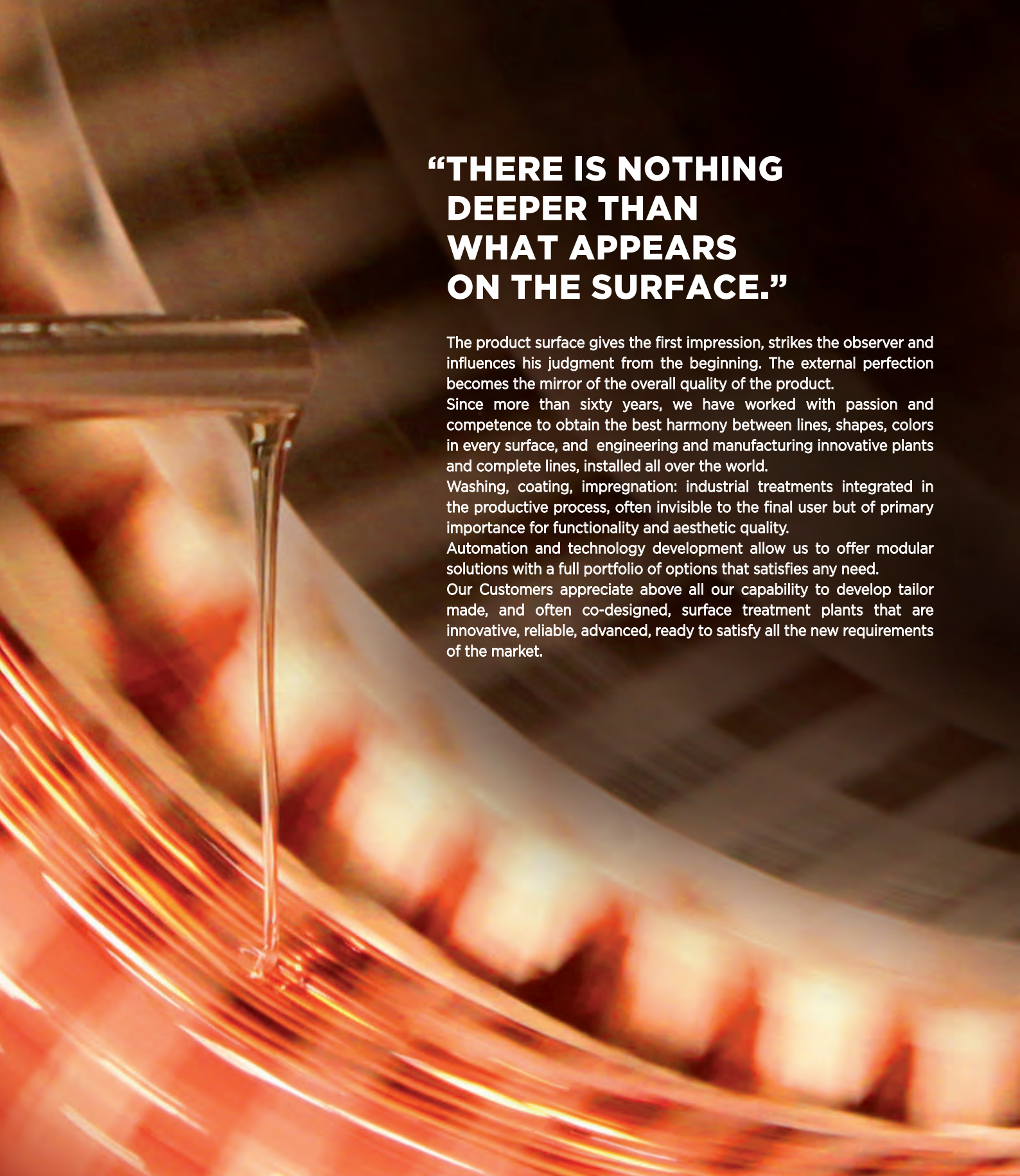




IMPREGNATION TECHNOLOGY



**STRONGER ELECTRICAL MOTOR
WITH THE RIGHT PROTECTION**



“THERE IS NOTHING DEEPER THAN WHAT APPEARS ON THE SURFACE.”

