



TEXTILEATHER



This project has been funded by the European Commission through the LIFE + Programme

# Functional textiles and leathers by innovative MLSE® process

LAYMAN'S REPORT

TEXTILEATHER-LIFE13 ENV/E/001138



**ATEVAL**



**INESCOP**  
CENTRO DE INNOVACIÓN  
Y TECNOLOGÍA



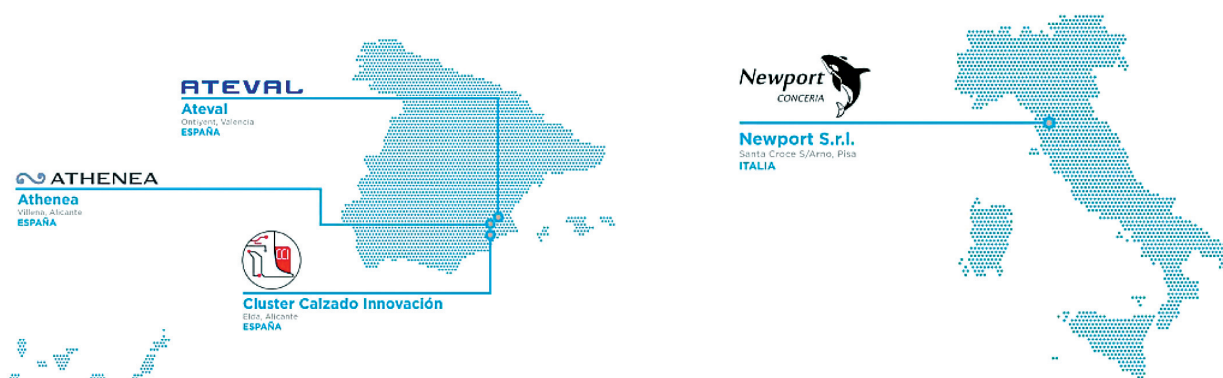
**Newport**  
CONCERIA

**ATHENEA**

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This document presents the main results obtained in the framework of the LIFE TEXTILE-ATHER project, an initiative funded by the European Union through the LIFE + Programme on Environment and Climate. The project, led by **ATEVAL** (Association of Textile Entrepreneurs of the Valencian Community), has been developed by a Consortium of five members, including the Spanish cluster of footwear industries **CCI** (Cluster Calzado Innovación), the Italian tannery **NEWPORT srl** and the Spanish textile company **TEXATHENEA S.L.**, under the technical guidance of **INESCOP** (Technological Institute for Footwear and Related Industries)



## CONTEXT

### PROBLEM TO SOLVE

En la actualidad, uno The introduction of more efficient and sustainable production processes with a lower environmental impact is one of the main challenges that the European textile and leather industries are facing nowadays.

In both sectors, the **finishing** process is one of the production stages of greatest impact, due to the fact that they are wet processes, requiring large amounts of energy and water (both in treatment baths, as in the subsequent washing process). Other important environmental aspects are related to emissions of volatile organic compounds, effluents to be treated and the generation of solid waste and odours, which can represent a significant drawback in certain treatments. Additionally, traditional finishing treatments for obtaining functional textiles and leathers, such as fireproofing, water repellency, stain resistance or antimicrobial agents, generally involve the use of chemicals such as halogenated organic compounds, organophosphorus compounds, fluorocarbon polymers, organic biocides, etc., which are currently limited or under restriction under existing European legislation.

## PROJECT OBJECTIVE

**LIFE TEXTILEATHER** project is aimed at demonstrating the feasibility of the Multiple Laser Surface Enhancement (MLSE®) Technology - originally developed in the field of metal industry - as a more sustainable alternative surface treatment to provide textiles and leathers with functional properties.

