

Powder coated MDF kitchen elements made in Belgium

Everyone's talking about powder coating of MDF panels. Various technologies are used. In the last few years, powder producers, MDF panel manufacturers, oven builders and application manufacturers achieved a major advancement. Does a brand-new installation in Belgium possibly hold the key to the breakthrough configuration for the powder coating process of MDF panels and the decisive step towards mass production?



Electrostatic powder coating ranks among the most environment-friendly and cost-effective technologies in the field of surface treatment. Powder coatings have been around since the early 1960s. Their production and processing is trouble-free and make powder coating a well-established and commonly recognized process. In fact, powder coatings are

- environment-friendly
- solvent-free
- energy-saving
- safe to handle and process
- cost-effective

Powder coatings are coating materials that are applied and subsequently fused under heat exposure onto the substrates to be painted resulting in a closed, ideally adhering film. Like most surface treatments, its main functions fall into two categories: decorative or protective coatings. Powder coatings typically contain binders (resins, hardeners), pigments and colorants, fillers and additives.

Electrostatic powder coating is based on the fact that particles with opposite charges attract each other. This is why most of the conductive and thermally stable solids are suitable for powder coating. Electrostatic powder coating is increasingly used especially for metallic objects as aluminum profiles, façade elements, household appliances, automotive accessories, and office furniture. Dramatic advances in the development of modern materials such as methods of inducing conductivity into MDF components and powder coatings with very low melting points now also make it possible to coat temperature-sensitive parts.



Various systems are used to charge the powder. It would go too far to list all these processes at this point. The choice of the system is dependent on the end-use application and the customer's requirements. However, in general, the different charging technologies are split into three different categories:

- electrostatic charging
- electrostatic low-ion charging
- tribo-charging

Today, electrostatic charging is by far the most commonly used process in the field of industrial powder coating. Its advantages include high cost-effectiveness, high transfer efficiency and uniform layer distribution.

What is powder coating?

Dry coating powder is filled in a hopper and subsequently conveyed by means of pressurized air via injectors to the powder gun. In this gun, low voltage (10V) is transformed into high voltage utilizing the cascade principle. During the spraying process, one or more electrodes charge the powder with 60 – 100 kV. The tip of the electrostatic spray gun is equipped with an electrode that expels electrons.

The expelled powder particles are charged through the deposition of air ions. Like the free ionized air particles, the ionized powder particles are attracted to all grounded objects. In practice, the grounded object is the workpiece and the powder adheres to it.



Why powder coating on MDF?

Common surface finishes used on MDF are wet paint, melamine paper or PVC foil (laminare). All these processes have specific disadvantages. Until recently, powder coating was limited to conductive materials such as metals. Major advances in the methods of preheating the MDF board to increase conductivity and powder coatings with very low melting points now also make it possible to powder coat temperature-sensitive items.

The advantage of the laminating process over liquid paint is that it requires less polishing and priming. However, laminating can only be used in cases of bigger volumes and 2-D applications. In addition, the waste rate of excess foil is very high as the surplus is cut away in the production process and cannot be reused.

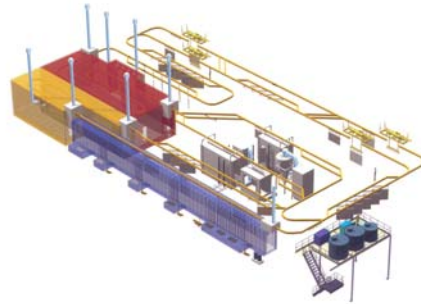
Powder coating on MDF offers the following benefits compared to common processes:

- cost-effective through reduced handling
- recovery and reuse of the excess powder
- high automation grade
- compliance with the more and more severely applied VOC and environmental regulations
- liberty in design for MDF panels, e.g. possibility of flowing round shapes

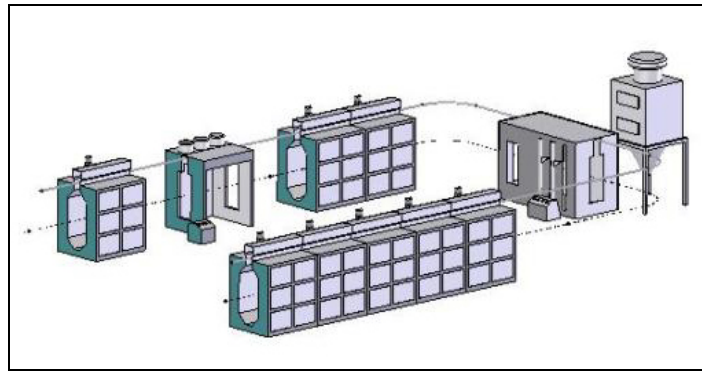


In what consists a powder coating installation?

