



LIFE Project Number
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FINAL Report
Covering the project activities from 02/06/2014 to 31/05/2017

Reporting Date
31/10/2017

LIFE TEXTILEATHER
Functional textiles and leather by innovative MLSE[®] process

Project Data

Project location	Spain, Italy
Project start date:	02/06/2014
Project end date:	30/11/2016 Extension date: 31/05/2017
Total Project duration (in months)	36 months
Total budget	942.842 €
Total eligible budget	942.842 €
EU contribution:	471.419 €
(%) of total costs	50
(%) of eligible costs	50

Beneficiary Data

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1. LIST OF CONTENTS

1. LIST OF CONTENTS.....	2
2. EXECUTIVE SUMMARY	3
3. INTRODUCTION	9
4. ADMINISTRATIVE PART	10
4.1. Description of the management system.....	10
4.2. Evaluation of the management system.....	15
5. TECHNICAL PART	16
5.1. Technical progress, per task	16
5.1.1. Action A1. Selection of parameters to be optimized for textiles treatment.....	17
5.1.2. Action A2. Selection of parameters to be optimized for leather treatment.....	20
5.1.3. Action B1. Adaptation of MLSE® process for textiles and leather treatment...	23
5.1.4. Action B2. Optimization of textiles and leather treatment in the demonstration plant.....	30
5.1.5. Action B3. Characterization of functional textiles and leather.....	37
5.1.6. Action B4. Validation of the technology. Goods prototypes manufacturing....	41
5.1.7. Action C1. Socio-economic and environmental impact assessment.....	46
o Life cycle inventory (LCI) MLSE® versus conventional finishing system.....	48
5.1.8. Action E2. Networking activities	50
5.1.9. Action E3. After-LIFE Communication Plan	60
5.2. Dissemination actions	61
5.2.1. Objectives	61
5.2.2. Dissemination: overview per activity	61
5.3. Evaluation of Project Implementation.....	90
5.4. Analysis of long-term benefits.....	95
5.4.1. Environmental benefits.....	95
5.4.2. Long-term benefits and sustainability	96
5.4.3. Replicability, demonstration, transferability, cooperation	98
5.4.4. Best practice lessons.....	100
5.4.5. Innovation and demonstration value	100
5.4.6. Long term indicators of the project success	101

2. EXECUTIVE SUMMARY

Traditional finishing treatments to provide textiles and leathers with special features such as water-proofing, antibacterial or fire-retardant properties are, in general, wet batch processes that involves a high consumption of heat as well as large volumes of water (both in treatment liquors and in further rinsing baths). Furthermore, they usually involve the use of chemicals such as halogenated organic compounds, biocides and organophosphorous compounds, currently restricted or under consideration at the European Union (REACH and Biocides legislation).

In this sense, Multiple Laser Surface Enhancement (MLSE[®]) technology is a dry, continuous process that can reduce significantly the environmental impact of textile and leather finishing operations, especially in the case of the treatments considered in this project.

Although the technology was developed for the metallurgic and electronic sectors, MLSE[®] has proved to be suitable for the cleaning process of wool fabrics as a step previous to dyeing. Nevertheless, the process needs to be adapted to the particularities of other textile fibres and leather, as well as to the desired functional properties to be acquired.

Therefore, LIFE TEXTILEATHER project aims at demonstrating, on a semi-industrial scale, the technical, environmental and financial feasibility of the MLSE[®] technology for the treatment of textiles and leather as a way of providing them with properties such as water-proofing, fire-retardancy and antibacterial for their application in the manufacture of products with functional properties and high added value.

LIFE TEXTILEATHER project consortium is made up of five partners (ATEVAL, TEXATHENEA, NEWPORT, CCI and INESCOP), all of them acting according to the LIFE Common Provisions and the proposal approved by the European Commission, as well as under the provisions of the **Partnership Agreement**. This document **was provided to the Commission as Annex 1 to the Inception Report delivered in January 2015**.

The project has achieved an adequate progress along the first development period. During the development of the last period of the project some serious unforeseen problems were encountered affecting the progress of the Implementation Actions (Actions B1 to B4) due to an eventual unavailability of the technology supplier, the company MTIX. This delay affected the date of completion of the project because a six months extension was requested to achieve the proposed objectives. Therefore, the project development has been from 2nd June 2014 until 31st May 2017.

Regarding project management, it has proceeded as expected in the Partnership Agreement but an amendment was requested and approved by the EC due to the above mentioned delay. ATEVAL as coordinator is the communication medium between the project beneficiaries and the Commission, both directly (when reports delivery) and by means of the designated LIFE External Assistance Team. The project progress has been reported to them in a regular basis. Furthermore, three monitoring visits have been received by ATEVAL on January 26th 2015 (all the Spanish partners attended), May 27th 2016 (all partners) and May 31st (all partners).

LIFE TEXTILEATHER project was planned to be developed in 30 months time and a six months extension requested. In order to achieve the project objectives, the workplan was divided into different actions. A summary of the tasks carried out till date is as follows:

In a first phase, two **Preparatory Actions** were scheduled, focused on the selection of the MLSE[®] experimental parameters to be optimised for treatment of textiles (**Action A1**) and leathers (**Action A2**) to provide them with functional properties including water-proofing, fire retardant and antimicrobial ones.

Action A1 started in June 2014 and was completed in December 2014. During this action, ATHENEA and CCI, in collaboration with ATEVAL and INESCOP, have made a first selection of textiles of their interest, to be functionalised by means of MLSE[®] technology. Selected compositions include both synthetic (polyester, acrylic) and natural (cotton, linen) fibres. Those textiles are commonly used in household items (curtains, cushions, tablecloths, etc.), upholstery and footwear (uppers, lining, etc). According to the beneficiaries' interest, the selected textiles should be treated in order to achieve different functional properties depending on the textile's intended use: Fire retardancy, water repellence, oil repellence and/or antibacterial properties. ***Deliverable A1** entitled "Report on the selected experimental MLSE[®] parameters for the different functional treatments to obtain suitable functional textiles"* contains detailed information on the work carried out in this Action. It was produced by INESCOP by the end of January 2015, as scheduled.

Concerning leathers, within **Action A2**, CCI and NEWPORT, with the collaboration of INESCOP, have made a preliminary selection of leathers of interest, their intended use and the expected functionalities to be provided by means of MLSE[®] technology (fire resistance, water repellency and water absorption/desorption properties, oil repellency and/or antibacterial properties). Selected leathers include: bovine (grain, split, nubuck and other finishings), goat, sheep and pig. Those leathers are commonly used in footwear components (upper, lining, insock) and leather goods manufacturing. Different requirements for each treatment and material have been established depending on their intended use, since both test standards and specifications can differ.

INESCOP was the responsible for this Action which started in June 2014 and was completed in December 2014. ***Deliverable A2** entitled "Report on the selected experimental MLSE[®] parameters for the different functional treatments to obtain suitable functional leathers"* was produced by INESCOP by the end of January 2015, as scheduled. Such document contains detailed information on the work carried out and the results obtained in this Action.

In a second phase, different actions oriented to the adaptation (**Action B1**) and optimization (**Action B2**) of the MLSE[®] process, characterisation (**Action B3**) and validation (**Action B4**) of the functional textiles and leathers produced by MLSE[®], have been established to implement the project proposal.

Bearing in mind the results of the Preparatory Actions and the characteristics of the textiles and leathers considered, **Action B1** aimed at defining the adaptation needs of the current MLSE[®] system developed by MTiX in UK for the treatment of the considered materials. Substrate feeding system, precursor/finishing application system (if necessary), gap between rollers and the arrangement among the different elements within the treatment region have

been identified as potential parameters to be adapted in order to ensure a proper treatment of textiles and leathers. Other issues to be taken into account include animal origin as well as chemical or mechanical finishing, in the case of leathers. Project beneficiaries had the opportunity to visit the MTiX's MLSE[®] demonstration plant that is available in the facilities of the Textile Centre of Excellence in Huddersfield (UK) and were able to discuss *in situ* any adaptation need.

This Action started in September 2014, as scheduled, and finished in February 2016. Consequently, **Milestone B1** “Availability of the adapted MLSE[®] system in the demonstration plant in UK to begin the optimisation of the different materials treatment in action B2” was achieved by the end of March 2016.

The optimisation of textiles and leathers treatment in the MLSE[®] demonstration plant available at MTiX premises have been carried out under **Action B2**. Non functionalised textiles selected in Action B1, as well as leathers, were supplied to MTiX as “yard goods” by TEXTATHENEA, NEWPORT and CCI, in the form of rolls but in A4-size sheets in the case of leathers. The results and experience gained in such trials has helped identifying the need of any kind of adaptation of current MLSE[®] system to be made in Action B1. During this Action, technicians from INESCOP and ATEVAL had the opportunity to visit the first MLSE[®] industrial plant in UK and were able to discuss *in situ* any adaptation need with MTiX staff.

ATEVAL in collaboration with INESCOP were the responsible for this Action, which started in January 2015 and was completed in December 2016. As a consequence, **Milestone B2** “Obtaining functional materials, leathers and textiles, by MLSE MLSE[®] system which is an eco-friendly process” was achieved. **Deliverable B2** “Report on the optimal conditions to obtain functional leathers and textiles by MLSE[®] system with antimicrobial, fire retardant and/or hydrophobic properties” was released by the end of May 2017.

Textile and leather samples treated by MLSE[®] have been assessed by INESCOP within **Action B3**. Furthermore, changes in chemical composition and material's morphology have also been evaluated. Materials treated with MLSE[®] procedure were compared with both non-treated and conventionally functionalised references. As a result, MLSE[®] treatment has demonstrated to be a suitable surface treatment to obtain functional leather and textiles with improved hydrophobic properties, stain and fire resistance, as well as antibacterial properties. Nevertheless, in the case of leathers, despite of the good results obtained, specific equipment should be developed according to technical specifications established in Action B1 for a successful implementation of the technology in leather industry.

Action B3 started in December 2014 and finished in May 2017. **Deliverable B3** “Report on the physico-chemical characterisation of the functionalised textiles and leathers in the demonstration plant” has been released.

