



Opening photo: Mascar SpA (Grumolo delle Abbadesse, Vicenza, Italy) has specialised in the production of agricultural machinery for the sowing and haymaking sectors for over twenty years.



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Continuous Technological Innovation and Paintshop Updating for High Quality Agricultural Machinery: Mascar's Winning Strategy

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Like much of the manufacturing industry, the agricultural sector is currently facing the challenge of digitalisation and technological evolution. Originally a totally labour-driven sector, from the 1950s to the present day the agricultural industry has changed a lot – through the so-called green revolution, which led to the introduction of chemical fertilisers, the 3.0 era, characterised by the advent of machinery aimed at speeding up and improving production, and finally the so-called smart agriculture or agriculture 4.0. Nowadays, the primary sector is in fact more prosperous than ever in terms of technological innovation. Proof of this are the drones used for mapping areas, “smart” tractors with autonomous driving,

“The primary sector is more prosperous than ever in terms of technological innovation. Proof of this are the drones used for mapping areas, “smart” tractors with autonomous driving, and sensors and IoT technologies capable of collecting data on environmental, climatic, and crop conditions in real time.”

and sensors and IoT technologies capable of collecting data on environmental, climatic, and crop conditions in real time as well as providing information on the possible spread of diseases.

In this constantly evolving framework, continuous research and development of innovative solutions has proved to be a winning strategy adopted by many businesses. These include Mascar SpA (Grumolo delle Abbadesse, Vicenza, Italy), a company specialising in the production of agricultural machinery for the sowing and haymaking sectors for over twenty years (Ref. opening photo). The current quality requirements for the finishing of such equipment are as high as those of the automotive sector are.



Figure 1: Balers are among Mascar's top products.



Figure 2: After machining and assembly, the parts are transferred to the coating department.

In order to meet these needs at best, in 2017 Mascar renovated its paintshop with the help of Graco, a world leader in the supply of fluid management systems and equipment (through Comaind, one of the Graco distributors in Italy), and Inver, a brand of the Sherwin-Williams Company, which supplies the company with last generation water-soluble two-component coatings.

Company history

"Established in 1964, Mascar's contemporary history started in 1998, when agricultural machinery expert Antonio Maschio decided to break away from the homonymous industrial group and acquire this company, already active in that sector. We used our know-how and previous experiences to reorganise the firm from every point of view, turning it from an artisanal to an industrial business," explains Mascar General Manager Maria Teresa Maschio. "We also redesigned the entire product range by choosing to specialise exclusively in the production of agricultural machinery for the sowing sector, such as pneumatic seed drills, which my father knew very well, and the haymaking sector, such as round balers and bale wrappers, which already accounted for 40% of the original company's production (**Fig. 1**)".

"The choice not to produce a full line, but only focus on these products arose from Mascar's will to offer reliable, high tech, high quality, high productivity machinery in a very specific market niche. For example, whereas a standard haymaking machine can pack around 5,000 bales a year, Mascar's systems produce up to 12,000 bales a year; our seeders can reach a speed up to 15 km per hour, which is crucial for markets like Russia and China, where arable land plots are enormous. These are premium machines, with mechanic, hydraulic, and electronic solutions of excellence. Our engineering team is constantly looking for innovative concepts especially aimed at improving field

performance, increasing work speed, and reducing environmental impact. In order to remain a leader in its sector, each year Mascar reinvests about 10% of its turnover in research and development and in the updating of its production equipment, including the coating one." "Mascar now exports over 80% of its production worldwide and it has recently signed two very important partnership agreements: one with Alpego SpA (Vicenza), which will enable the two companies to expand their customer portfolio, and the other with CNH, for the exclusive supply of fixed-chamber balers for cylindrical bales," says Maria Teresa Maschio.

Mascar's production flow

"Mascar produces 95% of its machines in-house by dealing with all phases, from carpentry to coating and assembly, in a 27,000 m²-wide plant. We are equipped with the most advanced carpentry technologies such as laser cutting, numerical control machining centres, and welding robots, with which we treat our raw material: pickled sheet metal. After machining and assembly, the parts are subjected to quality checks and then transferred to the coating department (Fig. 2). This enables us to both constantly monitor the production process, thus guaranteeing our products' reliability, and reduce our time to market," states Mascar plant manager Emanuele Ghezzi."

“The choice not to produce a full line, but only focus on specific products arose from Mascar's will to offer reliable, high tech, high quality, high productivity machinery in a very specific market niche.”



Figure 3: Manual primer application.



Figure 4: Manual top coat application.



Figure 5: Workpieces exiting the coating booth, ready to be transferred to the polymerisation oven.

