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Opening photo: **CBM Group** specialises in the production of 3-point coupling systems for tractors: in the picture, a 3-point coupling system for rear mounting.



# A rinse water treatment process contributes to the success of CBM, an agricultural machinery OEM

Monica Fumagalli **ipcm**<sup>®</sup>

The last 2016 issue of **ipcm**<sup>®</sup> and the conference we held on December 14<sup>th</sup> were both devoted to the technological evolution of finishing treatments in the field of Agricultural, Construction and Earthmoving (ACE) equipment. We highlighted that, while the aesthetic quality level of the ACE machinery is now comparable to that of the automotive industry, the corrosion and shock resistance performance required to the former is even higher than that imposed for the latter. The search for new application systems able to meet the demands of the major players in the market is constant and their development is a permanent test bed.

We will deal again with these issues in this article about CBM Spa Costruzioni Meccaniche, a well-established company based in Modena (Italy) and specialised in the agricultural machinery sector. It has been producing tractor hooking, towing and lifting systems since 1967 and is now a leading company at the international level. Thanks to its relationship with key stakeholders in the sector – John Deere, CNH Industrial, Same Deutz-Fahr, Agco

Fendt and Claas, to name a few – it is the perfect example of a company that has managed to adapt to such demands for increasingly high performance coatings. Besides developing the most appropriate coating process to improve its final results,

**“CBM has installed a water demineralisation plant to optimise the final rinsing stage of its pre-treatment process and thus obtain perfectly clean surfaces prior to painting”**

it has installed a water demineralisation plant to optimise the final rinsing stage of its pre-treatment process and thus obtain perfectly clean surfaces prior to painting. In order to do so, CBM has cooperated with Water Energy, a company based in San Pietro in Casale (Bologna, Italy), specialising in waste water treatments. The aim was to improve the washing efficiency level and make the production process smoother, eliminating the need for touch-up operations due to a non-suitable metal pre-treatment process.

## The company

“With nearly fifty years of experience,” CBM’s Manufacturing Manager Daniele Iaquinto says to introduce his company, “we are among

the major OEMs in the world for the design, manufacture and supply of hooking, towing and lifting systems for implements and trailers connected and/or coupled with tractors. Established in the late ‘70s, this firm has remained a family business. Omero Cornia, its founder, is still active and present in the company (Fig. 1).”

CBM is now managed by the second generation of the family, leading a group made up of five companies with about 900 employees. In the



Figure 1: From right to left: Omero Cornia, the founder of CBM, Elisabetta Masotti, the Sales Office Coordinator of Water Energy, and Daniele Iaquinto, the Manufacturing Manager of CBM, in the show room of the Modena headquarters.



**Figure 2: The monorail conveyor leads the hydraulic cylinders along the pre-treatment and coating line.**

Modena area, there are CBM Spa, the group's headquarters, and Te-tra Acciai, dealing with the heat treatment of alloy and special steels. In Tregnago, in the province of Verona, Mita Oleodinamica manufactures lifters and hydraulic cylinders, as well as their related control parts.

In 2007, a Polish company based in Lublin, previously an important part of the Same Deutz-Fahr Group, joined the group and changed its name to CBM Polska. Initially producing the full range of agricultural machinery components, following the acquisition by CBM it has specialised in medium-heavy carpentry products, mainly featuring welded structures. "We have chosen to entrust CBM Polska with the construction of towing components. In this way, in the Modena plant we have been able to focus on our production of 3-point coupling systems for front or rear mounting, which have always been our core business, without wasting any resources in the installation of the same machines for the same processes in different plants (Ref. opening photo)."

The fifth company of the group is Mita India, founded in 1999 as a joint venture for the production of hydraulic lifts for the Indian and the Far East markets and located in the industrial area of New Delhi. At the moment,

they are building a second plant in Dewas to meet the demand of John Deere, a major customer of CBM, for the creation of a few satellite activities in this Indian region. With this structure, the Italian group exports over 85% of its production, while 15% remains on the Italian market.

### The customisation of complex components

The design of CBM products complies with the strictest regulations on size and dimensions as a function of the roadway, the position of the power take-off (PTO) system and the axle of the towing vehicle, as well as with the requests of the customers.