The product surface gives the first impression, strikes the observer and influences his judgment from the beginning. The external perfection becomes the mirror of the overall quality of the product.

Since more than sixty years, we have worked with passion and competence to obtain the best harmony between lines, shapes, colors in every surface, and engineering and manufacturing innovative plants and complete lines, installed all over the world.

Washing, coating, impregnation: industrial treatments integrated in the productive process, often invisible to the final user but of primary importance for functionality and aesthetic quality.

Automation and technology development allow us to offer modular solutions with a full portfolio of options that satisfies any need.

Our Customers appreciate above all our capability to develop tailor made, and often co-designed, surface treatment plants that are innovative, reliable, advanced, ready to satisfy all the new requirements of the market.

2000

The beginning of impregnation: Tecnofirma introduces the impregnation technologies in its production portfolio

2009

Tecnofirma introduces induction heating as alternative source for preheating, gelification and polymerization

2011

Tecnofirma develops the Joule Heating technology for preheating, resin gelification and polymerization





TECNOFIRMA HQ



For more than seventy years Tecnofirma S.p.A. has been a pioneer on the international market thanks to our innovative and up-to-date solutions for the treatment of plastic and metal surfaces.

Over these years, we have specialized in impregnation treatments, with solutions that have changed the rules in this industrial field.

Not just for standard solutions, but also special solutions, customized on the specific needs, with activities based on an important co-design, with our most important customers.

Our “reference list”, built over the years, is composed of companies of all size and manufacturers of various types of products, including the most famous automotive manufacturers in the world.

Tecnofirma has always pursued customer satisfaction from the first contact to the final testing of its products.

Our passion for technology and our devotion to our customer needs drive all of our employees to work for the best results.

The district of Shun Yi in Beijing is home to Diamond (Beijing) Machinery Equipment Co. Ltd, the TT Group company that provides the immense Asian continent with technology “Made in Italy”.

It is located just 20 km from the airport. The all-indoor 3000 square meter company headquarter has 300 square meters of office space with room for future manufacturing expansion.

Thanks to the Tecnofirma know-how, the Beijing team is able to meet Chinese companies’ demands in surface treatments and also the demands of all the multinational companies delocalized in Asia, with both sales and after sales services for our products.

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DIAMOND BEIJING



2013

Tecnofirma develops a new solution expressly designed for Hairpin stator impregnation (patented technology)

2017

Tecnofirma patents a system to check parts’ temperature in joule dipping impregnation process