After that, the validation of the adapted MLSE[®] technology by using optimal functionalised materials to produce footwear and other goods has been undertaken under **Action B4**, simultaneously to the development of Actions B2 and B3. As a result, the feasibility of the MLSE[®] technology for the production of textile and leather products with functional properties has been demonstrated. The best performing treated materials were selected for

further manufacturing tests. Different footwear prototypes have been considered such as women's and men's town footwear, children's footwear, occupational and safety footwear. Furthermore, different housewares were also manufactured using functionalised textiles. In general, good performance of leathers and textiles has been stated when manufacturing most prototypes. Differences in handling were negligible among MLSE[®] treated materials and those commonly used by the companies, and modifications in the operation conditions were not necessary.

CCI in collaboration with TEXATHENEA were the responsible for this Action, which started in December 2015 and was completed in May 2017. As a consequence, **Milestone B4** “Validation of MLSE[®] treatment as ecofriendly process to produce functional materials with high added value” was achieved. **Deliverable B4** “Report on validation of the technology, goods prototypes manufacturing and characterisation” was released by the end of May 2017.

In addition, the project's socio-economic and environmental impacts have been assessed all along the project within **Action C1**. The feedback from the textiles, tanning and footwear companies was collected through a questionnaire at the beginning of the project.

Furthermore, the **environmental impact** of the proposed technology in comparison with conventional treatments to obtain functional leathers and textiles has been assessed in terms of energy and water consumption, hazardous chemicals, wastewater generation, carbon, etc. LIFE TEXTILEATHER project results are considered to be in concordance with the European environmental policy. It helps textile and leather sector to implement more eco-friendly and sustainable technologies in complying with the current legislation and European policies. Concerning the **socio-economic impact** analysis, the proposed MLSE[®] technology has demonstrated economical savings in comparison with conventional treatments. MLSE[®] has demonstrated to be a versatile technology for different industrial applications (replicability). For each functional property and material, the process can be adequately designed in terms of process parameters according to the technical requirements of the intended application of the material and product.

Action C1 makes adequate progress in line with the foreseen schedule. It started in June 2014 and is expected to finish in May 2017. A report on the socio-economic impact of the project has been released as an Annex to this report.

To ensure the proper dissemination of the project initiative and results, a web site (**Action D1**), diverse dissemination materials (**Action D2**) and publications (**Action D4**) were released; direct dissemination was planned via participation in fairs and congresses (**Action D3**), as well as specific workshops (**Action D5**).

The project website (<http://www.textileather.eu>) was launched in November 2014 within **Action D1** and is available in English, Spanish and Italian, achieving the envisaged **Milestone D1** “Launching the project's web site”. Action D1 started in June 2014 and will be active for at least five years after the end of the project. At the moment of the project completion, the website received over 5.836 reading page requests from at least 8 different countries. Furthermore, a Quick Response Barcode (QR) is available for the URL of the project website.

With reference to communication and dissemination **Action D2**, the project's corporate image was created, notice boards were prepared and placed at the partners' premises, leaflets, project factsheets and posters have been used in different events for dissemination purposes. Furthermore, a video has been produced in English, Italian and Spanish which have been shared at the public area of the website and in the project's YouTube channel. This Action, started in June 2014 and finished in May 2017. INESCOP is the responsible for this Action.

Dissemination of LIFE TEXTILEATHER project started as soon as the EC notified its approval within **Action D3**. Dissemination has taken place at different events. As a result, it is estimated that over 3.200 people (scientific and technical audience) have been reached in congresses, workshops and meetings. A potential audience of more than 500.000 people may have been addressed in fairs and by means of different publications.

Dissemination through different publications (press release, technical papers, scientific papers, Newsletters, etc.) was carried out within **Action D4**. It started before the project kick-off in June 2014 and will continue after the end of the project. *Deliverable D4 "Layman's report"* is released along with the Final Report.

Two demonstration workshops have been organised at the end of the project in which the results of the project were disseminated. On the one hand, on 18th May 2017, INESCOP held the workshop "Towards Sustainable Footwear". It was focused on latest environmental improvements for footwear and related industries. Within this outstanding framework, the talk entitled "Functional treatment for leather and textiles by laser technology" showed main project results to the attendees. On the other hand, ATEVAL organized a special event for the presentation of the project results. The event was held in the "Industrial Circle of Alcoy" with the title Conference New Patterns - the textile evolution towards fashion " of 31th May 2017. The event was attended by important fashion companies and important commercial institutions. 170 representatives attended this event.

Both events were organized in the framework of the 2017 edition of Green Week and 25 Aniversary of the European LIFE Programme.

Finally, three management and monitoring actions were deemed to ensure the proper project development and implementation, and were focused on project management (**Action E1**), networking activities (**Action E2**) and the development of an after project communication plan (**Action E3**).

Action E2 focused on networking activities in order to establish a "knowledge network" with projects related to textiles and leather finishing technologies that will be of interest. Different networking actions started as soon as the EC notified the project's approval. Furthermore, a series of LIFE projects of interest related to textiles and leather finishing technologies has been identified. Some of them have been contacted in order to exchange ideas and experiences and analyse potential synergies with them Action E2 makes adequate progress according to the schedule envisaged in the proposal. It started in June 2014 and finished in May 2017.

Regarding long-term benefits of LIFE TEXTILEATHER project, the implementation of the MLSE[®] technology in both textiles and leather sectors is an innovative breakthrough which

enables textiles and leathers to be converted for enhanced hydrophobicity, fire retardancy and antimicrobial functionalities without the use of harmful chemicals or water. As a result of LIFE TEXTILEATHER project, the following environmental benefits have been achieved expected: a) A significant reduction of total water consumption in the textile and leather facilities and in the considered finishing process; b) A significant reduction in the total power consumption and in the considered finishing process; b) A reduction of about 10% in consumption of chemicals in the total production process and of more than 90% in the considered finishing process. As a consequence, a reduction of the environment costs of the textile and tanning industries is obtained.

Furthermore, this project meets the objective of Life+ Environment Policy and Governance in that it will contribute to the development and demonstration of innovative technologies, thus enhancing the knowledge of the most environmentally-friendly techniques in the European textile and leather industries. 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, as the Waste Framework Directive (2008/98/EC) or the Water Framework Directive (2000/60/EC). What is more, LIFE TEXTILEATHER endorses the Commission's "Resource efficient Europe" flagship initiative.

Apart from environmental benefits, economical benefits associated to water, chemical and power consumption reductions, as well as reduction of the environmental costs of the textile and tanning industries have been identified. Furthermore, the implementation of the MLSE[®] technology in textiles and leathers companies can provide them with the opportunity to increase their market share offering high quality materials with functional properties, more eco-friendly and competitive and last but not least improving user comfort and wellbeing. This would allow to the involved companies to cover new market niches.

In addition, MLSE[®] technology would offer the European companies opportunities to process products which have previously been processed offshore due to the restrictions operating across the EU regarding the chemical usage.

Related social benefits, benefits related to general health and wellbeing of the population are foreseen. What is more, innovative materials with functional properties have been identified as key to satisfy increasing demands of consumers in different fields such as health, hygiene, protection and safety, sports, goods (clothes and footwear), etc. Last but not least, the implementation of more cost-effective technologies such as MLSE[®] technology can also benefit the employability in the involved industrial sectors.

Finally, this project will also contribute to accelerate the uptake of nanotechnologies, advanced materials or advanced and sustainable manufacturing and processing technologies by SMEs, which are future challenges at European level.

3. INTRODUCTION

The increasing demand for functional, comfortable and safe textile products prescribes the intensive development of new technologies of textile processing and treatment. Functionalities such as fire retardancy, stain resistance, hydrophobicity and antimicrobial properties are some of the most interesting possibilities that can be achieved for the new materials.

In general, conventional finishing treatments that provide textiles and leathers with the said functional features, involve significant energy consumption as well as large volumes of water (both in bath liquors and in further rinsing). In addition, in most cases, said treatments involve also the use of chemicals such as halogenated organic compounds, biocides and organophosphorous compounds, the use of which is currently restricted or under consideration in the European Union (REACH and Biocides legislations).

Other environmental issues of relevant interest are air emissions, as well as solid wastes and odours generation, which can be a significant nuisance in certain treatments. All these issues are currently under consideration by the Directive 2010/75/EU on industrial emissions (integrated pollution prevention and control), the Waste Framework Directive (2008/98/EC) or the Water Framework Directive (2000/60/EC).

As sustainable alternative, LIFE TEXTILEATHER project focused on the implementation of Multiple Laser Surface Technology (MLSE[®]) for the treatment of textiles and leathers in order to provide them with functional properties.

The proposed MLSE[®] technology is a dry, continuous process able to significantly reduce the environmental impact of textile and leather finishing operations, especially in case of water-proofing, fire-retardant and antibacterial properties.

The environmental impact reduction, in terms of greenhouse gas emissions, chemicals and water consumption, as well as energy consumption, apply not only to the finishing process itself, but also to the further waste management process.

4. ADMINISTRATIVE PART

4.1. Description of the management system

LIFE TEXTILEATHER project consortium is made up of five partners (ATEVAL, TEXATHENEA, NEWPORT, CCI and INESCOP), all of them acting according to the LIFE Common Provisions and the proposal approved by the European Commission, as well as under the provisions of the **Partnership Agreement**. This document **was provided to the Commission as Annex 1 to the Inception Report** delivered in January 2015.

The Coordinator **ATEVAL** is a non profit-making organization that groups and coordinates the Valencian companies from the textile sector in Spain. ATEVAL provides to their members with advice in the fields of innovation, industry and environment, promotion abroad, training, labour and tax law. Responsible for coordinating the actions of the CIE (Consejo Intertextil Español), ATEVAL participates in the European Textile Apparel and Textile Confederation (EURATEX). In addition, ATEVAL has participated in many projects, including LIFE projects, and has made lobbying actions regarding environmental issues such as wastewater recycling within the textile industry.

The Associated Beneficiary **INESCOP** is a non profit-making organization that develops scientific and technical activities of interest to the Spanish footwear, tanning and related industries. INESCOP staff includes experts in environmental and regulatory issues, chemistry, microencapsulation, materials science, biotechnology, design, computer science, electronics, telecommunications, etc. Its laboratories provide a wide range of testing equipment for quality control servicing. In the field of the proposal, INESCOP has been deeply involved in the participation and coordination of several Regional, National and European research projects related to the development of new functional materials and procedures aimed at reducing the environmental impact of activities carried out within the footwear and related industries.