Mascar builds its different types of agricultural machines with different production cycles: round balers follow a fixed path, whereas for our seed drills we produce the individual components separately and we assemble them in different ways based on customer needs."

Features of the new coating line

"In our coating department, the assembled products undergo a pre-treatment phase that includes a phospho-degreasing stage, a rinse with mains water, and a rinse with demineralised water. Then, they pass through the drying oven and the masking station. Finally, they enter the coating booths' area. Here, they are subjected to the

following operations: manual application of a two-component epoxy primer (**Fig. 3**), flash-off, second primer application stage and further flash-off, application of an acrylic top coat (**Fig. 4**), and polymerisation in the oven (**Fig. 5**)," says Emanuele Ghezzi.

"We use waterborne two-component coatings developed by Inver, specifically a state-of-the-art 2k epoxy primer and a 2k acrylic enamel, both designed by Inver to meet the high quality requirements of the heavy equipment industry. We apply them with new spray guns from Graco's XP range, which in just two months have allowed us to save over 30% of paint and improve the quality of our finishes,"

the plant manager adds. "Moreover, in order to solve some problems related to the fluidity of our paint products and increase plant productivity by eliminating machine downtimes due to extraordinary maintenance, we have installed two new dosing and mixing systems developed by Graco (**Fig. 6**)."

"We have provided Mascar with equipment that requires less ordinary and preventive maintenance," states Davide Galvani from Comaind, a Graco distributor for the industrial coating and fluid management fields. "We recommended to Mascar the Graco ProMix 2KE dosing unit (**Fig. 7**) for the primer application stage, as it provides thanks to the dynamic dosing technology

accurate fluid volume measurements to efficiently achieve the pre-set mixing proportions.

With this compact and flexible system, the primer is applied at a maximum pressure of 21 bar. Graco ProMix 2KE also features a user-friendly LCD display that allows setting, managing, and monitoring the system during operation and scheduling maintenance activities. For the top coat application, we also recommend to Mascar the installation of the 2KS multi-component dosing system (Figs. 8 and 9), which allows managing up to five colours, but is expandable up to a maximum of thirty. These are arranged within an insulated box that guarantees quick colour changeovers and interfaces with fibre-optic Coriolis mass flow metres to precisely measure paint density and viscosity," explains Galvani.

“We have installed a control panel with the aim of gradually organising our production based on the Industry 4.0's principles. It manages the supply flow to the recovery tank, the recirculation cycle, and the pumps and it controls the temperature, density, flow rate per minute, and circulatory pressure values”

Results achieved and future projects

“We have also solved a problem related to electrostatic insulation by supplying an advanced insulated polypropylene cabinet with dielectric certification designed by Comaind to isolate the tanks containing the primers and an air-insulated bench, where the tanks containing the top coats are positioned with an external perimeter protection spaced at 5000 m. Both systems are adjacent to the booth area,” says Galvani. “Finally, we have installed a control panel with the aim of gradually organising our production based on the Industry 4.0's principles (Fig. 10). It manages the supply flow to the recovery tank, the recirculation cycle, and the pumps and it controls the temperature, density, flow rate per minute, and circulatory pressure values (Fig. 11).