## MLSE® TECHNOLOGY

**MLSE®** is a surface treatment based on the combination of two types of energy (laser and high frequency plasma) which, under atmospheric conditions and in the presence of inert gases (N<sub>2</sub>, O<sub>2</sub>, Ar and CO<sub>2</sub>) produces nanoscale physico-chemical modifications on the surface of the substrate. This allows the addition of a thin but consistent precursor layer on the surface, thus resulting in an improved material with functional properties.



**MLSE®** technology is a dry and continuous process allowing for a drastic reduction of the environmental impact, when compared to traditional leather and textile finishing operations. The current industrial facility was especially designed for the treatment of textiles. Therefore, the processing of leathers represented a **challenge**.

The type of material being processed, together with other parameters such as the plasma intensity, the laser energy and the gas combination, will determine to a large extent the modifications on the material surface and therefore, the imparted functional properties.

Parameter		Textile	Leather
<b>Precursor*</b>		Methyldisiloxane	
<b>Laser</b>	Pulse Frequency	100 Hz	
	Power (mJ)	500	
<b>Plasma</b>	Carrier gas	N <sub>2</sub> , He, Ar – 80%	
	Reactive gas*	CO <sub>2</sub> + N <sub>2</sub>	
	Flow rate (L/min)	10-40	10-20
	Power (kW)	0.5	1
	Pressure (bar)	Slightly above 1	
<b>Material feeding speed</b>		20m/min	

Experimental conditions assessed.



## Technical specifications

The development of the TEXTILEATHER initiative involved the **study and selection of parameters to be optimised in the treatment of textiles and leathers through MLSE® technology**. For this purpose, textiles of a different chemical nature (cotton, polyester, cotton-polyester, etc.) used in household articles and upholstery were selected. Furthermore, leathers of different animal origin (namely, bovine, ovine and pig), which had been subjected to diverse finishing and tanning processes were selected.

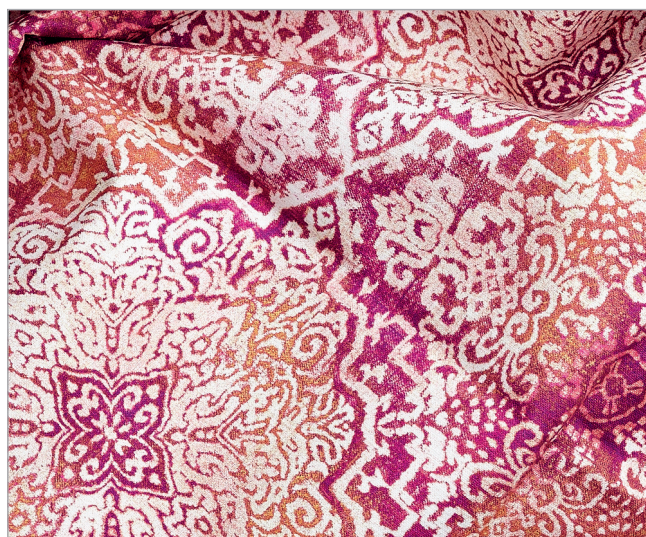
Taking into account the features of selected materials, a number of parameters were established as fundamental properties for the adaptation of the **MLSE®** demonstration plant. Additionally, functional textiles and leathers obtained using traditional methods were characterised and used as reference materials for comparison.



Technical requirements were established according to the target functional properties identified (waterproofing, fire resistance, stain resistance and antimicrobial properties) according to the intended industrial applications.



Technical specifications have contributed to the identification of the engineering design parameters for specific equipment aimed at the treatment of discrete parts, such as hides and leathers.