The Associated Beneficiary **CCI** is a non-profit association whose main aim is to undertake the promotion and management of an innovative footwear cluster in the Vinalopó geographical area in Spain, relying on the necessary companies' support. The Association carries out its activity using the means and contributions of the various agents that make up the footwear innovation system, as well as collaborating with other organisations, institutes and companies. CCI is formed as a coordinating instrument between the companies, technological, public and training agents and other groups linked with the business footwear innovation system to promote cooperation. Its territorial scope of performance basically includes the Region of Valencia although its activities can take place nationally and abroad.

The Associated Beneficiary **TEXATHENEA** is a textile company producing fabrics for home and apparel since 1996. TEXATHENEA offers a wide range of fabrics, of a large variety of qualities, colours and styles to home, decoration and fashion industries. The company covers all the productive manufacturing processes, from fabric and jacquard development to dye, preparation, rotating and digital printing in different qualities and finishes. TEXATHENEA has been a cutting-edge enterprise in the introduction of new technologies such as digital printing.

The Associated Beneficiary **NEWPORT** is a tannery that relies on many years of experience dealing with many kinds of leathers using various tanning techniques, always with the

greatest care for the environment, and leading market trends. The company relies on cutting edge equipment and specialised and qualified human resources in order to give a customer service, working in cooperation with its clients to meet their technical, design and production requirements and needs. NEWPORT carefully monitors all phases of production to guarantee the best performing products. Furthermore, the company is concerned with the rationalisation of production processes, products that have a low impact on the environment, fulfillment of anti-pollution standards.

The overall project management has been done by ATEVAL, being Mr Felipe Carrasco the Project Coordinator. He has counted with the support of Dr Francisca Arán, from INESCOP, who has been designated as Technical Coordinator of the project. Figure 4.1 shows a scheme of the project management structure.

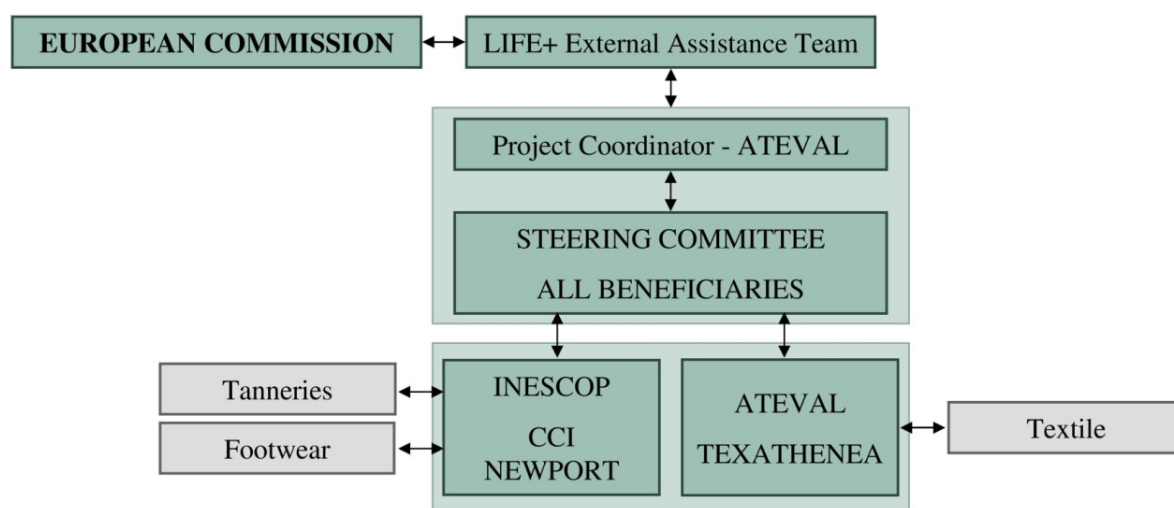


Figure 4.1 Project Management Structure.

As an integral part of the project global management, two sublevels were found. One of these sublevels corresponded to the management of all the activities carried out in the textile sector, and which concerned ATEVAL; and the other sublevel, which encompassed INESCOP, consisted in the management of all the activities carried out regarding the leather and footwear industries. Both levels have been managed at a higher scale by ATEVAL.

ATEVAL was responsible of the strategic co-ordination of the project, including a monitoring of the technical progress (with INESCOP's support) and financial reports. Furthermore, ATEVAL was the communication medium between the project beneficiaries and the Commission by means of the designated LIFE External Assistance Team, and was responsible for the timely and high quality delivery of all project deliverables and reports.

A Steering Committee (SC) was set up by the Project Coordinator and the technical/managerial coordinators from each beneficiary (two members per beneficiary). Decisions were taken by consensus. The SC met, coinciding with the co-ordination meetings. Figure 4.2 shows the SC organization chart, including the key staff involved in the project. The whole staff involved in the project is listed and its role is described in Table 4.1.

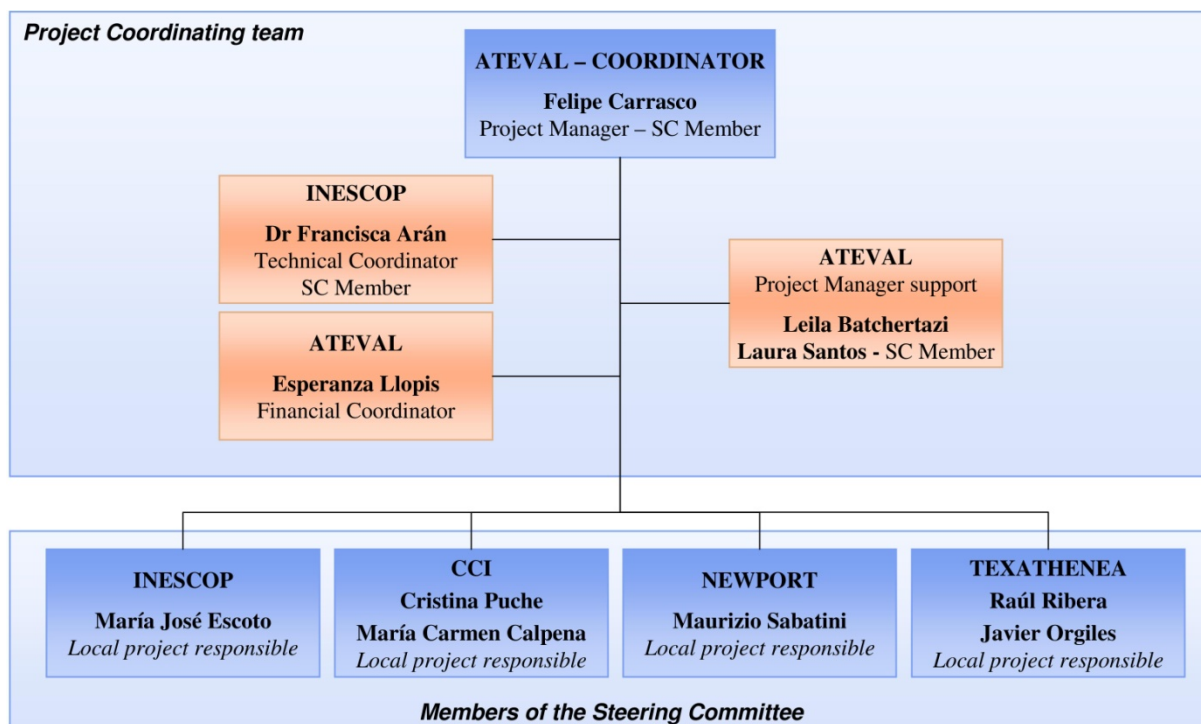


Figure 4.2 Organigramme of the Steering Committee.

Since the project start, contact among partners has been intense through different media, mainly by e-mail and phone conversations, in order to organise, coordinate and develop the project. Furthermore, the following face-to-face meetings have been held:

- The kick-off meeting of the project was held on July 11th 2014 at INESCOP premises in Elda (Spain).
- On 9th September 2014 ATEVAL, as coordinator beneficiary, attended the Kick-off meeting of Life+ 2013 projects held in Madrid.
- The 6-Month Progress Meeting was held on 9th December 2014 at ATEVAL facilities in Ontinyent (Spain).
- The 12-Month progress meeting was held on June 24th 2015 at MTiX premises in Huddersfield (UK).
- The 18-Month progress meeting was held on December 2nd 3rd 2015 at NEWPORT premises in Santa Croce sull'Arno (Italy).
- The 24-Month progress meeting was held on May 27th 2016 at ATEVAL facilities.
- The Final meeting was held on May 31st 2017 at ACETEX premises in Alcoi (Spain).
- Six Technical Meetings were held in INESCOP on 10th October 2014, 1st April 2015, 18th February, 11th March 2016, 6th March 2017 and 9th - 10th March 2017, 25th May 2017. One technical meeting in UK at MTiX premises on 24th May 2016.
- Besides, three visits of the external monitoring team were received on January 26th 2015, May 27th 2016 and May 31st 2017. The conclusions of these reviews were satisfactory.



Kick-off meeting held in INESCOP (Elda, Spain) on 11th July 2014



First Progress Meeting held in ATEVAL (Ontinyent, Spain) on 9th December 2014



Final meeting and last monitoring team ACETEX (Alcoy) on 31st May 2017



Technical meeting held in: a) INESCOP on 10th October 2014; b) TEXATHENEA 24th October 2014; c) INESCOP on 25th May 2017 with MTiX and ATEVAL

ATEVAL as coordinator was responsible for the timely and high quality delivery of all project deliverables and reports. Along with INESCOP as technical coordinator, they were responsible of the monitoring of the technical progress in order to ensure the correct development of the work programme and the achievement of the project objectives. Such work programme was established according to different phases:

In a first phase, two Preparatory Actions were scheduled, focused on the selection of parameters to be optimized for textiles (Action A1) and leathers (A2) treatment.

In a second phase, different actions oriented to the adaptation (Action B1) and optimization (B2) of the MLSE[®] process, characterisation (B3) and validation (B4) of the functional textiles and leathers produced with MLSE[®], have been established to implement the project proposal.

The project's socio-economic and environmental impact is assessed all along the project (C1).

