





Shot Blasting 4.0 for a Flexible and Highly Efficient Pre-Treatment Process Prior to Coating

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Operating based on the Industry 4.0 principles, with highly automated and interconnected production processes and rationalised and optimised costs, is now crucial for companies in the industrial sector. A firm based in the Italian Brianza area has turned its generational change into a starting point towards innovation 4.0: Co.An.Auto Componenti S.r.L., established in Arcore (MB, Italy) in 1997. "When it was established twenty years ago, Co.An.Auto Componenti S.r.L. was a cataphoresis coating contractor," explains Bruno Maggioni, one of the owners and founding partners, "but we immediately started widening our horizons. Our service range now includes shot blasting as well as cataphoresis, powder and combined-system coating for both steel and aluminium parts. The latter is currently our most requested treatment besides processes requiring masking. Initially, we dealt almost exclusively with auto parts, hence our name; now, we can treat workpieces from the most varied industrial sectors."

"In the last seven years, we have started a generational change," says Maggioni, "with my son Alberto, a management engineer who is now our technical-commercial manager as well as a partner, and the son of another founding member, Matteo Teruzzi, currently our production manager and an advocate of process industrialisation. Our entrepreneurial vocation was strengthened with their entry

into the firm; our next goal is to become a company 4.0." Co.An.Auto is no longer a simple coating contractor, but it is a true enterprise. By operating in the most diverse industries (motorcycles, cars, tractors and earth-moving machines, toys, lighting), it has increasingly



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focused on surface preparation processes through shot blasting, besides coating (with a cataphoresis and a powder plant).

The importance of shot blasting for Co.An.Auto

Whether a cataphoresis or powder coating or a combined system is required, the first process performed by Co.An.Auto

on its clients' parts, when requested or authorised, is shot blasting. This is followed by cataphoresis coating with a chemical pre-treatment phase and/or powder coating for combined systems; if only a powder coating process is required, this is carried out with an Oxsilan "green technology" nanotechnology pre-treatment."

"Based on our company philosophy, we have always refused to include any acid pickling stage in our chemical pre-treatment," states Maggioni. "First of all, it is a little controllable chemical process and it decreases the corrosion resistance performance of substrates. Secondly, it has a negative environmental impact, which is totally unacceptable for us. The only alternative to acid pickling that is equally effective for preparing surfaces is shot blasting: if performed properly according to the metal treated, it offers an incomparable level of surface cleanliness and paint adhesion. That is why we opted for a large-sized, highly automated advanced shot blasting system, enabling us to be competitive also in terms of costs."

The new shot blasting plant

"Our turning point towards innovation 4.0 was precisely the purchase of this new shot blasting machine (ref. **Opening photo**) in December 2017," states Maggioni. "As a supplier, we chose Tosca Srl (Canegrate, MI, Italy), a company with over fifty years' experience in the industry, a team composed of young and proactive people with which we have worked in perfect harmony

Opening photo: The tailor - made shot blasting system supplied to Co.An.Auto by Tosca Srl.



Figure 1: A detail of the ring-shaped one-rail conveyor, which enables to load and unload parts on different hooks outside the chamber while another one is being subjected to shot blasting.

right from the design phase, and the ideal know-how for our needs.”
“The peculiarity of our company,” states Tosca srl’s team, “is that over the years our customers have led us to develop a definite kind of machines. We build shot blasting machines that are very solid in terms of mechanics and very well equipped

in terms of electronics – to facilitate their digital integration with already automated customer lines, which is very important in the framework of the Industry 4.0 – as well as easy to maintain and definitely durable. Our “standard” are tailor made shot blasting systems and not “basic models”: this is what differentiates us from our competitors.”