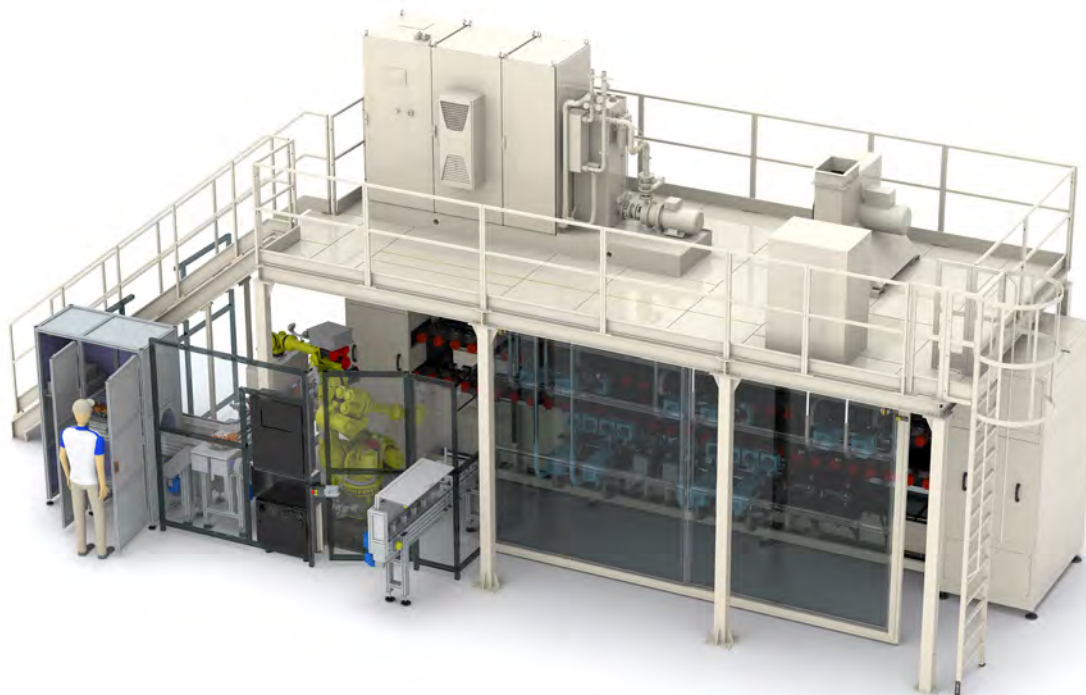
2018

Tecnofirma develops fluid bed powder painting for Hairpin welding insulation

2020

Tecnofirma design a new concept of machine called Modular for responding to new market needs in terms of scalability and flexibility





RING



TRICKLING



ROLL DIP

Parts treated :

Round wire Stators, Hair Pin stators , Rotors

Standard processes :

Preheating / Impregnation / Gelification

Polymerization / Cooling

Optional processes :

Joule effect / Induction Heating

The RING machine is designed to handle high production rates and high-quality levels. The parts are positioned and fixed horizontally on special rotating chucks. The parts are kept rotating during all stages of the process.

The machine is composed of a preheating area, a resin application area (Trickling or Roll Dip), a gelification area and final polymerization area.

In addition, it can be equipped with external cooling tunnel to complete the whole process.

The heating of the stators can be done using hot recirculated air, induction heating, Joule effect heating, or by the combination of these heating sources.

The RING machine doesn't have the tilting function, so is suitable for rotors, round wire stators or hairpin stators with short lamination stack.

The Ring can be customized according to the customer needs.

The number grippers in the different process areas and the right design of the impregnation stations are studied case by case according to the parts need. The machine can be fully automatic and totally integrated in a stator production line without any operator.



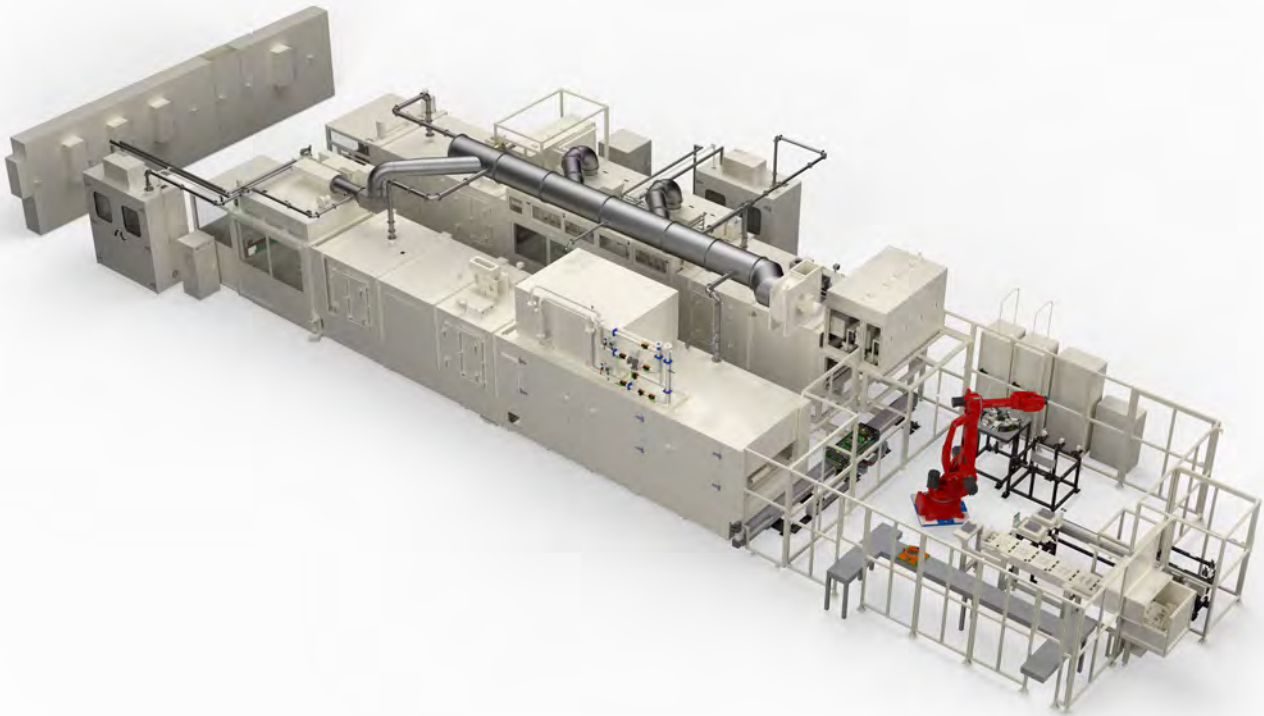
Ring Trickling machine
for Powertrain Stators