To ensure the proper dissemination of the project initiative and results, a web site (D1), diverse dissemination materials (D2) and publications (D4) are released; direct dissemination is planned via specific workshops (D5) and participation in fairs and congresses (D3).

Finally, three management and monitoring actions are deemed to ensure the proper project development and implementation, and are focused on project management (E1), networking activities (E2) and the development of an after project communication plan (E3).

In general, most Actions have made adequate progress according to the schedule envisaged in the proposal. However, the adaptation of the available system for the treatment of leather and other discrete items required of significant engineering developments which had been identified during Action B1 in order to obtain an efficient treatment for such kind of materials. Therefore, the optimisation of the MLSE[®] treatment on leathers required of more efforts that foreseen in order to obtain efficient treatments. Such difficulties led to a delay in Action B2, which slightly hindered the development of further Actions B3 and B4. In order to deal with the said delays, the duration of some Actions had to be extended, as reported in the Progress Report.

Figure 4.3 shows the scheduled (according to the Amendment to the Grant Agreement) and actual timetable for the different actions.

Besides, Dr. Pravin Mistry, the technological manager and responsible of the company MTiX, supplier of the MLSE[®] technology in the project, and key personnel for the development of the subcontracted activities by MTiX, suffered a serious accident. Dr. Pravin Mistry is the material scientist of the company and as such is instrumental in leading and guiding the development of the technology, especially when trying to achieve unique functionalities on different substrates such as leathers and textiles of different nature. For such reason, an extension of the project deadline was applied to the Commission and **an Amendment to the Grant Agreement** was signed by the EC on 28th October 2016.

4.2. Evaluation of the management system

Project management has proceeded as expected and no deviations from the arrangements made in the Partnership Agreement have been produced.

ATEVAL as coordinator is the communication medium between the project beneficiaries and the Commission, both directly (when reports delivery) and by means of the designated LIFE External Assistance Team.

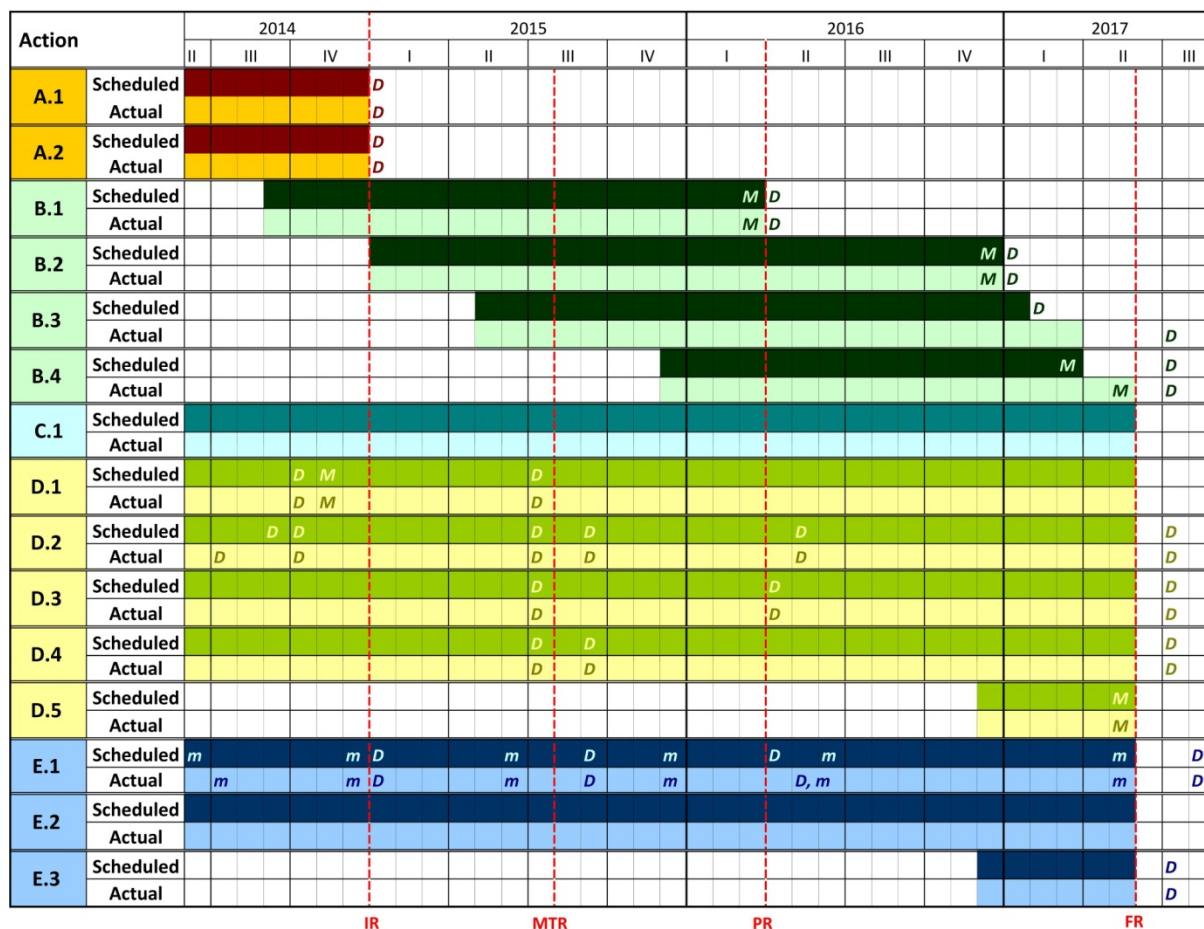


Figure 4.3. Gantt chart. Scheduled workprogrammes vs actual development. **Key:** **IR:** Work reported in the Inception Report; **MTR:** Work reported in the Mid-Term Report; **PR:** Work reported in the Progress Report; **FR:** Work reported in the Final Report; **D:** Deliverables; **M:** Milestones; **m:** meetings

5. TECHNICAL PART

5.1. Technical progress, per task

This section reports the technical work carried out during the first 14 months of the project. More precisely, the activities accomplished in order to develop the following actions.

Preparatory Actions:

- Action A1 “Selection of parameters to be optimized for textiles treatment”
- Action A2 “Selection of parameters to be optimized for leather treatment”

Implementation Actions:

- Action B1 “Adaptation of MLSE[®] process for textiles and leather treatment”
- Action B2 “Optimization of textiles and leather treatment in the demonstration plant”
- Action B3 “Characterization of functional textiles and leather”
- Action B4 “Validation of the technology. Goods prototypes manufacturing”

Impact Monitory Actions:

- Action C1 “Socio-economic and environmental impact assessment”

Dissemination Actions: *The development of the following actions is described under section 5.2 “Dissemination Actions” of this Report.*

- Action D1 “Creation of a project Web-site”.
- Action D2 “Preparation of dissemination material, including Project Notice Boards”.
- Action D3 “Participation in fairs and congresses”.
- Action D4 “Publications, including Layman’s report”.
- Action D5 “Final Workshops/Conferences”.

Management and Monitory Actions:

- Action E1 “Project management by ATEVAL”. *The development of this Action has been described under section 4 “Administrative part” of this Report.*
- Action E2 “Networking with other projects”.
- Action E3 “After-LIFE Communication Plan”.

5.1.1. Action A1. Selection of parameters to be optimized for textiles treatment

Beneficiaries ATHENEA and CCI, in collaboration with ATEVAL and INESCOP, have made a first selection of textiles of their interest, to be functionalised by means of MLSE[®] technology. Selected compositions include both synthetic (polyester, acrylic) and natural (cotton, linen) fibres. Those textiles are commonly used in household items (curtains, cushions, tablecloths, etc.), upholstery and footwear (uppers, lining, etc).

According to the beneficiaries' interest, the selected textiles should be treated in order to achieve the following properties:

- Fire resistance
- Water repellence. Depending on the application (i.e. footwear and apparel), additional good water vapour permeability properties must be kept.
- Additionally, oil repellence and antibacterial properties should be advisable.

Different requirements for each treatment and material have been established depending on their intended use, since both test standards and specifications can differ.

Table 5.1 compiles the type of textiles, characteristics, intended use and functional property to be achieved with MLSE[®] technology.

Table 5.1. Selected textiles. Composition, intended use and expected main functionality

Composition	Dimensions	Application	Functionality
Polyester/ polyamide	<u>Weight:</u> 200 - 300 g/m ² <u>Thickness:</u> 0.6-1 mm <u>Width:</u> 140 cm	Upper material for footwear	Hydrophobicity Oil repellence Antibacterial
		Lining/insock material for footwear	Antibacterial
Polyester	<u>Weight:</u> 50 - 300 g/m ² <u>Thickness:</u> 0.2-0.8 mm <u>Width:</u> 280 - 300 cm	Curtains, cushions	Fire retardancy
Acrylic	<u>Weight:</u> 195 g/m ² <u>Thickness:</u> 0.5 mm <u>Width:</u> 140 cm	Outdoor upholstery	Hydrophobicity
Cotton	<u>Weight:</u> 195 - 290 g/m ² <u>Thickness:</u> 0.4 - 0.6 mm <u>Width:</u> 140 - 280 cm	Tablecloths	Hydrophobicity
		Upholstery	Fire retardancy
Cotton/linen mixtures	<u>Weight:</u> 390 - 440 g/m ² <u>Thickness:</u> 0.9 - 1 mm <u>Width:</u> 140 - 280 cm	Upholstery	Fire retardancy

The project Beneficiaries have also stated that any treatment intended to provide textiles with the above described requirements, should not affect other properties in such a way that they

would not be suitable for their intended use. Such properties include: laundering/washing performance, printable capability, sewability, bondability, mechanical performance and durability (ageing), among others.

A series of test methods have been established in order to assess the effective functionalisation of the materials. Furthermore, the requirements to be achieved have been established. Both test methods and requirements are highly dependent on the final use of the textiles. Table 5.2 summarises the different standard methods and requirements.