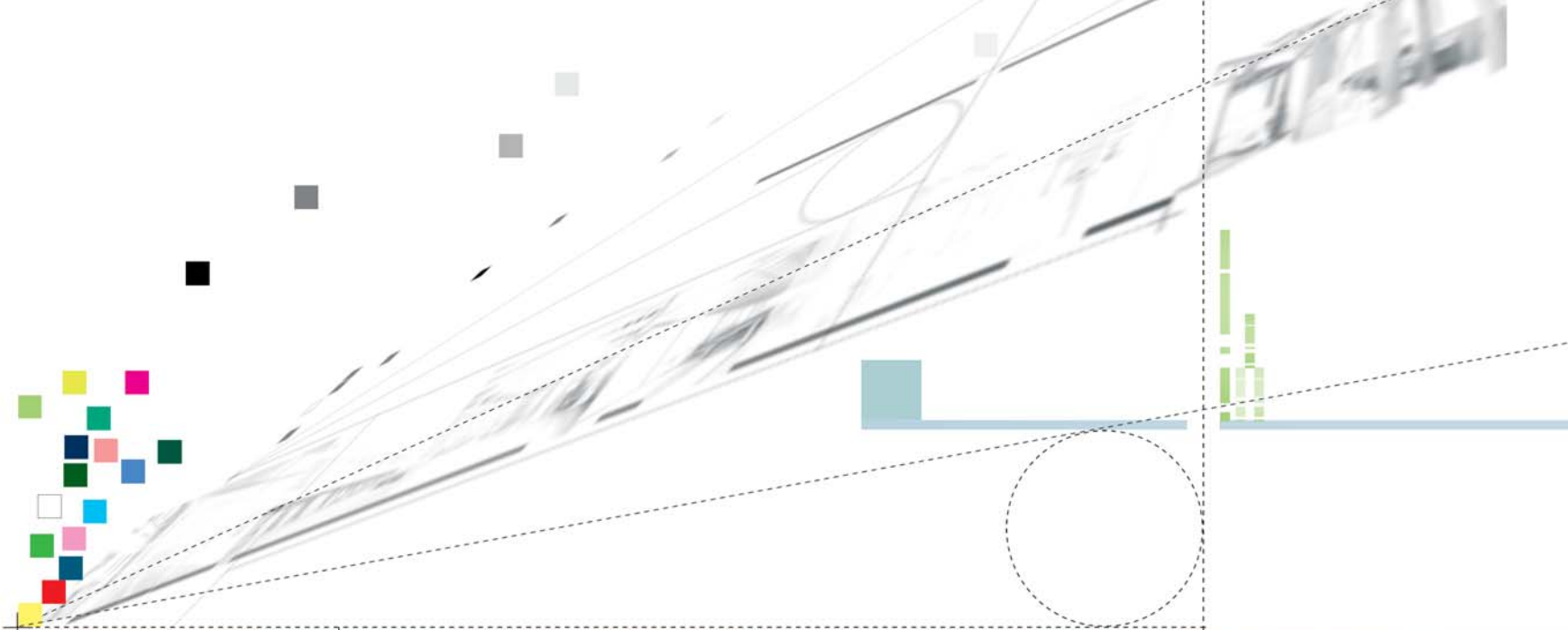
The plant installed at the premises of Co.An.Auto is a cluster shot blasting system equipped with a one-rail conveyor and several hooks; its ring layout enables to load and unload parts on different hooks outside the chamber while another one is being subjected to shot blasting (Fig. 1).

During this phase, the hooks are rotated and simultaneously perform a “coming and going” movement, in order to ensure that the media launched by the turbines hit the parts’ surfaces with different angles and therefore optimally. The plant is equipped with four 7.5 kW turbines managed by separate inverters, which allow to select the abrasive throw speed depending on the type of workpiece to be treated (Fig. 2). These are matched to servo controls

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Figure 2: Electric circuits equipped with an inverter to allow the selection of the abrasive throw speed.



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Figure 3: The recovery and reconditioning system.

that regulate the quantity of abrasive based on the rotation speed of the turbines, thus optimising their operation. The abrasives used are small conditioned steel cut wire; by being able to set out their throw speed, users can define in advance the surface roughness value they want to obtain for each hook. A recovery and reconditioning system ensures the total elimination of waste, burrs and powders (Fig. 3). Since aluminium parts are also shot blasted, in order to comply with the regulations concerning the risk of detonation due to the concentration of aluminium powders, which explode at lower concentrations than the iron ones, Tosca srl opted to install an ATEX-compliant filter, not 'self-certified', but supplied by one of the world's leading companies in the sector. A PLC programmable via the operator panel allows to control all system functions and create customised sequences with different pace, turbine rotation speed, and media flow values (Fig. 4). Tosca created a series of HUB connections so that all solenoid valves and sensors can be managed via PROFINET through the PLC and remotely with a modem and an Internet connection (Fig. 5). When properly developed, in future this system will enable to monitor the systems' status even from a smartphone.

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Figure 4: The touch screen operator panel for setting all the shot blasting machine's functions.



Figure 5: HUB connections of all the solenoid valves and sensors of the system.

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Figure 6: The shot blasting machine is equipped with two automatic doors operated by pneumatic cylinders.

“Another characteristic of all the machines produced by Tosca, besides extreme durability, it is their ease of maintenance. For instance, the interchangeable plates are fixed outside the plant, so that it is always possible to replace them quickly and easily, thus reducing costs and downtimes.”

“Tosca’s shot blasting machines can adapt their characteristics and working parameters to the products treated and the finishes required. Before starting a cycle, the operator selects the proper sequence through a touch screen panel,” states Tosca’s team. “However, this stage will soon be completely automated and managed remotely through pre-set barcodes for each type of product, again in compliance with the Industry 4.0 principles.”

As for the plant’s construction, the shot blasting chamber is made with steel and manganese steel sheets featuring reinforcement profiles and an anti-wear lining as follows:

- interchangeable 10 mm thick manganese steel plates at the centre
- interchangeable 6 mm thick manganese steel plates at both sides
- special anti-abrasive rubber sheets on the interior walls of the automatic doors (Fig. 6).

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Industry 4.0: goal achieved

“Relying on Tosca was the right choice,” states Maggioni. “Their shot blasting machines are highly technological and effective. All our requirements have been met quickly and concretely. The Tosca team has always been available and above all flexible, paying attention to the smallest details and enabling us to get the most out of their expertise.” In terms of both process and finishes obtained, the results are definitely satisfactory. “Since we installed the system two months ago,” says Maggioni, “we are still at the ‘break-in’ stage, but we are already working on implementing a management interface between the Tosca machine and Co.An.Auto’s already existing software. This will enable us to manage the over 5,000 part numbers we deal with, each with different shot blasting needs, much more efficiently.”