Line for non-woven fibreglass fabrics, coated for acoustic, electrical and chemical insulation

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Project category 2.b
Title: *Line for non-woven fibreglass fabrics, coated for acoustic, electrical and chemical insulation* ***(acronym TNTF)***

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Project proposal summary

The project is part of various initiatives that Aigle has been undertaking for some time to seek commercial areas of application for its textile technologies (coating, coagulation and laminating) in market sectors that are also distant from the more traditional supply chains and/or in existing production systems and therefore to be developed thanks to its technologies.

Among the various operating sectors in which Aigle is a leader, the production of coating, coagulation and laminating systems plays a very important role.

We start from decades of consolidated experience in coating systems for the production of resin-coated technical fabrics for various uses (furniture, clothing, automotive, construction, etc.) and synthetic leather for various sectors (clothing and furniture, automotive). In summary, we are beginning to apply these techniques and technologies, adapting them to the production of non-woven fabrics coated with microparticles that can be textile, plastic or mineral in nature. These coatings have special characteristics and can be used for a variety of purposes: thermal, acoustic and electrical insulation; other uses include filtration and the replacement of materials to reduce weight. Some of these uses concern products that have an impact on environmental sustainability, such as electric batteries (insulation and cooling).

The idea and the project

With studies underway on prototype lines and more, Aigle is able to move forward with further research into lines with a view to producing an industrial coating line for non-woven fabrics with microparticles.

The prototype and then the final line will include the following main modules:

- Unwinding module with material splicing system
- Coating module with a doctor blade system on a cylinder and in air or slot
- Powder distribution system module for microparticles
- Drying module with heat recovery system
- Winding module with automatic roll change system
- Electronic process controls and sensors

This has resulted in the creation of elements of a prototype line that is capable of producing the above-listed coated products with high productivity, resolving issues and achieving objectives such as:

- Productivity of approximately 10,000 metres per shift.

- Maximum of 2 operators required to manage the line.
- Automation of loading and unloading operations for rolls of virgin/coated material
- Management of coating issues with micro-particles within the compound in terms of coating and feeding the coating paste.
- Feeding of particles after coating when they are not introduced during the compound preparation process.
- Effective and efficient drying (to minimise fuel consumption).
- Management of support tensioning systems along all modules of the line.

General objectives and scope of intervention.

With regard to the development and advancement of significant scientific results within the project, it is already part of a continuous effort to integrate coating technologies in the textile sector in order to seek different and innovative fields of application. There is still considerable scope for research and development for a variety of uses.
It is believed that the coating of non-woven fabrics with micro-particles can open up new horizons and new markets, as has already happened in similar experiences in the past.

There are already customers who have expressed a genuine interest in finding solutions that suit their production needs. This would therefore demonstrate the continuity of the value chain, which started with a market need and technical and economic feasibility (industrial and market viability) and led to prototype design and then development.

The mechanical, functional and aesthetic properties of this particular category of non-woven fabrics obtained from the line in question can be used in a wide variety of sectors.

Reference trajectory in relation to the main innovative aspects of the project

The purpose and focus of the project is as follows:

Process innovation:

A prototype coating line has been studied, already at an advanced stage based on previous experience. The objective was to combine different coating, powder distribution and drying techniques geared towards a type of support that allows for extensive product development.

The coating bench can coat using three different technologies with extreme flexibility:

- High-precision doctor blade coating
- Cylinder coating with air doctor blade.

- Coating with distribution slot for using high-viscosity products with an innovative self-positioning system based on the thickness of the substrate, which is measured with a special laser sensor. This also allows for non-continuous sectoral spreading.

These various coating options allow the characteristics of fibreglass/carbon non-woven fabrics to be exploited and even amplified.