Table 5.2. Standard methods and requirements to be reached for each textile application

Application	Property/Test method	Requirement
Curtains/cushions	Ignitability – EN 1101	No ignition
	Flame spread – EN 1101 + EN 13772	Class 1
Upholstery	Fire retardancy – BS 5852 (EN 1021-1 + EN 1021-2)	No ignition or limited area of charring
Outdoor upholstery	Water resistance (wetting) – EN ISO 4920	Grade 4 – Slight random sticking or wetting of upper surface
Tablecloths		
Upper material for footwear	Water resistance – EN 13518 (ISO 17702)	Water penetration time \geq 30 min Water absorption $<$ 30% after 120 min
	Oil repellence – EN ISO 14419	Grade \geq 5 (not wetted by <i>n</i> -dodecane)
Lining material for footwear	Antibacterial activity – ISO 16187	Antibacterial activity ratio $>$ 99%

Taking into account the characteristics of the said textiles, a series of parameters have been established, which are to be taken into account in the adaptation of MLSE[®] system for the demonstration plant (Actions B1 and B2):

- Material dimensions can range 0.2 -1 mm thick and 140-300 cm wide.
- Continuous material feeding system integrated in the current production line would be advisable.
- Production system (weaving, knotting, pressing...) will lead to different MLSE[®] substrate structure.
- Material composition (cotton, polyester, polyamide, linen, mixtures...).
- Functional properties (Fire retardancy, Water/oil repellence, Antimicrobial).
- MLSE[®] treatment should not affect textiles performance (feeling at touch, laundering/washing, printability, bondability/sewability, durability, mechanical properties...).
- Impact on final product cost not exceeding current functional treatments.

ATEVAL was the responsible for this Action and was in charge of selecting and defining the main parameters to be provided for MLSE[®] process adaptation. CCI provided technical information on available textiles for footwear manufacturing and INESCOP established technical requirements for functional footwear and footwear components. TEXATHENEA provided technical information on available textiles for household goods and established technical requirements for functional textiles for this use.

Action A1 has made adequate progress according to the schedule envisaged in the proposal. It started in June 2014 and was completed in December 2014. Deliverable A1 entitled “Report on the selected experimental MLSE[®] parameters for the different functional treatments to obtain suitable functional textiles” was produced by INESCOP by the end of January 2015, as scheduled. Such document contain detailed information on the work carried out in this Action and the results obtained, and are included in the electronic version of Annex 5 to this report. A hard copy was provided in Annex 2 to the Inception Report.

5.1.2. Action A2. Selection of parameters to be optimized for leather treatment

The project beneficiaries CCI and NEWPORT, with the collaboration of INESCOP, have made a preliminary selection of leathers of interest, their intended use and the expected functionalities to be provided by means of MLSE[®] technology. Selected leathers include: bovine (grain, split, nubuck and other finishings), goat, sheep and pig. Those textiles are commonly used in footwear components (upper, lining, insock) and leather goods manufacturing.

According to the beneficiaries' interest, the selected leathers should be treated in order to achieve the following properties:

- Fire resistance
- Water repellency, maintaining good water vapour permeability properties must be kept.
- Water absorption/desorption properties
- Oil repellency
- Antibacterial properties

Different requirements for each treatment and material have been established depending on their intended use, since both test standards and specifications can differ.

Table 5.3 compiles the type of leathers, characteristics, intended use and functional property to be achieved with MLSE[®] technology.

Table 5.3. Leathers of potential interest. Origin, intended use and expected functionality

Origin	Dimensions	Application	Functionality
Bovine	<u>Thickness:</u> 1.5-2.5 mm <u>Surface:</u> 1.1-2.8 m ² <u>Length/width:</u> 1-2 m	Upper material for firefighter footwear	Fire retardancy
		Upper material for footwear Leather goods	Hydrophobicity
			Oil repellence
			Antibacterial
		Lining for footwear	Antibacterial
Goat/Sheep	<u>Thickness:</u> 0.6-1 mm <u>Surface:</u> 0.23-1.1m ² <u>Length/width:</u> 0.5-1 m	Upper material for footwear Leather goods	Antibacterial
			Antibacterial
			Antibacterial
		Lining for footwear	Antibacterial
		Insock	Antibacterial
Pig	<u>Thickness:</u> 0.8-1 mm <u>Surface:</u> 0.37-1.3m ² <u>Length/width:</u> 0.5-1 m	Lining for footwear/insock	Antibacterial
			Antibacterial

The project Beneficiaries have also stated that any treatment intended to provide leathers with the above described requirements, should not affect other properties in such a way that they would not be suitable for their intended use. Such properties include: bondability, mechanical performance and durability (ageing), among others.

A series of test methods have been established in order to assess the effective functionalisation of the materials. Furthermore, the requirements to be achieved have been established. Both test methods and requirements are highly dependent on the final use of the textiles. Table 5.4 summarises the different standard methods and requirements.

Table 5.4. Standard methods and requirements to be reached for each leather application

Application	Property/Test method	Requirement
Upper material for firefighter footwear	Fire retardancy - EN 15090	Flame persistence and glow times ≤ 2 s. Absence of deep cracking, ignition or melting that affects more than a half of material thickness
Upper material for safety/occupational/protective footwear	Hydrophobicity/Water Vapour permeability (WVP) – EN ISO 20344	Water penetration ≤ 0.2 g, absorption $\leq 30\%$ WVP ≥ 0.8 mg/cm ² •h Water vapor coefficient ≥ 15 mg/cm ²
Upper material for footwear (general)	Hydrophobicity/Water Vapour permeability (WVP) – EN ISO 5403-4	Water penetration time ≥ 60 min, absorption $\leq 20\%$ WVP ≥ 0.8 mg/cm ² •h
	Water vapour absorption (WVA) – EN ISO 14268	If $0.8 \leq WVP < 2$, WVA ≥ 8.0 mg/cm ²
Upper material for fashion footwear	Oil repellence – EN ISO 14419	Grade ≥ 5 (not wetted by <i>n</i> -dodecane)
Lining/insock	Antibacterial activity – ISO 16187	Antibacterial activity ratio $>99\%$
Leather goods	Oil repellence – EN ISO 14419	Defined by the client
	Hydrophobicity – EN ISO 5404	Dynamic impermeability ≥ 30 min
	Antibacterial activity – ISO 16187	Antibacterial activity ratio $>99\%$

Taking into account the characteristics of the said leathers, a series of parameters have been established, which are to be taken into account in the adaptation of MLSE[®] system for the demonstration plant (Actions B1 and B2). :

- Material thickness can range 0.2-2.8 mm thick. Uneven thickness can occur.

- Material dimensions can vary from about 0.25 m² to nearly 3 m², with dimensions (length and/or width) ranging 0.5-2 m
- A discrete material feeding system would be advisable.
- Different animal origin (bovine, goat, pig) and different leather layer, side of interest or mechanical finishing (grain side, flesh side, split, nap, suede, etc.) will lead to different MLSE[®] substrate structure.
- Functional properties (fire retardancy, water/oil repellence, antimicrobial).
- MLSE[®] treatment should not affect textiles performance (feeling at touch, bondability, durability, mechanical properties...).
- The new system should be able to treat volumes of at least 10,000 m² per month
- Impact on final product cost not exceeding current functional treatments.

INESCOP was the responsible for this Action and was in charge of selecting and defining the main parameters to be provided for MLSE[®] process adaptation. CCI provided information on available functional leathers for footwear manufacturing in order to establish technical requirements. NEWPORT provided technical information on available leathers and current functional finishings.

Action A2 has made adequate progress according to the schedule envisaged in the proposal. It started in June 2014 and was completed in December 2014. Deliverable A2 entitled “Report on the selected experimental MLSE[®] parameters for the different functional treatments to obtain suitable functional leathers” was produced by INESCOP by the end of January 2015, as scheduled. Such document contain detailed information on the work carried out in this Action and the results obtained, and are included in the electronic version of Annex 5 to this report. A hard copy was provided in Annex 2 to the Inception Report.

5.1.3. Action B1. Adaptation of MLSE[®] process for textiles and leather treatment

Figure 5.1 shows a general scheme of the original automated MLSE[®] prototype of MTiX (project's subcontractor), available at the premises of the Textile Centre of Excellence (TCoE) in Huddersfield (UK). In this system, a substrate in roll form (long, continuous sheets of material rolled on a cylindrical core) is fed into a treatment area that comprises three regions:

- A pre-treatment area where, optionally, some precursors are applied on the substrate, e.g. sprayed by means of a row of nozzles.
- A treatment region where atmospheric-pressure plasma and a laser act simultaneously on the substrate. Treatment is carried out in the cavities between rotating and driving rollers.
- A post-treatment area where, optionally, a finishing can be applied, e.g. sprayed by means of a row of nozzles.

Substrate feeding system, precursor/finishing application system (if necessary), gap between rollers and the arrangement among the different elements within the treatment region were some of the potential parameters to be adapted to ensure a proper treatment of textiles and leathers within LIFE TEXTILEATHER project.

