Calandrados Textiles S.L

ECOFLUORTEX

R&D OF FLUOROCARBON-FREE FINISH FOR OUTDOOR FABRICS

AUGUST 2014 - DECEMBER 2015

CDTI EEA-GRANTS

1. MOTIVATIONS FOR THE PROJECT (REASONS FOR THE STUDY).

CALANDRATEX was founded in order to offer the only service of calandering, although progressively was industrially evolving and making wider the list of services, such as: bleaching, calandering and finishing services (degreasing tumbler machine processing, hydrophobic treatments, softening…). The Company is able to face new developments and challenges because of its long experience and the know-how acquired, despite the crisis that affect the textile industry. CALANDRATEX is a leading company that invest in researching and development in order to grow up.

The company base its business strategy on two key aspects; the first one is the ability to offer an agile advising, and the second one, the ability to start off new developments in which quality is a fundamental requirement. At the same time, as the company is completely concerned by environmental issues, a water purifying plant (for chemicals and biological pollutants) is installed in its facilities.

CALANDRATEX is formed by a complete team of technicians, laboratory staff and experts that collaborate in the research of new products and processes.

In spite of being a Company which belongs to a traditional industry, the research carried out in the recent years have allowed CALANDRATEX to introduce and specialise in the treatment of technical textiles.

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The project developed, ECOFLUORTEX, have been focussed on the **research and development of a new product treatment process as an alternative of the current hydrophobic and stain resistant treatments based on fluorocarbons** that are utilised frequently in awnings and canopies (outdoor fabrics). In order to reach the goal, the project based the research on silicones compounds as the components to substitute fluorocarbons from formulations and thus obtain an environmental friendly treatment.

This new development have been carried out in order to solve the environmental and health risks related with the use of fluorocarbons and thus offering a product that meets with what society demands: safe products. Therefore, this project developed by CALANDRATEX represents the anticipation before future changes towards new safer solutions in the industry, based on what society is claiming.

This new project had clear commercial and strategic motivations for the Company, because the development was undertaken in order to be prepared front future customer's demands of products environmental friendly or riskless, besides this new product for textile finishing provides a positive image as an innovative company with ecological solutions.

The use of the traditional fluorocarbon solutions in hydrophobic finishes in textiles is expected to be banned or out of the market because of the environmental risks that represents and because of the social claiming for safe products. Therefore, the decision of developing this new silicone based hydrophobic treatment as an alternative, provides the company the know-how and technology to face the future and being one step further than the competence.

2. OBJECTIVES.

CALANDRATEX carried out this project in order to develop a new product for awning fabrics able to substitute the traditional hydrophobic and stain resistant finishes based on the use of fluorocarbons compounds, with the intention of avoiding the water to trespass the fabric, avoid the weight increase of the fabric and create a non-stick surface to avoid the dirt to stain the fabric.

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The research was focussed on the use of silicones to achieve the same effect and treatment than the fluorocarbon based finishing. The main goal was to obtain an alternative able to provide the same effectiveness in the hydrophobic and stain resistant properties.

From the technical point of view, the objective was to obtain a compound able to provide the expected repellent and stain resistant properties, and at the same time offer a satisfying durability in outdoor conditions.

The project was carried out with only one milestone targeted in the product development and the application process on textiles, as well as the industrial fabrication. Also the creation of a process compatible with the company's facilities was studied.

In order to succeed with the new product and treatment, the following requirements needed to be fulfilled:

- **Antibacterial finishing:** The fabric must be manufactured using yarns treated with antibacterial properties. Moreover, the fabric must be characterised by stain resistant properties in order to avoid the dirt to fix on the fabric.

- **Water repellence**: It must offer hydrophobic behaviour and air permeability by treating the fabric's surface at the end of the fabrication process.

- **Maximum resistance and dimensional stability:** The fabric must have high resistance front degradation and braking, as well as guarantee the dimensional stability

- **Breathable**: The fabric must offer satisfying breathable properties, making easy to trespass the air and moisture through the fabric and offering sun protecting andclimate regulation by reducing the heat sensation.

- **Quick dry:** The fibres to use in the yarn manufacture must allow the fabric to dry quickly

- **UV fastness**: The fabric must have high fastness level front UV radiation.

- **Easy maintenance:** The fabrics intended to be awnings require easy maintenance based on dirt removal by dry cleaning (vacuum cleaner) or using neutral soap and cold water (30ºC max) and a drying process before roll up, always without using abrasive products.