Ring Trickling machine
for Stators



Ring Trickling machine
for Rotors



U LINE



FLEXIBLE TRICKLING



ROLL DIP

Parts treated :

Hairpin Stators / Rotors

Standard processes :

Preheating / Impregnation / Gelification
Polymerization

Optional processes :

Induction Heating



GEL COATING

Parts treated :

Hairpin Stators

Available processes :

Preheating / Gelification / Curing
Cooling

Optional processes :

Plasma cleaning

The U LINE machine (patented solution) has been designed to respond to the high-quality requirements of hairpin stators. It is able to reach high production rates, guaranteeing at the same time, high quality levels.

The parts are placed horizontally on special pallets into special chucks to allow processing of medium and large size pieces and are constantly rotated during all stages of the process.

The machine offers the possibility to tilt the stators during the trickling application process, ensuring fast and long penetration of the resin into the slots. All process parameters are adjustable as rotation speed, rotation direction, tilting angle, flow rate of drippers, and others for each single impregnation station. The machine can be run in random mode with different stator types without any change over time.

The U LINE can be customized according the customer needs in term of production rate. It is easily integrable in a stator manufacture line, with all standard requirements in term of traceability and automation. All these features made the U-line the most suitable solution for the automotive companies.

Combination with other processes

The U LINE machine offers the possibility to combine the standard resin application with the application of the product for the welding joints protection (Gel coating).

This process is usually placed after resin gelification because is necessary to have the high temperature before the application. The integration of gel coat application allows energy saving and cost saving by doing a unique final curing of the two products.