Industrial powder coating installations for the automatic coating metal parts, typically include a pretreatment zone, a dryer system, a coating area, a curing oven, and a conveyor system. Please refer to the following schematic layout as an example of a powder coating installation for metallic items. In general, a small booth for manual coating is sufficient for smaller production quantities or in the case of specific colors. Space-wise, this type of equipment can be installed in virtually every production facility.



A MDF powder coating installation is structured differently. One of the major differences is the absence of the pretreatment operation. The MDF panels do not have to be de-greased or cleaned. Instead, gas catalytic ovens are used for the preheating of the MDF panels as well as the curing process of the powder. The following illustration shows the rough layout of the powder coating installation at Ledro Keukens in Belgium.



Further MDF powder coating processes are based on convection ovens and the use of UV-curable powder coatings.

State-of-the-art powder coating technology in Belgium

At the furniture supply fair in Bad Salzuflen 2004 (ZOW) in Germany, Ledro Keukens NV based in Houthalen-Helchteren, Belgium, presented for the first time, a mass produced powder coated kitchen and bathroom furniture. The items aroused a tremendous amount of interest, and jointly with Tiger Coatings, Austria, the Belgian company won the innovation award of the fair..

Ledro initially specialized in kitchen furnishings for private clients. Under the direction of Paul Peters, the company in the three-border area of Limburg, Maastricht and Aachen has become one of the most renowned kitchen and bathroom manufacturers in Europe. Created in 2003, the Ledro Powder Coatings division is equipped with today's most advanced production line for MDF panel powder coating in Europe.

At Ledro Keukens NV, the increasing demand for MDF products from the furniture industry coupled with a progressive corporate philosophy recently led to the decision to invest, as a pioneer in the sector, in the future-oriented powder coating technology for MDF items.

Why powder coating has been chosen? Powder coating is the best surface application for modern and environment-friendly MDF coating. In the Belgian premises, 90% of the MDF panels are coated with PVC foils. This process is well-established, but it does generate relatively high handling costs and waste rates.

Paul Peters, General Manager of Ledro, is convinced of the benefits of powder coating:

- ecological, even after tightened EU regulations effective from 2007
- 99% material utilization thanks to powder recovery
- only 1 working step to achieve the requested film thickness
- quick and simple color changes
- excellent chemical and physical surface properties
- easy to use for flat and cubic shapes
- high cost-effectiveness

A further advantage: the free choice of design for all MDF products! With laminates or foils, the shaping of the MDF parts is very limited, that is to say it is reduced to rectangular products. Powder coating allows for all kind of shapes, a fact that certainly brings joy to the furniture designers' hearts worldwide.

MDF and Metal coatings – the major differences.



Edwin Kuipers, Production Manager at Ledro Keukens, is well positioned to give further information: “MDF is a continuously changing material, it literally lives! For example, MDF panels react very quickly to variations in temperature. Also variations in quality within the MDF panels of one production lot are immediately detected on grounds of faulty coating results. Unlike metal parts, MDF does not allow paint-stripping and subsequent recoating, rejects are rejects!”

The entire plant configuration is structured in a completely different way as it is in the case of metal coating. The cooperation between MDF panel manufacturer, powder producer, oven builder and application manufacturer is very important. The coating process has to be seen as a whole, each component is only as strong as the weakest link of the chain.

Paul Peters: “In recent years, many mistakes have been made in the field of MDF coating. We counted too much on our experience in metal coating, instead of realizing that here we have entered a completely different world.”

Edwin Kuipers explains MDF panel coating with a good comparison: “Basically it is the same as for a race car. MDF powder coating is permanently pushed to its limits, it totally exhausts all components and does not forgive any mistake. If you have the right package and everything fits together, the results are spectacular!”

The interplay of the components

As already mentioned, the interplay between all components is very important. Only a concerted action of all elements results in a perfectly powder coated MDF panel. Each component has its own characteristics, to which particular attention has to be paid.

The MDF panel:

The panel should have a correct humidity level, short fibers and have a high Internal Bond Strength. In addition, it is important, that the MDF panels feature a certain tensile strength.

The powder:

Ledro Keukens uses Drylac Wood from Tiger Coatings, which is based on the "low bake" principle, that is to say cured at low temperatures. The powder was especially designed for the use on MDF material and is continuously being developed in line with the latest technological advances.

The oven:



The gas catalytic oven of the US-based company Vulcan Catalytic Systems is the heart of the entire installation. Thanks to precise-controlled ceramic catalysts and properties of the Infrared that is emitted, the MDF panels are preheated and subsequently powder coated and then cured. Compared to convection ovens and UV systems, gas catalyst technology is not only far better to control and adjust, but also more cost-effective while not subjecting the board to prolonged exposure to hot air in a convection oven that destroys the mechanical properties and dries the wood to dangerous levels.

