnology conversion module also in our San Secondo factory.”