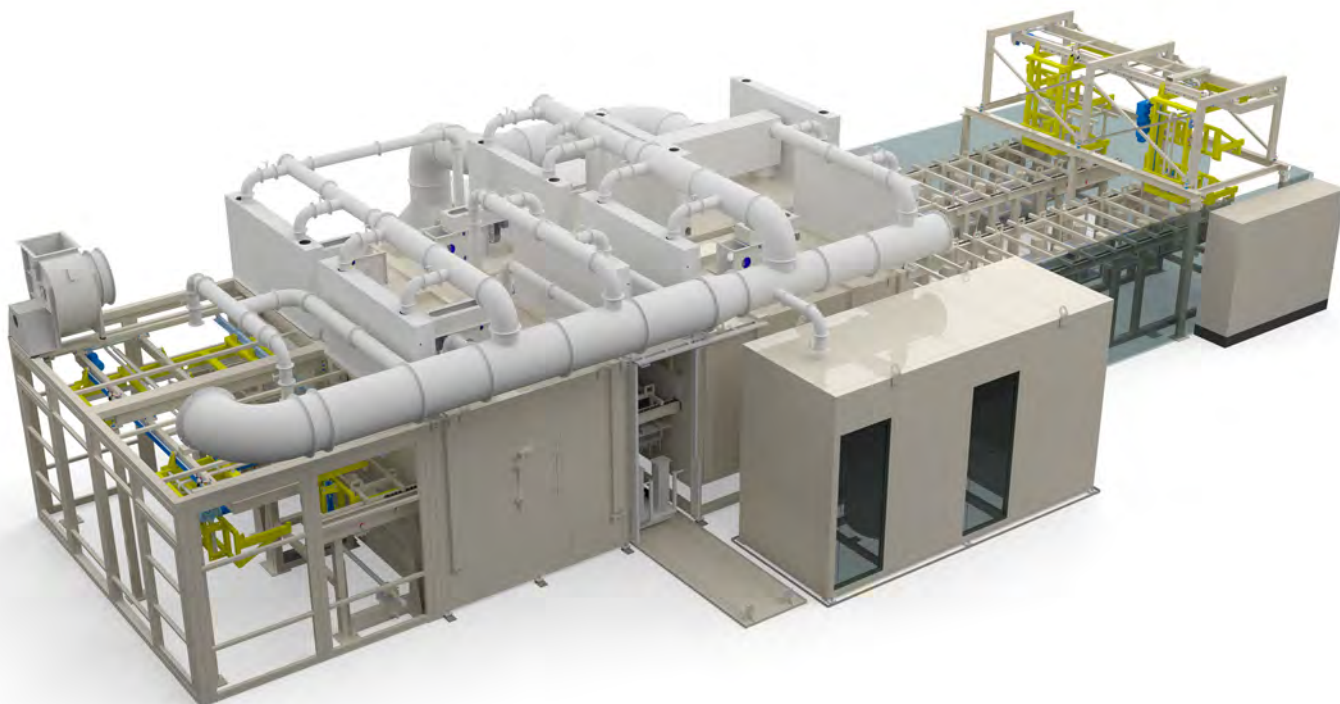
U Line Trickling machine
for Hairpin Stators



U Line Roll Dip machine
for Winding Stators



U Line Trickling machine
for Hairpin Stators



CAMELOT LINE



COLD DIPPING



HOT DIPPING

Parts treated :

Round wire Stators, Electrical windings, Transformers, Coils, Bobbins

Standard processes :

Preheating / Impregnation / Gelification Polymerization / Cooling



JOULE DIPPING

Parts treated :

Round wire Stators / Hairpin Stators

Standard processes :

Preheating / Impregnation / Blowing for cleaning / Gelification / Polymerization Cooling

The Camelot machine has been developed to combine user friendly, flexibility, economy and environmental sustainability.

The machine is able to treat a wide range of products and meet the different production capacity requirements.

The machine cycle requires the pieces to be loaded into a special basket or hanged to special hooks.

The modular nature of the units, that forms the system, makes it possible to build it up rapidly and facilitates any adjustment to specific customer needs.

The Camelot line can be designed in two versions: Cold dipping and Hot dipping.

The immersion phase in cold dipping is carried out, as the name suggests, at room temperature. The immersion phase in hot dipping on the other hand requires a preheating of the parts before the immersion phase.

Thanks to this additional step in the process, it is possible to use resins with a higher viscosity and achieve higher slot saturation level compared to the cold process.

New Process expressly dedicated to powertrain motor: Current Dipping

The whole thermal process is made by electrical current supplied on the motors (DC or AC current).

The temperature profile is managed by a special system (Tecnofirma patent).

The possibility to keep the stators warm during the dipping process and have a fast gelification permits to have a very high saturation level with low resin contamination on the lamination stack.