We use this information to have a general

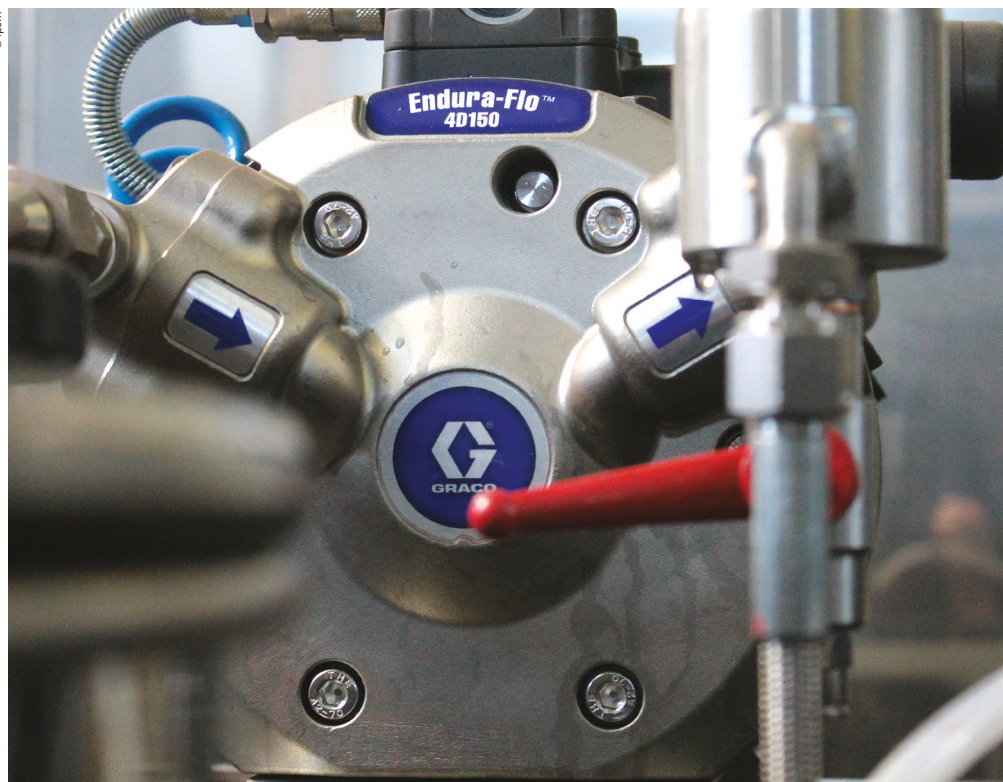
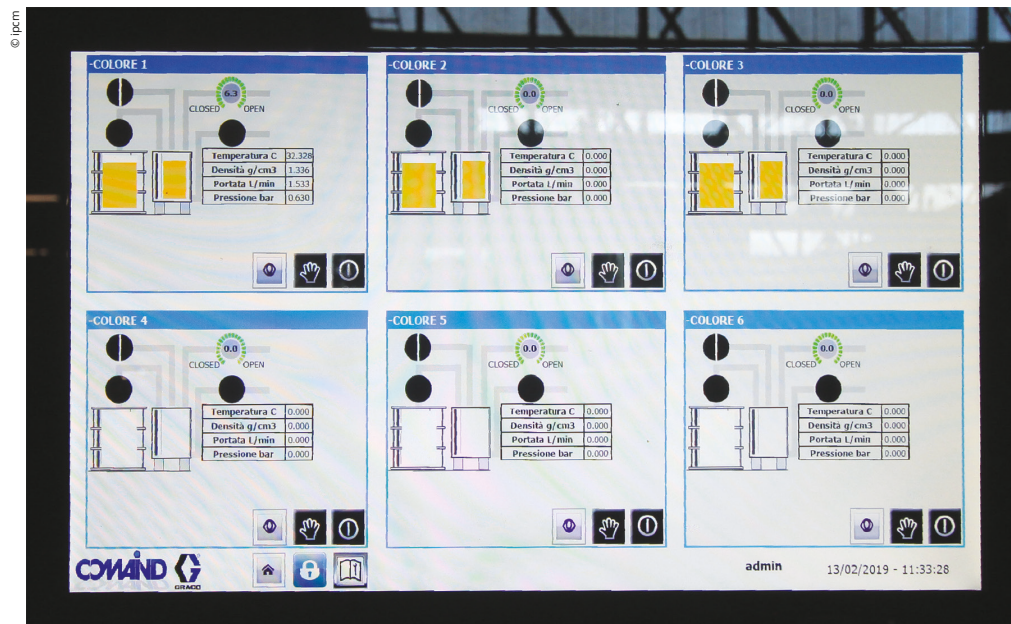


Figure 6: The Endura-Flo 3D high-pressure diaphragm pump has solved the coating fluidity issues.



Figure 7: Mascar has chosen the GracoProMix 2KE dosing unit for the primer application stage.



Figures 8 and 9: For the top coat application, Mascar installed the 2KS multi-component dosing system, which allows managing up to five colours but is expandable up to a maximum of thirty.

control of the system and detect any anomalies or variations with respect to the standards. The next step will be to put the machines in communication with our company's management systems to achieve global control over our production cycle".

"Thanks to the research done by Inver's laboratory in Minerbio (Bologna, Italy) Mascar managed to switch from waterborne one-component products to waterborne two-component ones, thus reducing the environmental impact, increasing parts' corrosion resistance and durability, and optimising the tack time" states Filippo

Pellegrini, Sales Manager, GI Italy of The Sherwin-Williams Company. "With our new coating plant, in a few months we have saved paint, optimised consumption, increased productivity, and significantly reduced maintenance. Our partnership with Graco have turned out to be winning choices. The company is not just a supplier for us, but also a partner that has helped us solve our coating issues and improve the final quality of our products. At the same time, thanks to the results obtained, we have strengthened our collaboration with Inver," states Ghezzi. ○



Figure 10: Mascar installed a control panel to manage the system and detect anomalies.



Figure 11: A bird's eye view of the coating management unit.