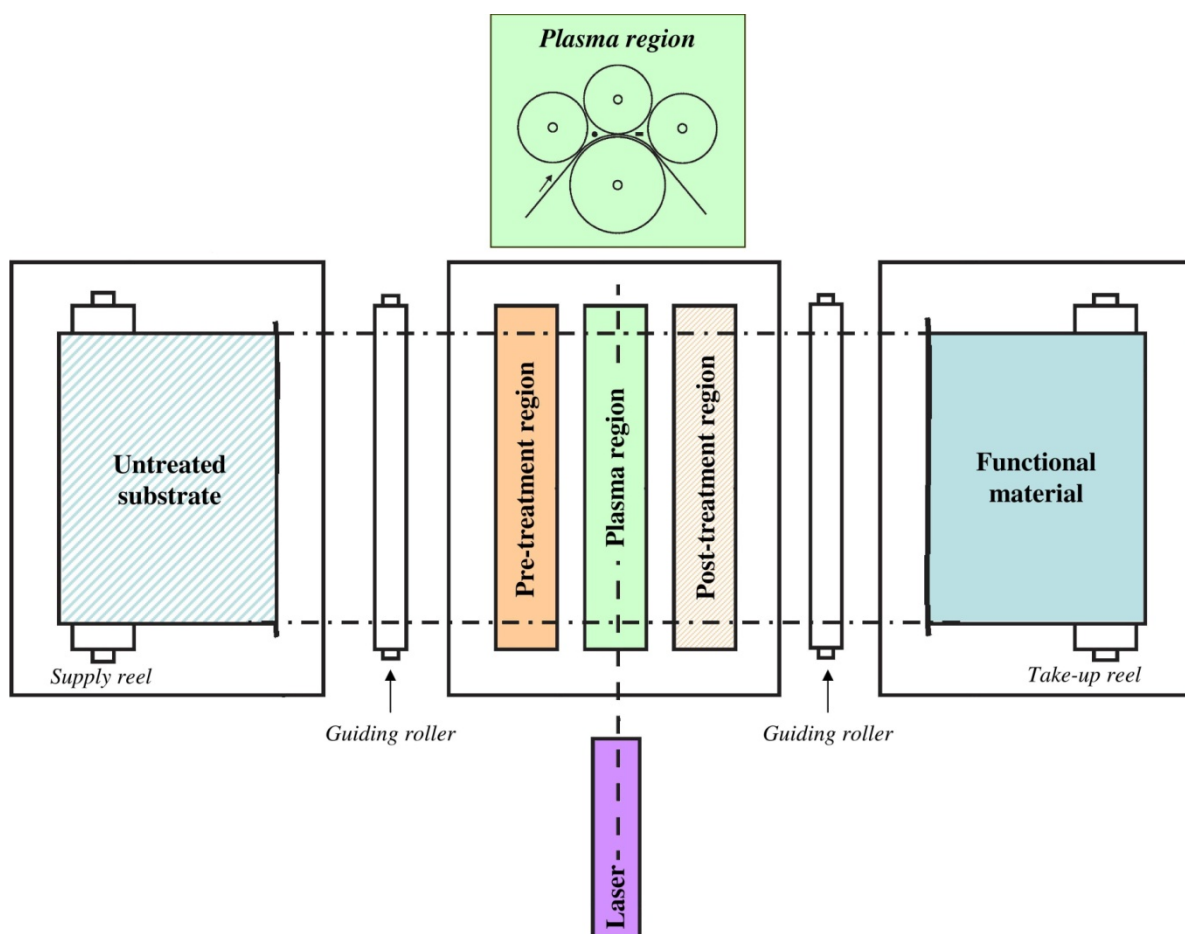


Figure 5.1 Scheme of MLSE[®] prototype.

In order to define the adaptation needs, the Associate Beneficiary TEXATHENEA made a selection of different textiles, based in both synthetic and natural fibres, for different uses. Table 5.5 lists and describes the selected textiles, as well as the properties to be achieved by MLSE[®] treatment. These textiles have been used during the adaptation of MLSE[®] system for the treatment of fabrics. Textiles of same or similar composition with the required properties were also provided as standard material for the assessment of the different treatments in MLSE[®] adaptation.

 Table 5.5. Selected reference textiles used in MLSE[®] process adaptation

Type of fibre	Composition	Weight // Width (g/m ²) // (cm)	Properties	Use
Synthetic	100% Polyester	50 g/m ² // 300 cm	Fire resistance	Curtains, cushions
		50 g/m ² // 150 cm		
		120 g/m ² // 300 cm		
		300 g/m ² // 280 cm		
	100% Acrylic	190 g/m ² // 280 cm	Hydrophobicity	Outdoor upholstery
Natural	100% cotton	195 g/m ² // 280 cm	Hydrophobicity, stain resistance	Tablecloth
	100% cotton	290 g/m ² // 140 cm	Fire resistance	Upholstery
	60% cotton, 40% linen	390 g/m ² // 140 cm		
	65% cotton, 35% linen	390 g/m ² // 140 cm		
		440 g/m ² // 140 cm		

Issues that had to be taken into account in MLSE[®] adaptation include:

- Differences in composition may affect the gas mixture and/or power.
- Differences in weight, ranging from 50 to over 400 g/m². Weight affects both structure and thickness. In MLSE[®] prototype, the space between rollers was 1.5 mm.
- Width of textiles: MLSE[®] prototype allows the treatment of materials up to 200 cm wide. Some TEXATHENEA materials are up to 300 cm wide.
- In some applications, combination of two or more functionalities could be desirable. MLSE[®] prototype only allowed one treatment per run.

With regards to leathers, bovine hides and sheep skins with different functionalities were selected by CCI and INESCOP as reference materials based on conventional treatments, as requested by MTiX. In order to have an accurate control on leather production process, shaved wet-blue hides and skins (chrome tanned leather that has not been further processed)

were acquired from local tanneries and were processed at INESCOP facilities. Thus, references B, BWR0, BOR0, BFR, S and SWR0 were produced.

Furthermore, other non functional chemical and mechanical finishings were identified as key parameters to be taken into account during MLSE[®] adaptation and optimisation. For this reason, several leathers with different finishings were selected by NEWPORT, all of them being part of the current product's portfolio of the company.

Table 5.6 lists and describes the selected leathers. Functional materials have been used as standard leathers by MTiX. Non-functional leathers have been used during the adaptation and optimisation of MLSE[®] system for the treatment of leathers.

Table 5.6. Selected reference leathers to be used in MLSE[®] process adaptation

Material	Reference	Thickness (mm)	Functionalisation	Finishing
Bovine/ Cow	B	1.5-1.6	-	None
	B-WR-0	1.7	Conventional hydrophobic	None
	B-OR-0	1.5-1.6	Conventional oil-repellent	None
	B-FR-0	1.4-1.5	Conventional fire-resistant	None
	CCR	1.67±0.04	-	oil – wax – aniline
	CG1	1.47 ± 0.05	-	+ oil, - wax
	CG2	1.30 ± 0.03	-	- oil, + wax
	CAN	1.26 ± 0.03	-	Nappa, + Aniline – Pigment
	CN2	1.16 ± 0.03	-	Crust Nappa
	CNT	2.46 ± 0.03	-	Natural, only grind
	CTW	2.35 ± 0.06	-	Natural, crust
	CTC	2.39 ± 0.04	-	Natural
	CO	1.43 ± 0.02	-	+ Pigment – Aniline
	CCE	1.72 ± 0.05	-	Natural, centrifuged
	CB	1.20±0.09	-	+ Aniline – Pigment
	CSV	1.07±0.02	-	Split, Natural and Aniline
Sheep	S	0.85-1.10	-	None
	S-WR-0	1.0-1.29	Conventional hydrophobic	None
Goat	GC	1.64 ± 0.05	-	Natural
	GW	0.90 ± 0.03	-	Natural
	GF	0.56 ± 0.03	-	Pigment
	GN	0.85 ± 0.03	-	Nappa, Aniline

References B-WR-0 and S-WR-0 were considered as standard materials for the assessment of water resistance in MLSE[®] adaptation. Reference B-OR-0 was considered as standard materials for the assessment of oil repellence in MLSE[®] adaptation.

As for fire retardant properties, leather in itself is not a readily burnable substance. Nevertheless, dyes and finishing products can affect fire resistance. Conventional non-functional leathers show good performance against fire. Nevertheless, a waterproofing treatment in the sheep leathers has proved to worsen their fire resistance. Alternative waterproofing treatment based on MLSE[®] technology is expected to solve this inconvenience.

Issues taken into account in MLSE[®] adaptation included:

- Leathers are discrete items. In MLSE[®] prototype, feeding system only allows the treatment of materials supplied in roll form (long, continuous sheets of material rolled on a cylindrical core).
- Differences in animal origin and side of treatment will affect MLSE[®] substrate structure (see Figure 5.2) and, therefore, the gas mixture and/or power to be applied during treatment.

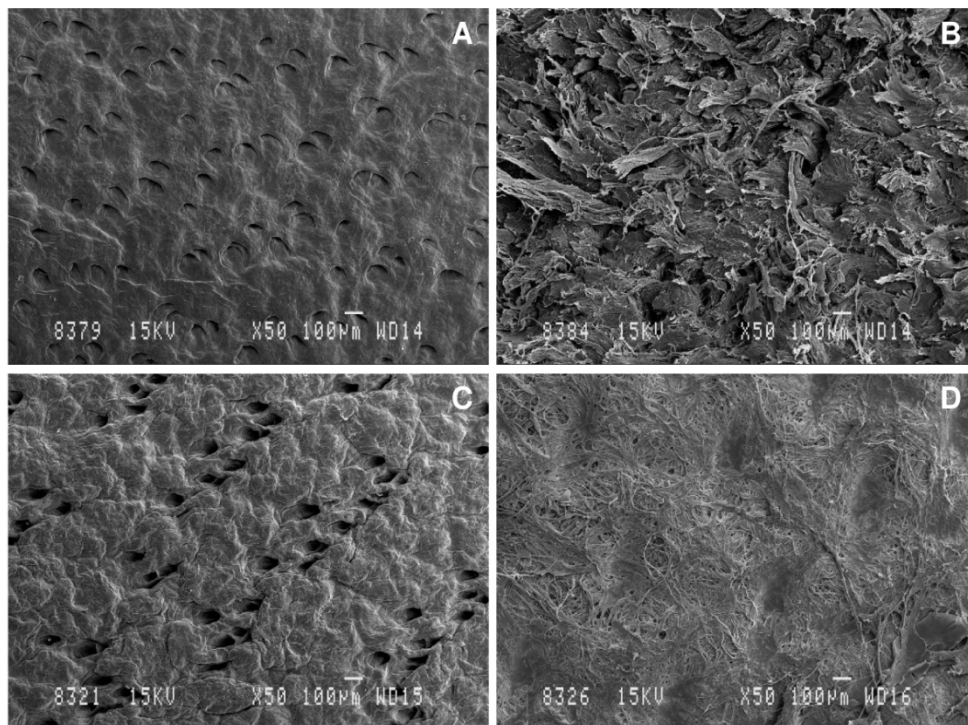


Figure 5.2. Differences in leather morphology. A: Bovine leather, grain side; B: bovine leather, flesh side; C: Sheep leather, grain side; D: Sheep leather, flesh side.

- Furthermore, any chemical or mechanical finishing may affect the gas mixture and/or power.
- In the case of Chrome-tanned leathers, attention must be paid so that Cr(III) is not oxidised into Cr(VI).
- Differences in thickness, ranging from 0.56 to 2.5 mm. In MLSE[®] prototype, the space between rollers is 1.5 mm.

- In some applications, combination of two or more functionalities could be desirable. MLSE[®] prototype only allows one treatment per run.