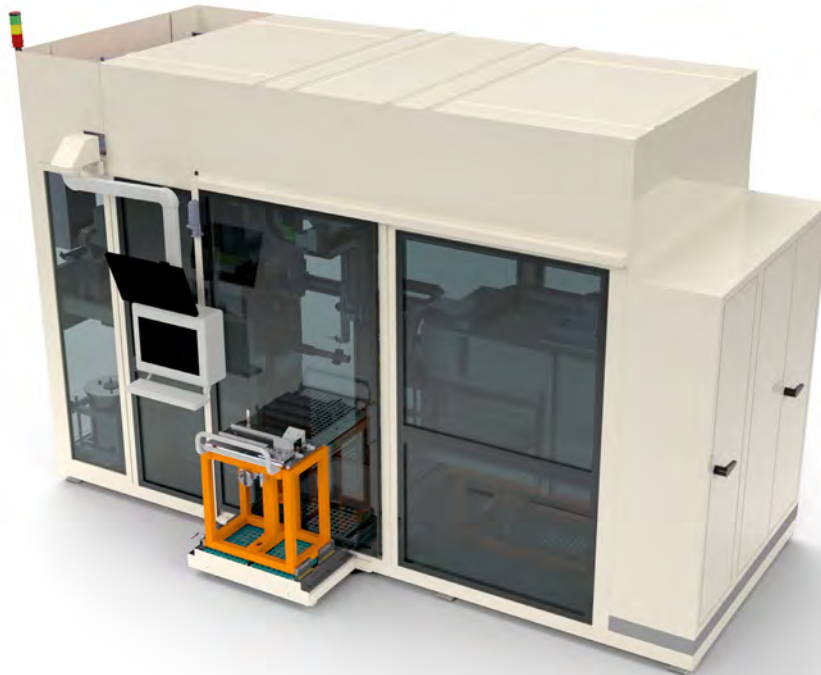
Camelot Cold Dipping machine
for Stators Linear model



Camelot Hot Dipping machine
for Stators U Shape model



Camelot Hot Dipping machine
for Stators Linear model



PILOT



TRICKLING



FLEXIBLE TRICKLING



ROLL DIP



JOULE DIPPING



POWDER COATING



GEL COATING

The Pilot machine has been developed to be easily fitted with a wide range of devices that makes it possible to properly set up the machine for the main methods of impregnation.

Besides the opportunity of testing processes and products, the pilot machines can be equipped with multi spindle devices that make the solution excellent for small productions, with different potential level of automation.

The main processes installable on Tecnofirma Pilot machines are Trickling, Roll Dipping, Current Heating & Powder Coating.

Tecnofirma Pilot machines are designed and realized in order to use traditional Polyester and Epoxy and all other medium-high performance products suitable for the selected impregnation method.

The operator can easily change process data in order to comply with the product manufacturer's instructions in the maximum safety and environmental respected condition.

Parts treated :

Round wire Stators, HairPin Stators, Rotors, armatures, electrical windings

Standard processes :

Preheating / Impregnation / Gelification / Polymerization

Optional processes :

Gel coating / Joule effect / Induction / Microwave



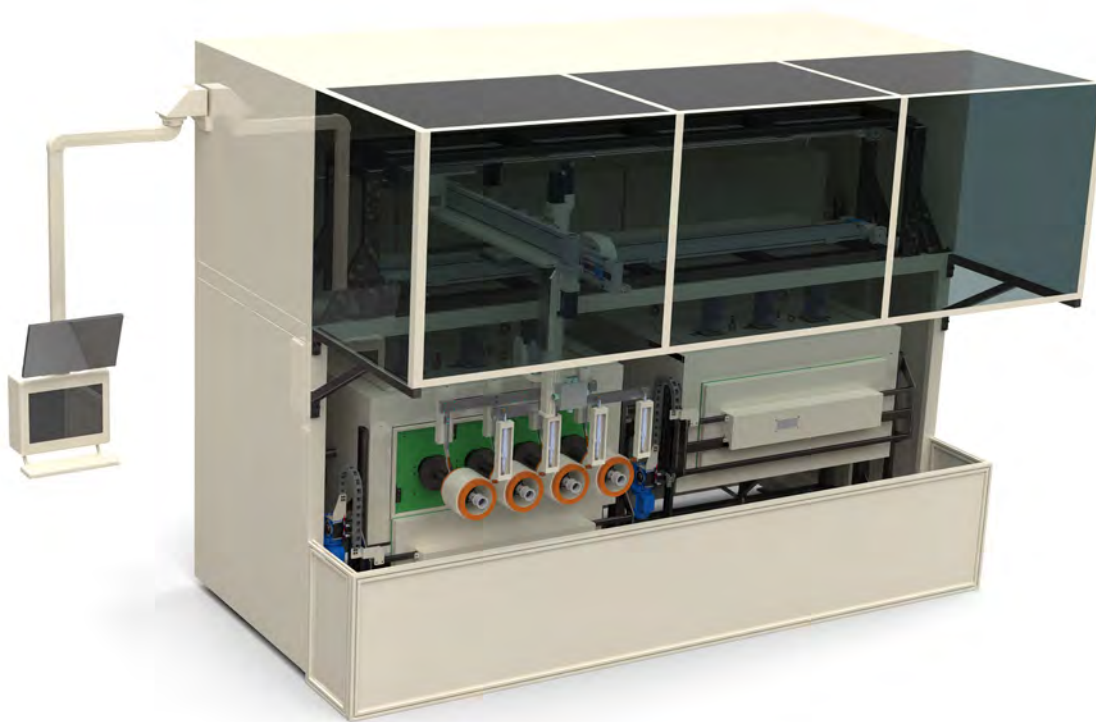
Pilot Trickling machine for Stators multispindle model