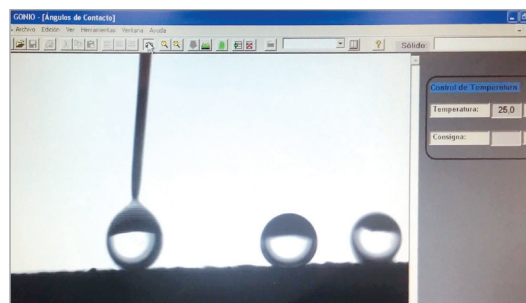
## ACHIEVED RESULTS

### WATERPROOFING MATERIALS

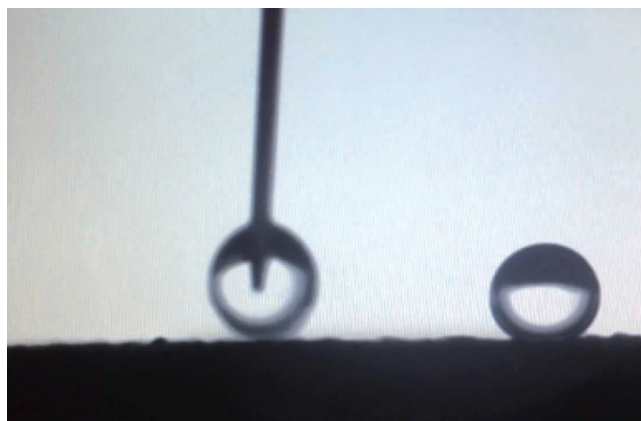
#### Leathers and textiles with high hydrophobicity

The identification of some contact angles allows the wettability of a substrate to be measured, according to the interaction of said substrate with a water droplet. The greater the substrate repulsion to the water droplet, the greater the contact angle of the droplet.

MLSE® processed materials show contact angles greater than  $130^\circ$ , which means high hydrophobicity of the treated surface, when the contact angle is zero for untreated materials due to a total absorption of the liquid by the material.



a) Untreated leather

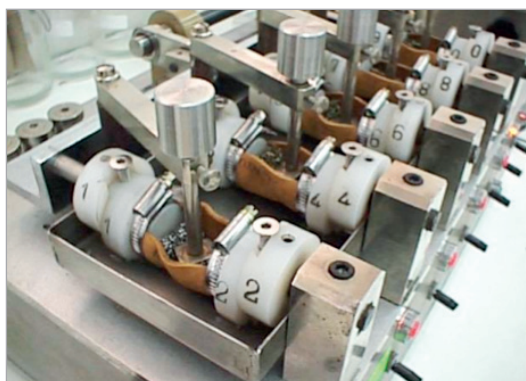
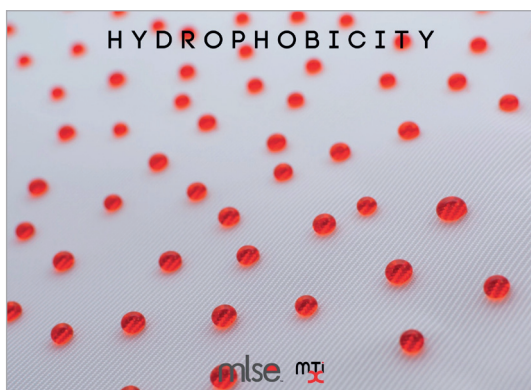


b) MLSE® treated leather with hydrophobic properties

#### Waterproofed leather for footwear for professional use (EN ISO 5403-1)

- Penetration time > 60 min
- Water absorption < 20%

MLSE® treatment does not significantly modify the water vapour permeability of processed materials.





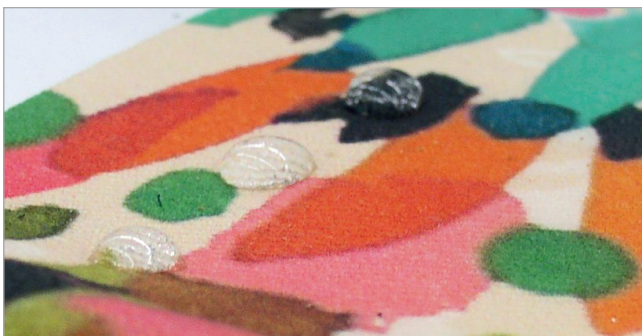
## Home textiles and upholstery with resistance to surface wetting (EN ISO 14419), up to **Spray Rate**

Textiles with resistance to surface wetting are obtained, assessed by the "spray test" method up to Grade 5, which is the maximum grade in accordance with the Standard.