The line includes a powder and micro-particle distribution unit consisting of a hopper containing the powder, at the base of which is mounted a motorised dosing cylinder with adjustable speed controlled by an inverter. An innovative composite material doctor blade is placed on the cylinder to regulate the powder output, while a variable speed rotating brush controlled by an inverter and opposite the cylinder removes the powder and distributes it onto the fabric below. The characteristics of the machine are crucial for optimal distribution of the micro-particles.

For particles that are sensitive to the electrostatic field, an electrostatic dispersion unit is used to further improve distribution. This unit consists of an insulating structure for the electrostatic field and a variable voltage electrostatic generator, whose function is to improve the uniformity of powder distribution.

A suction system completes the module with a suction blade located at the outlet of the powder distributor, equipped with a vertical adjustment system.

Coating is followed by a horizontal hot air oven to better manage chemicals that vary in terms of handling and technological yield during the drying phase.
Specifically, the line uses high-precision ovens with high-precision air circulation over the material and high temperature uniformity across the width of the coated product (+/-1 degree over a maximum of 200°C). The distribution of hot air allows the use of compounds containing expanders to achieve thicknesses of up to 4-5 mm. All this can enhance the technical insulation characteristics of materials used in the automotive, technical-construction, home-decorative and other sectors.
The ovens feature innovative air distribution technology that uses two fans, one for the upper blower and one for the lower blower.
The air is pressurised in the ducts so that it exits the blowers with extreme precision. This feature allows the use of a wide range of chemical products: from lacquers that have a low drying coefficient and therefore require high hot air speeds (up to 40 m/sec), to high-thickness compounds of 1-1.5 mm, which require large quantities of air in relation to the surface area but at the same time a reduced air ejection speed from the blower of 8-10 m/sec. so as not to detach the micro-particles, especially in the first sections of the oven.
To improve the sustainability of the project, the oven is equipped with a heat recovery system with three exchangers, one for each exhaust fan. The system also features an innovative automatic washing system for the exchanger e s which, in the event of wax build-up caused by the exhaust fumes from the chemicals used in the coating process, does not reduce the efficiency of the heat recovery system.
Complementing the coating and drying modules are the modules for unwinding the virgin substrate and rewinding the coated substrate.

The units feature innovative elements that improve operator ergonomics and automate reel change operations. This reduces the number of operators required to manage the line to two.

Quality control

Since the use of products coated on fibreglass/carbon non-woven fabrics with microparticles is mainly intended for the construction, automotive and transport industries and more generally for industry in general, special systems are being developed to enable in-line quality control with particular reference to the tension of the material before and after coating, the temperature of the ovens, and the control of reel dimensions to decide when to change reels: this is a type of requirement that the industry demands. Therefore, we adopt advanced and innovative process monitoring and management systems (temperature, thickness, speed and synchronisation sensors, process monitoring via PLC, etc.).

Potential impact of the project

Thanks to the development of new prototype coating line elements in the areas described above, Aigle now has the opportunity to produce specific systems for advanced and highly innovative products.

This innovation brings about a substantial change to the models used to date and allows for the use and development of innovative products with particular reference to technical and structural textiles, which represent one of the fastest-growing markets in the textile sector globally.

The innovation proposed in the project aims to develop a new model using coating techniques applied to technical fabrics in the field of insulation for various industrial sectors, with a particular focus on the energy transition in the automotive sector. This allows for the expansion of the markets in which coating techniques can be used and therefore foreshadows outcomes consistent with those stated (diversification of supply in growing markets, creation of new concepts and products for the living environment, transport, and the construction sector).

The benefits indicated represent, on the one hand, opportunities to occupy new value-added market segments by specialising the offer and, on the other hand, social challenges for which it is necessary to find intelligent, efficient and effective solutions to respond to global competition.

The project proposes a significant innovation in a market, that of technical textiles and energy transition, in which European production boasts a significant position globally. The project has the potential to help strengthen this position with positive impacts on th s in terms of turnover, employment, acquisition of new segments and market shares with higher added value (especially exports). The competitive advantages that Aigle will enjoy on international markets are therefore clear.