Pilot Trickling machine for Stators monospindle model



Pilot Joule Dipping machine for Hairpin Stators



MODULAR



FLEXIBLE TRICKLING

Parts treated :

Hairpin Stators, Rotors

Standard processes :

Preheating / Impregnation / Gelification
Polymerization / Cooling

Optional processes :

External preheating / External curing

The Modular machine has been developed for responding to new market needs in terms of scalability, process flexibility and efficiency.

Each single module is composed by a set of grippers kept under rotation on a horizontal axis during all process phases: preheating, impregnation, gelification and curing.

The standard module is available in 2 different configurations according to part dimension:

stator OD < 300 mm

stator OD > 300 mm

In each module is completed the whole impregnation process, from preheating to curing. This allows an easy line reprogramming in case of design product change.

The split of the line in more modules increase production efficiency.

In case of forced stop, this is limited to a single module.

Mass production and combination with other process

The line can be easily extended by adding modules according to production volumes.

In case of mass production requirement, the modular concept allow to place preheating and curing oven next to the Modular machine in order to achieve high time rates.

The parts handling between ovens and modules is provided by a 7-axis robot.

The Modular machine can be also integrated with a Powder Coating equipment.

SCALABILITY

FLEXIBILITY

MODULARITY

RELIABILITY



Modular machine 3-spindle
for Hairpin Stators



**Complementary process for the
protection of the Hairpin welded zones**

POWDER COATING

Powder coating process represent the best technology for the protection of the welding joints on I-pin and hairpin stators for medium and high voltage stators.

The purpose of the treatment is to restore the electrical insulation against the stripping and the welding of copper bars and to increase the resistance over time to mechanical thermal and environmental stress.

The Powder Coating equipment can be a stand-alone machine or can be integrated in a complete impregnation equipment.

Combined with the varnishing process permits to have a significant energy saving.

Powder coating can be applied on the pins side of the stators but also on the terminals side if necessary, by adding a special protective mask.

The dipping process is fully automatic, and it is made by a Robot or by a pick and place system.

Tecnofirma solution is designed to be environmental friendly, so it is always equipped with all the necessary filter for powder concentration abatement, and is always designed in compliance with the ATX rules in order to guarantee the highest level of safety for the operator.

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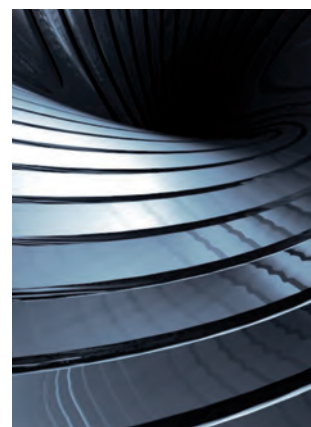
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TECNOFIRMA
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