Thus, the demand of processing TEXTILEATHER materials meant that MLSE[®] prototype might have to evolve significantly. The focus of the new design had to address:

- *Ability to process materials presented in different formats, including discrete items.*
- *Precursor/finishing application system (if required)*
- *Gap between rollers.*
- *Possibility of applying different treatments on one or both sides of the materials*

A new MLSE[®] demonstration plant, with considerable improvements, was made available in the course of Action B1 development. Currently, a new MLSE[®] demonstration plant is available. The new system incorporates up to 4 treatment zones, allowing the application of successive functional treatments and/or the treatment of both sides of the substrate. It also allows the treatment of thicker materials than those allowed by the former prototype. Thus, this demonstrator has the following advantages with respect to the previous prototype:

- *Robustness of machine and components to work in an industrial environment.*
- *Ability to process fabric presented in different formats.*
- *Ability to process materials up to 2.5 mm, as required by TEXTILEATHER materials.*
- *Possibility of applying several treatments per run, as required by the project beneficiaries.*
- *An operator interface that makes operation of the system user friendly and intuitive.*

However, this demonstrator is still designed to only run continuous web, woven fabrics. Consequently, to run any single piece structure such as leather hides and skins was a challenge. During the course of the project, several different principles to process leather pieces were attempted, but the final and preferred to be used during the optimisation of MLSE[®] process to change the properties of the leather (Action B2) used complex stitching to create a leather patchwork (see Figure 5.3).

Preliminary results achieved from the processing (Action B2) have demonstrated that the MLSE[®] system can make noticeable performance improvements to leather substrates, both on the grain and flesh sides. Thus, the available demonstration plant will be the basis for the development of a system for the treatment of leathers and other discrete items. In fact, a significant engineering development task has been made to consider the long term implications of applying the MLSE[®] process to single piece components, such as leather.

The current system which transfers fabric over and around a series of rollers suggests some level of difficulty. However, there needs to be the facility to have up to 4 process zones, configured to have 2 zones active on each side of the hide.

The proposed solution is to have a flat bed system, with nip conveyors between the processing zones (see Figure 5.4).



Figure 5.3. Handling of leather samples. Leather stitched to a fabric.

Each of the processing heads will be servo controlled, allowing the plasma gap between the high voltage and earth to automatically adjust to suit the leather piece. The control system already has the ability to adjust plasma power during processing, and algorithms will need to be developed that will modify the plasma power to suit the gap, ensuring a constant processing environment. The infeed and discharge conveyors will allow space to lay the leather hide out flat and in the proper orientation to fit into the machine.

ATEVAL was the responsible for this Action and was in charge of coordinating the activities for MLSE[®] system adaptation.

INESCOP was the contact with the MLSE[®] system provider and has characterised the reference materials. Furthermore, INESCOP, in collaboration with CCI, has produced standard leathers that were provided to MTiX and also provided technical requirements for footwear materials.

NEWPORT provided technical requirements for leathers and has supplied MTiX with leathers with different finishings for the MLSE[®] adaptation.

TEXATHENEA provided technical requirements for textiles and has supplied MTiX with textiles with different compositions for the MLSE[®] adaptation.

Coinciding with the 12-month progress meeting, project beneficiaries visited the MTiX's MLSE[®] demonstration plant that is available in the facilities of the Textile Centre of Excellence in Huddersfield (UK) and were able to discuss *in situ* any adaptation need. Furthermore, a visit to the first industrial equipment located in UK was also possible



Figure 5.4. a) Visit to the demonstration plant in Huddersfield; b) Visit to the first industrial equipment located in UK.

Action B1 has made adequate progress according to the schedule envisaged in the proposal. It started in September 2014 and finished in March 2016. Deliverable B1 “Report on the adaptation of MLSE[®] system for textiles and leathers treatment to obtain functional properties” was released by the end of March 2016 and is enclosed in the electronic version of Annex 5 to this Final report. In addition, a hard copy was provided in Annex 7.1 to the second Progress Report.

5.1.4. Action B2. Optimization of textiles and leather treatment in the demonstration plant

Non functionalised textiles selected in Action B1 were supplied to the MLSE[®] provider as “yard goods”, in the form of rolls. Leathers were supplied in A4-size sheets, as requested by the subcontracting company. In the case of leathers produced at INESCOP, cutting was carried out in an automated cutting system.

Some preliminary trials were carried out in the MTiX’s MLSE[®] prototype by applying baseline MLSE[®] conditions (see Table 5.7). Textiles were fed as usual in this system. Discrete leather pieces were attached to a continuous textile (carrier) so that they could be fed into the MLSE[®] system as with a conveyor belt (see Figure 5.6). In further treatments, leathers were stitched to the textile, creating a leather patchwork (see Figure 5.3 in the description of Action B1, in section 5.1.3).

Table 5.7. MLSE[®] baseline conditions

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

* Functional properties will depend on precursor and reactive gas concentrations



Figure 5.5. Handling of leather samples. Samples attachment to a carrier.

A first analysis on the effectiveness of the treatments was performed by the MLSE[®] provider. Water repellence was assessed according to Standard ISO 23232. Fire retardancy on textiles was assessed according to BS 5852. Taking as a basis the performance of the different materials during and after this treatment, the different MLSE[®] parameters were optimised for each material and functionality. Table 5.8 Summarises tested MLSE[®] parameters.

As shown in Table 5.8, the possibility of using different conditions in each of the 4 treatment zones was considered, as well as that of subjecting materials to several runs.

The following tables list the different treatments that have been performed on the different materials supplied to MTiX.

Table 5.8. Treatments performed on crust (non finished) leathers provided by CCI and INESCOP

Leather	Treatment	Treated side	Reference
Crust Bovine Leather	Water Repellency	Grain	B-WR-MLSE-1
		Grain + flesh	B-WR-MLSE-2
			B-WR-MLSE-3
			B-WR-MLSE-4
			B-WR-MLSE-5
			B-WR-MLSE-6
	Stain Resistant	Grain	B-OR-MLSE-1
			B-OR-MLSE-2
			B-OR-MLSE-3
			B-OR-MLSE-4
			B-OR-MLSE-5
			B-OR-MLSE-6
			B-OR-MLSE-7
			B-OR-MLSE-8
			B-OR-MLSE-9
	Water & Stain resistant	Grain	B-WOR-MLSE-1
			B-WOR-MLSE-2
			B-WOR-MLSE-3
			B-WOR-MLSE-4
			B-WOR-MLSE-5
			B-WOR-MLSE-6
			B-WOR-MLSE-7
			B-WOR-MLSE-8
			B-WOR-MLSE-9
			B-WOR-MLSE-10
			B-WOR-MLSE-11
			B-WOR-MLSE-12
			B-WOR-MLSE-13
			B-WOR-MLSE-14
			B-WOR-MLSE-15
			B-WOR-MLSE-16
			B-WOR-MLSE-17
	Fire Retardant	Grain	B-FR-MLSE-1 B-FR-MLSE-2
	Fire Retardant & Stain Resistant	Grain	B-FOR-MLSE-1
	Surface optimisation	Grain	B-SO-A B-SO-B B-SO-C B-SO-D

Table 5.9. *Continued*

Leather	Treatment	Treated side	Reference
Crust Sheep Leather	Water Repellency	Grain	S-WR-MLSE-1
		Grain + flesh	S-WR-MLSE-2
			S-WR-MLSE-3
			S-WR-MLSE-4
			S-WR-MLSE-5
			S-WR-MLSE-6
	Stain Resistant	Grain	S-OR-MLSE-1
			S-OR-MLSE-2
			S-OR-MLSE-3
			S-OR-MLSE-4
			S-OR-MLSE-5
			S-OR-MLSE-6
			S-OR-MLSE-7
			S-OR-MLSE-8
			S-OR-MLSE-9
			S-OR-MLSE-10
			S-OR-MLSE-11
			S-OR-MLSE-12
			S-OR-MLSE-13
	Water & Stain resistant	Grain	S-WOR-MLSE-1
			S-WOR-MLSE-2
			S-WOR-MLSE-3
			S-WOR-MLSE-4
			S-WOR-MLSE-5
			S-WOR-MLSE-6
			S-WOR-MLSE-7
			S-WOR-MLSE-8
			S-WOR-MLSE-9
	Antimicrobial	Flesh	S-AR-MLSE-1
	Fire Retardant	Grain	S-FR-MLSE-1
			S-FR-MLSE-2
	Fire Retardant & Stain Resistant	Grain	S-FOR-MLSE-1
	Surface optimisation	Grain	S-SO-A
			S-SO-B
			S-SO-C
			S-SO-D

Table 5.9. Treatments performed on finished leathers provided by CCI

Origin	Leather	Treatment	Reference
Bovine	Serraje empeine (split)	Water & Stain resistant	Serraje-WOR-MLSE-1 Serraje-WOR-MLSE-2 Serraje-WOR-MLSE-3 Serraje-WOR-MLSE-4 Serraje-WOR-MLSE-5
	Green split	Water & Stain resistant	Green-WOR-MLSE-1 Green-WOR-MLSE-2 Green-WOR-MLSE-3 Green-WOR-MLSE-4 Green-WOR-MLSE-5
		Fire resistance	Green-FR-MLSE-1
	Vacuno (lining)	Antimicrobial	Vacuno-AR-MLSE-1
Goat	Cabra	Water & Stain resistant	Cabra-WOR-MLSE-1 Cabra-WOR-MLSE-2 Cabra-WOR-MLSE-3 Cabra-WOR-MLSE-4 Cabra-WOR-MLSE-5
Lamb	Cordero	Water & Stain resistant	Cordero-WOR-MLSE-1 Cordero-WOR-MLSE-2 Cordero-WOR-MLSE-3 Cordero-WOR-MLSE-4 Cordero-WOR-MLSE-5
Pig	Hispania	Antimicrobial	Hispania-AR-MLSE-1

Table 5.10. Treatments performed on finished leathers provided by NEWPORT

Origin	Leather	Treatment	Reference
Goat skins	Goat leather - Finsihed	Water repellency	GF-WR-MLSE-1
	Crust Goat	Water repellency	GC-WR-MLSE-1 GC-WR-MLSE-2 GC-WR-MLSE-3
		Stain resistant	GC-OR-MLSE-1 GC-OR-MLSE-2
		Water & Stain resistant	GC-WOR-MLSE-1 GC-WOR-MLSE-2 GC-WOR-MLSE-3 GC-WOR-MLSE-4 GC-WOR-MLSE-5
	Washed Goat	Water repellency	GW-WR-MLSE-1 GW-WR-MLSE-2 GW-WR-MLSE-3
		Stain resistant	GW-OR-MLSE-1 GW-OR-MLSE-2