## STAIN RESISTANCE

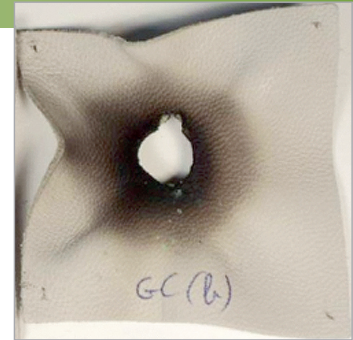
Home textiles and upholstery with hydrocarbon resistance. (EN ISO 14419), up to **Grade 7**, (8 being the maximum grade)



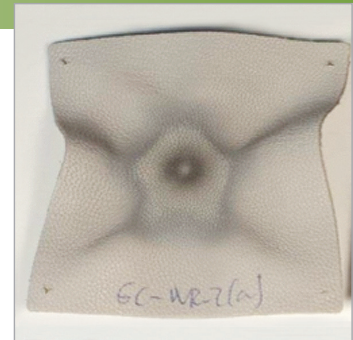
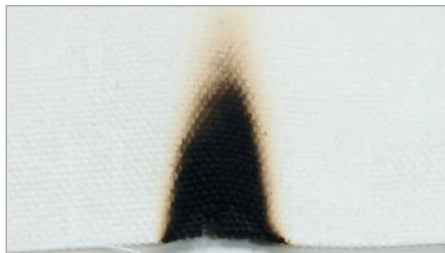
## FIRE RESISTANCE

Improved fire resistance of home textiles and upholstery.

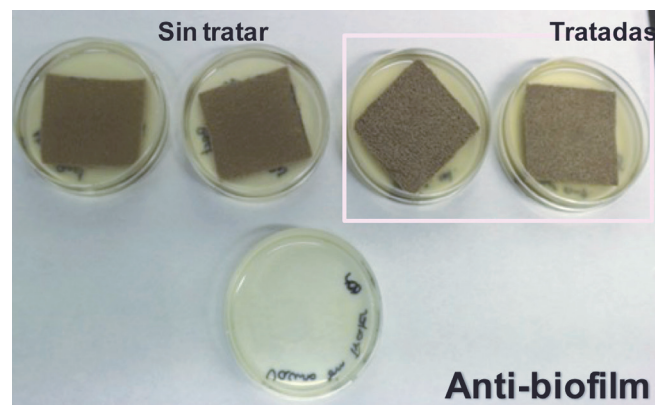
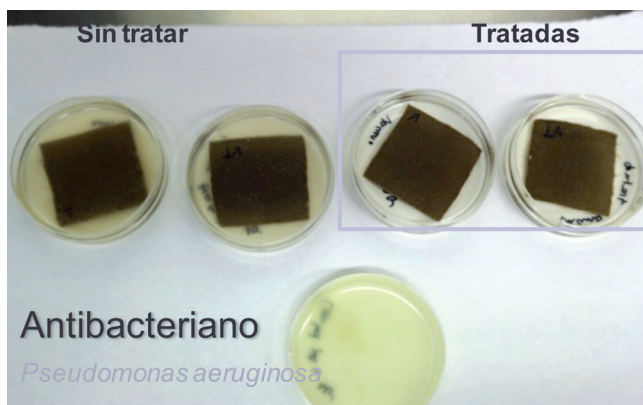
### WITHOUT TREATING