"Only a small part of CBM's production," Iaquinto states, "is based on standard designs. In most cases, our products are developed and customised for each client. Every day, we process our steel bars to obtain, on average, about 24 t of flat bars, 8 t of tubular bars and 6 t of round bars to produce rolled rods.

"We have two main production lines. One processes solid bars in quenched special steel, the other tubular bars in S275/2G3 steel. After cutting, we perform drilling and milling



**Figure 3: The outside of the pre-treatment tunnel and, on the right, the water demineralisation plant.**



Figure 4: On the left, the non-hazardous eluate collection silo and, on the right, the control panel for the management of the water treatment system.

operations with automated machining centres. Most components, at this point, undergo an induction bending and a heat treatment stage. The latter is a special process considered crucial to increase the material’s mechanical resistance, achieve greater surface hardness and protect the product against contact abrasion.”

After the thermal process, some products, such as the lifting arms, are welded to smaller parts; other components, such as the tow bars, go directly to the coating and assembly department.

**The coating of components for agricultural vehicles**

“In our sector, the aesthetic finishing of components has not always been considered a strategic operation: at the beginning of our collaboration with the manufacturers of agricultural vehicles, in the ’70s-’80s, our task was to provide them with a raw product. They dealt with the painting once it was mounted on the tractor’s axle. The first requests for treated surfaces were due to storage needs, with the aim of keeping the stocked parts in good conditions for long periods of time. Afterwards, such demand has grown and the required aesthetic level has become increasingly higher. Many years ago, therefore, we equipped ourselves with two coating plants, one for the application of a primer on the parts that are subsequently repainted by the customer and the other for the application of a full primer + topcoat system. We only use two-component, water-based epoxy primers and two-component polyurethane topcoats, all approved by our clients.

**“ We only use two-component, water-based epoxy primers and two-component polyurethane topcoats, all approved by our clients.”**

# Painting robots and turnkey solutions

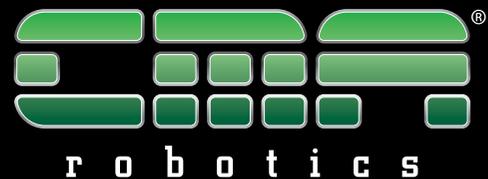


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**Figure 5:** In the foreground, the two columns of the demineralisation system: one with cationic resins, the other with anionic resins.

We have selected two coating suppliers: InverValspar, a multinational industry with an Italian branch in Bologna, and Gross & Perthun, based in Mannheim, Germany, for the Austrian and German customers who have approved the paints of this German manufacturer.”

The acquisition of more and more important orders has led the Italian company to replace the plant devoted to the primer + topcoat application with a new one, designed and installed three years ago by Airmadi Painting from Castelnuovo del Garda (VR), and to dedicate the primer application machine to the components that do not require a high degree of resistance.

### The pre-treatment cycle

“The decision to replace our old plant,” laquinto says, “was motivated by the addition of a new approved coating system: the supplier

**“Our current pre-treatment phase, includes 8 stages with a nanotechnology conversion process.”**

reported that an appropriate substrate preparation was needed in order to achieve the parameters required by the customer. The old system was designed with a 3-stage pre-treatment process that proved inadequate for this new coating. Our current pre-treatment phase, on the other hand, includes 8 stages with a nanotechnology conversion process. Because of the complexity of the treated parts, numerous tests have been performed with the supplier of chemical products, Henkel, to identify the best suited process.”

The plant consists of a through-feed monorail conveyor with a 0.9 to 1.1 m per minute speed, equipped with nearly 400 hooks on which the components (with a weigh ranging from a few kilograms up to 120 kg) are placed (Fig. 2).

After loading, the workpieces reach the spray pre-treatment tunnel, which includes:

- 2 alkaline degreasing stages with the same products. The first bath operates at 55 °C, the second one at 50 °C. In the first bath, a more intensive degreasing takes place; the passage in the second one enables to eliminate any residues that were not removed during the previous stage. When the first tank is saturated and must be emptied, the second one continues to operate, thus avoiding any interruption in

- the production flow;
- 2 rinses with recycled osmotic water;
- a nanotechnology conversion stage;
- 2 rinses with recycled demineralised water;
- 1 rinse with pure demineralised water.