The application:

With regard to the powder coating installation, it is very important that all electrostatic parameters can be exactly controlled to compensate the slightest changes in the characteristics of the MDF panels. Ideally suited here is the ITW Gema powder gun OptiGun coupled with the OptiTronic control unit.

The plastic booth with optimized airflow guarantees quick color changes. In case of manual precoating tasks, a separate manual booth is added.



Paul Peters: "We evaluated the process as a whole and then chose the best components suited to our problems. First of all, we concentrated our efforts on finding a precise-controlled oven. We were very quickly aware of the fact that this only works with IR technology, but to find a product that actually meets all quality requirements turned out to be a little bit more difficult. In the USA, we struck lucky with Vulcan Catalytics. Then, we chose the best application quality. As already mentioned, MDF is a continuously changing material, which is very sensitive to environmental factors. This problem requires an extremely accurate control of the application. ITW Gema's precise-controlled OptiTronic control units ideally meet these requirements. Simultaneously, we developed the optimal powder in close collaboration with the powder manufacturer Tiger Coatings. Another big challenge lies with the MDF manufacturer, as the quality has to be maintained and density and humidity have to remain unchanged."

In questions of MDF panel powder coating, we still have to learn a lot. In the last years, however, decisive advances have been achieved, in particular in the field of coating powders and MDF material. Ledro does not try to keep its gained know-how secret. On the contrary, the kitchen manufacturer makes its installation accessible to interested companies. Why this rather unconventional attitude? "We would like to share our know-how so that the entire industry can profit from our important progress achieved over the last years. Only in this way, can we find a way out of the standstill and then MDF powder coating will advance," says Paul Peters.

Hats off for such an attitude! Is the company not afraid that competitors may copy the concept?

"Up to now, there is no competition," explains Paul Peters. "MDF powder coating is still at the very beginning, even if a few parts of poor quality are already produced in the United States. What is important is the breakthrough of powder coating in the field of MDF panels and this requires purchase of big quantities. In turn, this implies that these quantities can be produced on an European level. Only in this way will, the cost-effective calculation be justified and large buyers switch over."

It sounds logical, and when you see the enthusiasm in Paul Peter's eyes, you willingly trust his statements. Numerous MDF suppliers and among them even Japanese manufacturers took the opportunity to visit the state-of-the-art MDF coating installation at Ledro Keukens in Houthalen in June 2004 demonstrating that certain companies are not only showing interest in this concept but get literally excited.



Details of the powder coating installation at Ledro Keukens NV

- 1 quick color change system type MagicPlus® including powder center type VZ1, monocyclone and after-filter
- 1 electrostatic powder coating unit type OptiMatic with 12 automatic guns type OptiGun and 1 manual gun type EasySelect
- 2 reciprocators type ZA02-18 with depth-adjustable axes type XT-8
- 1 programmable PC control with Touch Screen, including gap, width and height control
- 1 manual coating booth for special parts type CRS-L

Electrostatic powder coating procedure:

Electrostatic powder coating is based on the fact that particles with opposite charges attract each other. This is why most of the conductive and thermally stable solids are suitable for powder coating.

Dry coating powder is filled in a hopper, fluidized or stirred and subsequently conveyed by means of pressurized air via injectors to the powder gun. In this gun, low voltage (10V) is transformed in high voltage utilizing the cascade principle. During the spraying process, one or more electrodes charge the powder with 60 – 100 kV. An electrical field is generated between the gun and the grounded workpiece. The powder particles follow the field lines and, due to the residual charge, remain bonded to the object.



The coated workpieces are either manually or automatically transferred to a curing oven. Plastic powders are cured at temperatures between 140°C and 200°C. They fuse into a smooth film and then harden. With this process, layer thicknesses of 30 - 80µ for decorative and 200 - 500µ for functional purposes are obtained.

Contacts:

End-user: Ledro Powder Coatings
Europark 2027
B-3530 Houthalen-Helchteren / Belgium
E-mail: ledropowdercoatings@skynet.be

Application: ITW Gema AG
Mövenstrasse 17
CH-9015 St.Gallen / Switzerland
E-mail: info@itwgema.ch
www.itwgema.ch

Oven: Vulcan Catalytic
Portsmouth, RI 02871 USA
E-mail: VulcanTec@aol.com
www.VulcanCatalytic-Ltd.com

Powder: Tigerwerk
Negrellistrasse 36
A-4600 Wels / Austria
E-Mail: info@tiger-coatings.com
www.tiger-coatings.com