### WITH TREATMENT MLSE



## ANTIMICROBIAL PROPERTIES

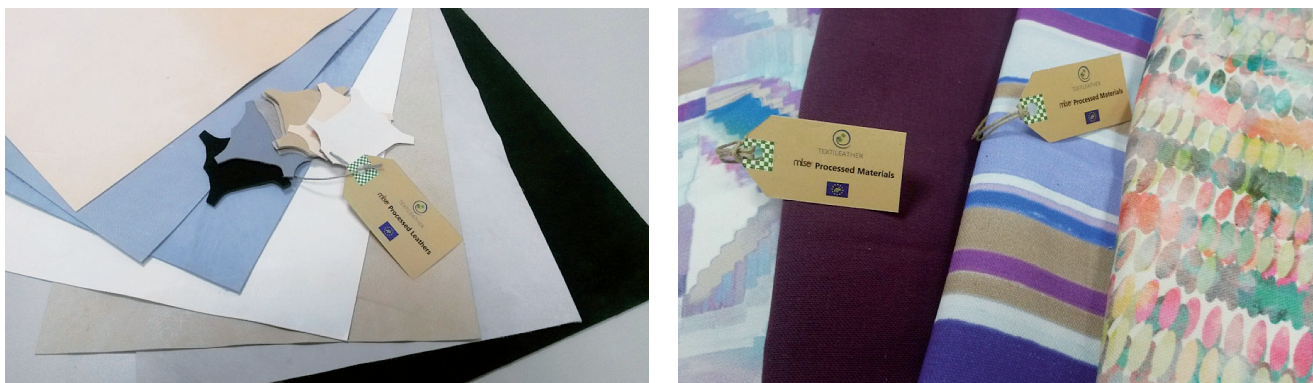


The MLSE® treatment allows the improvement of the antimicrobial properties of materials. In addition, thanks to the laser and plasma treatment the formation of bacterial biofilm on the surface of treated materials is avoided.



## VALIDATION

LIFE TEXTILEATHER project has demonstrated the feasibility of the MLSE technology for the production of textile and leather products with functional properties. The best performing treated materials were selected for further manufacturing tests.



Selected materials for validation activities. Leathers and textiles.

Different footwear prototypes have been considered such as women's and men's town footwear, children's footwear, occupational and safety footwear. In general, good performance of leathers and textiles was observed when manufacturing most prototypes. Differences in handling were negligible among MLSE® treated materials and those commonly used by the companies, and modifications in production conditions were not necessary.