“We have also installed a demineralisation plant to produce the pure water required for the last rinse of the pre-treatment process,” laquinto explains (Fig. 3).

“In this way, we avoid any hazing or staining problem due to salt residues remaining on the surfaces



**Figure 6:** The separator for the removal of mineral oils from the pre-treatment tanks.

after rinsing: our operators no longer have to intervene in order to complete the cleaning process, which results in a production process without any bottleneck.”

### The demineralisation plant's operating principles

“The demineraliser installed by Water Energy,” says Elisabetta Masotti, Sales Office Coordinator at Water Energy, “operates through an ion exchange process for the removal of salt from water. It consists of two columns, a cationic and an anionic one; they are regenerated with the most appropriate products: hydrochloric acid for the former and sodium hydroxide for the latter (Fig. 4). Demineralisation occurs as water passes through the two columns filled with resins: the cationic section removes the excess ions and the anionic one holds the negative ions. The

final result is the pure water fed to the last pre-treatment stage. The eluate is conveyed into a silo and disposed of by a specialised firm as non-hazardous waste (Fig. 5). The resins are depleted over time and must be regenerated properly.

**“Our operators no longer have to intervene in order to complete the cleaning process, which results in a production process without any bottleneck.”**

Water Energy has also installed a coalescence separator for the separation and removal of the mineral oil present in the pre-treatment baths (Fig. 6). The recovered oil is

continuously drained and conveyed into a waste oil storage tank through a pipe.

The de-oiled water, on the other hand, is sent to the degreasing tank.”

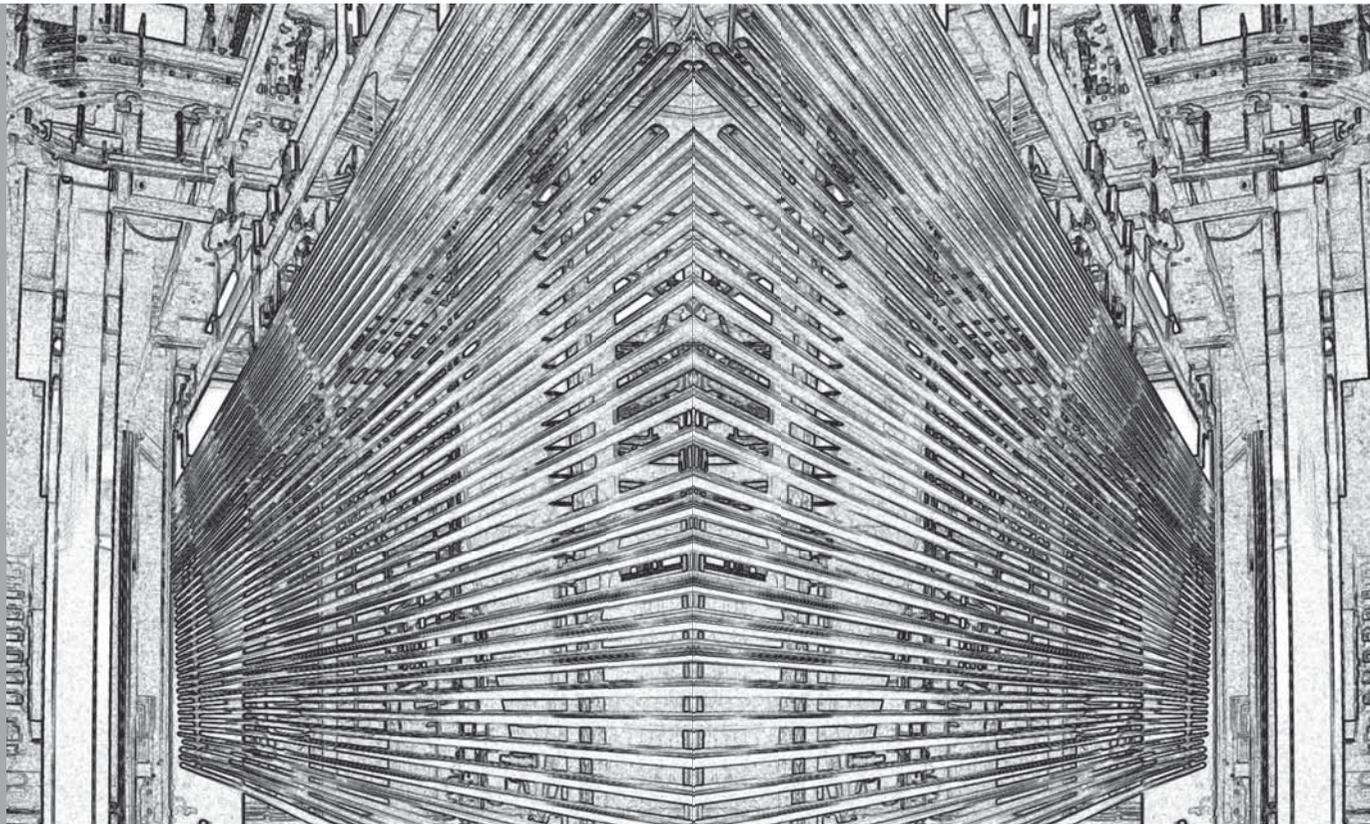
“Over three years of use,” Iaquinto states, “we have regenerated the demineraliser’s resins four times. Such operations should have been more frequent because of