From a technical point of view the goal has been achieved, obtaining a new silicone compound that, used as finishing process on fabrics, provides repellence and stain resistant properties, as well as an effective treatment and excellent durability.

From the commercial point of view, the company have taken advance in the market to face the demand of alternatives to fluorocarbon based finishing. Thereby, CALANDRATEX is now offering a solution that is not available from the competence, and which represents an added value for customers.

3. Obtained Results

The obtained product as a result of this research and development work carried out in this CDTI/EEA-Grants project has been based in the use of silicones to create a new finishing for outdoor textiles characterised by the hydrophobic and stain resistant properties.

The developed product is applied as superficial covering over the textile producing a modified surface of the fabric that reduce the contact angle of water, creating the hydrophobic behaviour, and avoiding the dirt to contact with the textile.

The research was focussed on the properties of the silicones, and more specifically, trying to obtain a compound able to provide a rough surface at microscale and nanoscale, which is the main condition in order to obtain the hydrophobic behaviour.

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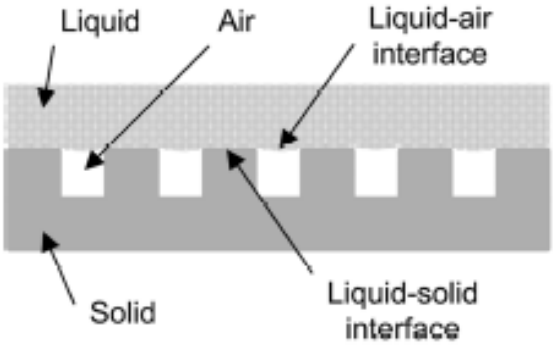
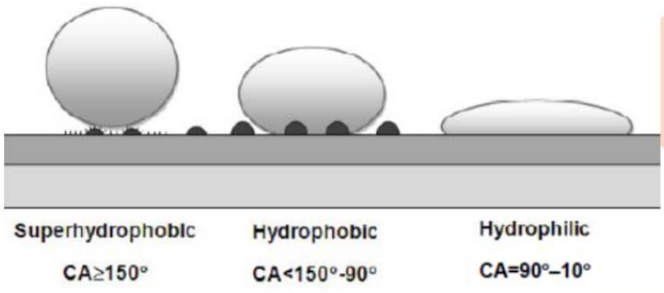
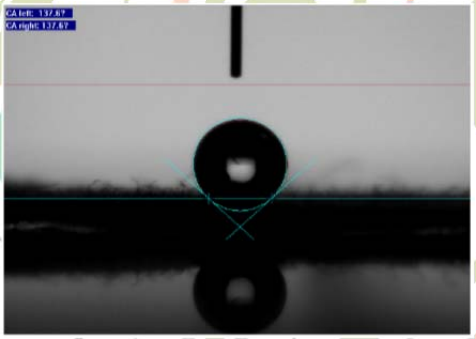
As represented in the following figures, reducing the contact surface between the solid base and the liquid (between phases) is the key to obtain hydrophobic features. It is in the solid-liquid phase where the adhesion forces are produced and generated the wetting effect.





In the figure at left It is possible to observe how the reduction of the surface contact by increasing the roughness in different scales improves the hydrophobic behaviour and therefore, the adhesive forces in the solid-liquid phase are lower.

The hydrophobic ability of the finishing has been tested in this project through the measuring of contact angles of water on the treated fabric with the silicone compound developed. Using the a contact angle measurer equip, which uses a camera and specific software, the different contact angles in different samples and the how these angle vary with time.



The project has been based in the study of silicones and how they perform in order to create the hydrophobic feature and thus obtain the aimed textile finishing. The research has been focussed on the use of these silicones in treatments for fabrics to be used in awnings. The main goals achieved are: resistance, durability and affinity with the manufacturing process. All the activities developed have provided a compound with the properties and performance needed to be used as alternative to fluorocarbon treatments.

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The new product allows the industry to treat textiles with hydrophobic and stain resistant properties without the environmental problems related with fluorocarbons. At the same time it is cost effective, durable and provides the quality demanded.

The new product based on silicones is totally innovative, being an alternative to the only product used by the industry for this sort of finishing for the last 20 years, the fluorocarbon compounds. However, the advances in silicones, and their uses at micro and nanoscale, have made possible to expect new products with excellent results. The use of this kind of products, which are typically named as hydrophobic softeners, they are absolutely new. The company take advantage from competence with the results of this project, obtaining the technology to solve the environmental problems related with hydrophobic finishing based on fluorocarbons.