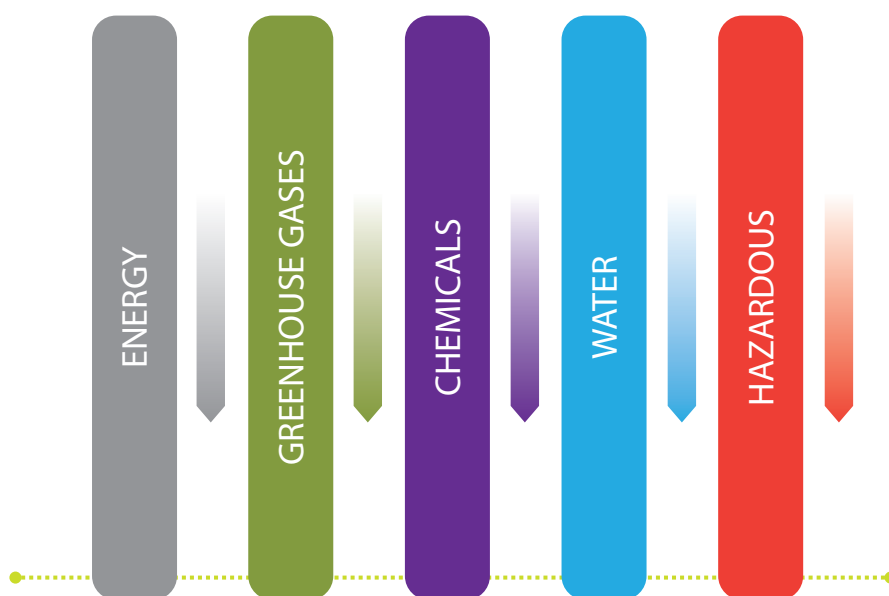


Footwear and Textile prototypes produced with MLSE® treated materials

## ASSESSMENT OF SOCIO-ECONOMIC AND ENVIRONMENTAL IMPACT

The first indicators on environmental impact with reference to “**hydrophobic finishes**” in textiles versus “**conventional finishes**”, show a reduction in energy consumption by 99% and a total reduction of dangerous chemicals (PFCs), thus resulting in a reduction of the impact of the carbon footprint by 90%.

Similarly, in the case of leather finishing with waterproofing properties, MLSE® treatment eliminates the use of PFC-type chemical compounds, hence reducing the environmental impact of the process. In addition, replacing this type of chemicals in the finishing operation avoids the subsequent generation of effluents, which shall be treated by an authorised agent.



As in the case of textiles, there is a considerable reduction of the carbon footprint of the finishing process by 90%.

The implementation of MLSE® technology by European companies will contribute to the creation of skilled jobs, thus contributing to the return of industrial activity to European countries, and strengthening their local economies.

## LONG TERM BENEFITS

MLSE® treatment is an efficient and sustainable alternative to traditional finishing processes of functional leathers and textiles, which will help reducing the environmental impact of both industrial sectors, thus contributing to meet increasingly more demanding European legislation.

The implementation of MLSE® technology in the leather sector requires the design of specific equipment for the treatment of discrete materials, for which the engineering parameters have been established within the framework of this project.

## SUPPORT FOR EU POLICIES

The Project supports the principles provided for in the Directive 2010/75/EU on industrial emissions (integrated pollution prevention and control).

It also supports the EU environmental policies, such as the Waste Framework Directive (2008/98/EC) or the Water Framework Directive (2000/60/EC).

Furthermore, LIFE TEXTILEATHER endorses the “Resource efficient Europe” flagship initiative of the European Commission.

## WOULD YOU LIKE TO KNOW MORE ABOUT THIS PROJECT?

LIFE TEXTILEATHER has been disseminated thanks to the partners’ participation in both technical and scientific forums, as well as through the publication of several press releases, newsletters and articles.

In particular, the project was presented in 22 conferences, 24 fairs, 8 workshops, and 8 networking meetings, among other events.

A total of 12 articles have been published in technical and scientific journals, partners’ newsletters and in conference proceedings. Besides, 16 press releases have been published in popular press. Most of these publications are available on the project website for direct download or through the publisher’s websites.

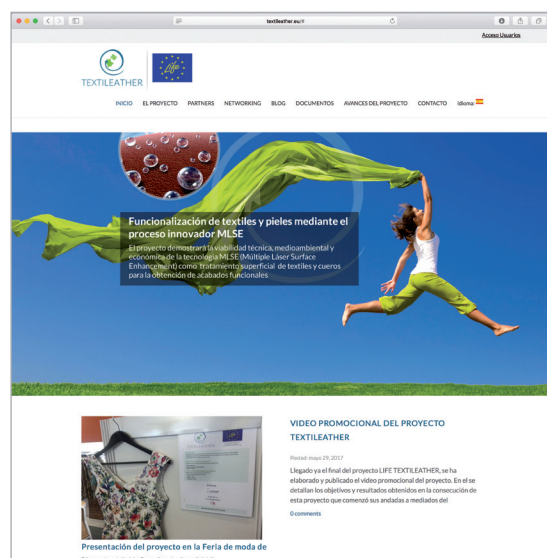
In addition, a video about LIFE TEXTILEATHER project has also been produced and is available on the project’s YouTube channel:



<https://www.youtube.com/watch?v=pVhbAFKGRqU>

All information related to LIFE TEXTILEATHER project is available on the website:

[www.textileather.eu](http://www.textileather.eu)





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