the high hardness of water, but Water Energy has added a pre-treatment system composed of a softener and an osmosis unit, which removes most salt from water.

As a consequence, the demineralisation plant is fed with treated water characterised by a reduced percentage of salt, which helps ensure it works optimally.

“This has resulted in higher efficiency of the coating process, thanks to constant, low  $\mu\text{S}$  levels and to the well-adjusted, uniform quality of the treated water.

We can only be pleased with the result.”



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## The coating line's features

The film thicknesses required by the clients' specifications range between 80 and 100 microns, depending on the components' shape: the primer layer is normally  $\geq 30$  microns thick, the topcoat one  $\geq 50$  microns. The coating process occurs in two dry application booths equipped with automatic electrostatic mixing and spraying system provided by Wagner Group and two semiautomatic reciprocators provided by Zeus Electrostatic System (Fig. 7).

The primer application booth features Columbus paint collection filters; the topcoat application one is equipped with two kinds of filters, Columbus and Andreae. After the application of the primer, the parts stay in the drying oven for 30 minutes at 55 °C. Then, the topcoat is applied and the parts are dried for 35-40 minutes at 90-95 °C. The following steps are: cooling, unloading, packaging and assembly, if required by the component; otherwise, the part is ready for the shipment. The entire painting cycle ends in 4 hours. "For our new coating line, we have required some fundamental parameters to be respected to ensure a successful surface treatment process," CBM's Paint Shop Manager Maurizio Guiduzzi says. "A crucial aspect for us was the system's automation level, according to the industrialisation philosophy applied to our entire production plant over the years. Since we deal with heavy construction materials, we have always tried to lighten the work of



Figure 7: The two booths for the dry application of primers and topcoats.



Figure 8: Coated hydraulic cylinders.

our operators as much as possible, with considerable advantages also in terms of human error reduction. "We have also asked the plant engineers to include an alarm system able to stop the process if the parameters set for any phase of the treatment, from cleaning and drying to paint mixing, are not respected. In this case, the system enters standby mode and it is not possible to resume work until the problem

is solved. In this way, we make sure that each component undergoes the right pre-treatment and coating process (Fig. 8)."

## Conclusions

"In the last few years, finishes have played an increasingly important role," Iaquinto says. "The attention paid to the coatings' performance is comparable to that of the automotive industry. The customers take it for granted that they will receive a workpiece to be sent on their assembly lines that complies with their technical requirements and that is also aesthetically pleasing. CBM's components are mounted on high-range tractors (from 400 to 500 horsepower) and we cannot afford to deliver a product with any defect, however slight, in the coating – even if it works perfectly. Nowadays, end users want to drive nice and eye-pleasing farm machines. That is why we are planning to replace also the second paint installation in the next few years. Given the good results obtained so far, we will turn to the same suppliers that helped us build the coating line installed three years ago." ○