Table 5.11. *Continued*

Origin	Leather	Treatment	Reference
Cow hides	Cow leather-Crazy	Water repellency	CCR-WR-MLSE-1
	Cow leather Centrifugato	Water repellency	CCE-WR-MLSE-1
	Cow Leather - Nubuck	Water repellency	CNT-OR-MLSE-1
	Cow leather - Old	Water repellency	CO-WR-MLSE-1
	Finished Cow	Water repellency	CF-WR-MLSE-1 CF-WR-MLSE-2
		Stain resistant	CF-OR-MLSE-1 CF-OR-MLSE-2
	Tecno Washed Cow	Water repellency	CTW-WR-MLSE-1 CTW-WR-MLSE-2 CTW-WR-MLSE-3
		Stain resistant	CTW-OR-MLSE-1 CTW-OR-MLSE-2
		Water & Stain resistant	CTW-WOR-MLSE-1 CTW-WOR-MLSE-2 CTW-WOR-MLSE-3 CTW-WOR-MLSE-4 CTW-WOR-MLSE-5
	Crust Cow	Water repellency	CTC-WR-MLSE-1
		Stain resistant	CTC-OR-MLSE-1 CTC-OR-MLSE-2

Table 5.11. Treatments performed on textiles provided by TEXATHENEA

Type of fibre	Textile	Treatment	Reference
PES	Cerdeña	Fire retardancy	C-FR-MLSE-1 C-FR-MLSE-2
	Nicaragua	Fire retardancy	N-FR-MLSE-1 N-FR-MLSE-1
	Voile	Fire retardancy	V-FR-MLSE-1 V-FR-MLSE-2
Acrylic	Kulso	Water repellency	KL-WR-MLSE-1 KL-WR-MLSE-2 KL-WR-MLSE-3
		Fire retardancy	KL-FR-MLSE-1
Cotton/Linen mixtures	Liro Friday	Fire retardancy	F-FR-MLSE-1 F-FR-MLSE-1
	Kendo	Fire retardancy	KEN-FR-MLSE-1 KEN-FR-MLSE-2
	Manila	Fire retardancy	MA-FR-MLSE-1 MA-FR-MLSE-2
	Tistan	Fire retardancy	TR-FR-MLSE-1 TR-FR-MLSE-2

Table 5.12. *Continued*

Type of fibre	Textile	Treatment	Reference
100% Cotton	Percal	Water repellency	P-WR-MLSE-1 P-WR-MLSE-2 P-WR-MLSE-3
	Panama Loira	Fire retardancy	PL-FR-MLSE-1 PL-FR-MLSE-2
	Sarga Unni	Water repellency	SU3-WR-MLSE-1 SU3-WR-MLSE-2 SU3-WR-MLSE-3
	Tex-1		Tex-1-WR-MLSE
	Tex-2		Tex-2-WR-MLSE
	Tex-3		Tex-3-WR-MLSE

The effectiveness of the different treatments was assessed as established in Actions A1 and A2 (see sections 5.1.1 and 5.1.2). Besides, the following additional properties were assessed in order to both evaluate treatments efficiency and any potential negative effect in physical-mechanical or chemical requirements of materials:

- Aqueous liquid repellency, according to ISO 23232
- Wettability, by contact angle measurement (EN 828)
- Antimicrobial/Antibiofouling properties (Biofilm formation, INESCOP method)
- Effect on surface morphology, analysed by Scanning Electron Microscopy (SEM)
- In chromium-tanned leathers, assessment of potential oxidation of Cr (III) into Cr(VI). Measurement of Cr(VI) according to EN ISO 17075.
- Effect on softness - EN ISO 17235
- Effect on leather mechanical properties. Measurement of tear strength, according to EN ISO 3377-1
- Effect of treatment on leather bondability. Measurement of T-peel strength, according to EN 1392

Every property was assessed under Action B4 (see section 5.1.5). According to the obtained results, a series of processing conditions have been established for the treatment of textiles and leathers to be used in the manufacture of goods prototypes for validation (Action B4). Table 5.13 summarises the said optimal conditions.

INESCOP was the responsible for this Action. They were the contact with the MLSE[®] system provider and were in charge of the optimisation of leathers treatment. ATEVAL was in charge of the optimisation of textiles treatment. CCI, NEWPORT and TEXATHENEA have provided the materials used in MLSE[®] optimisation.

Action B2 has made adequate progress according to the schedule envisaged in the amended proposal. It started in January 2015 and finished in December 2016. Deliverables B2.1 and B2.2 reporting the optimal conditions to obtain functional leathers and textiles, respectively, have been released and are included in Annex 5 to this Final Report.

Table 5.12. Selected MLSE[®] parameters

Functionality	Parameter	Run#1	Run#2
Leathers treatment			
Water & Stain resistance	Precursor	Methyl/ethyl copolymer silane and siloxane blends	
	Plasma Power (kW)	0.5	0.5
	Gas	100% N ₂	100% N ₂
	Laser Power (mJ)	650	650
	Material speed (m/min)	20	
Antimicrobial	Precursor	Methyl/ethyl copolymer silane and siloxane blends and salts of Ti/Ag	None
	Plasma Power (kW)	4	
	Gas	95% N ₂ + 5% CO ₂	
	Laser Power (mJ)	650	
	Material speed (m/min)	20	
Textile treatment			
Water & Stain resistance	Precursor	Methyl/ethyl copolymer silane and siloxane blends	None
	Plasma Power (kW)	0.1	
	Gas	100% N ₂	
	Laser Power (mJ)	500	
	Material speed (m/min)	20	
Fire retardancy	Precursor	Methyl/ethyl copolymer silane and siloxane blends	None
	Plasma Power (kW)	0.1	
	Gas	100% N ₂	
	Laser Power (mJ)	500	
	Material speed (m/min)	20	

5.1.5. Action B3. Characterization of functional textiles and leather

Treated materials in Action B2, leathers and textiles, were tested in order to verify both MLSE® treatment effectiveness and any potential negative/positive effect in physical-mechanical or chemical requirements of materials at INESCOP laboratories (responsible of this Action). Test methods and requirements established in Action A2 (see section 5.1.2) have been applied. Properties of the materials treated with MLSE® procedure have been compared with both non-treated and conventionally functionalised references.

On the one hand, the effectiveness of different cleaning treatments carried out on leather samples has been visually assessed by observation of the material **surface morphology** by Scanning Electron Microscopy (SEM), see Figure 5.7. What is more a chemical analysis of the treated material surface was carried out by Fourier Transformed Infrared Spectroscopy (FTIR).

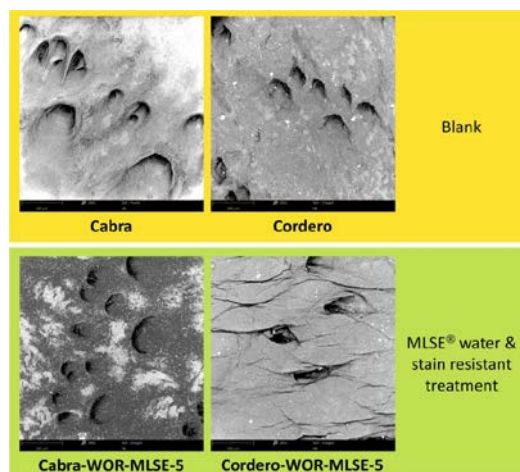


Figure 5.6. SEM micrographs of goat and lamb skins treated by MLSE®

Effects of the different treatments on leathers morphology are more noticeable in those having a grain side. Nevertheless, the observed effect highly depends on the different parameters studied within Action B2.

Furthermore, the effect of MLSE® treatment of materials surface was assessed in terms of chemical composition (by FTIR, see Figure 5.7. SEM micrographs of goat and lamb skins treated by MLSE® (see Figure 5.7). Besides, the effect of both conventional and MLSE® treatments on any potential change in Cr(VI) content is being assessed according to EN ISO 17075.

Regarding **water resistance**, both textiles and leathers were assessed by using different methods and techniques. Firstly, ISO 23232 “Textiles - Aqueous liquid repellency - Water/alcohol solution resistance test” was used. In this test, drops of different standard test liquids, consisting of a series of water/isopropyl alcohol mixtures with decreasing surface tensions, are placed on the surface of the substrate (see Figure 5.8a)). Their absorption, wicking and contact angle are observed and the aqueous repellency grade is established as the highest numbered test liquid which is not absorbed. This test was performed on materials treated with MLSE® processes for water resistance, stain resistance and combined water and stain resistance.

Secondly, wettability of treated materials was assessed according to EN 828 “Adhesives - Wettability - Determination by measurement of contact angle and surface free energy of solid surface”. In this test, 5 μ l-drops of water are dosed onto the surface of the material. Left and right contact angles (Θ) are measured as shown in Figure 5.8 b. Measured angles under 90° indicate that the liquid wets the assessed surface. Contact angles over 90° indicate low wettability and, therefore, some degree of water repellency. The higher the angle, the higher the water repellency.

Thirdly, water resistance of leathers to be used in footwear manufacture must be assessed under simulated wearing conditions, according to EN ISO 5403-1 “Leather - Determination of water resistance of flexible leather - Part 1: Repeated linear compression (penetrometer)” (see Figure 5.8c). Two parameters have been evaluated: 1) Water penetration time: time at which water penetration is observed; 2) Water absorption: percentage gain in mass of the material after 60 min.

In the case of textiles, water resistance was assessed according to EN ISO 4920 “Textile fabrics - Determination of resistance to surface wetting (spray test)”. According to this test, a specified volume of water is poured (sprayed) on the textile surface through a funnel that incorporates a spray nozzle (see Figure 5.8d). In addition, resistance to wetting (spray rating) was determined by comparing the appearance of the test piece with descriptive standards which correspond to the American Association of Textile Chemists and Colorists (AATCC) photographic standards provided in their Test Method 22 “Water repellency: Spray Test”.

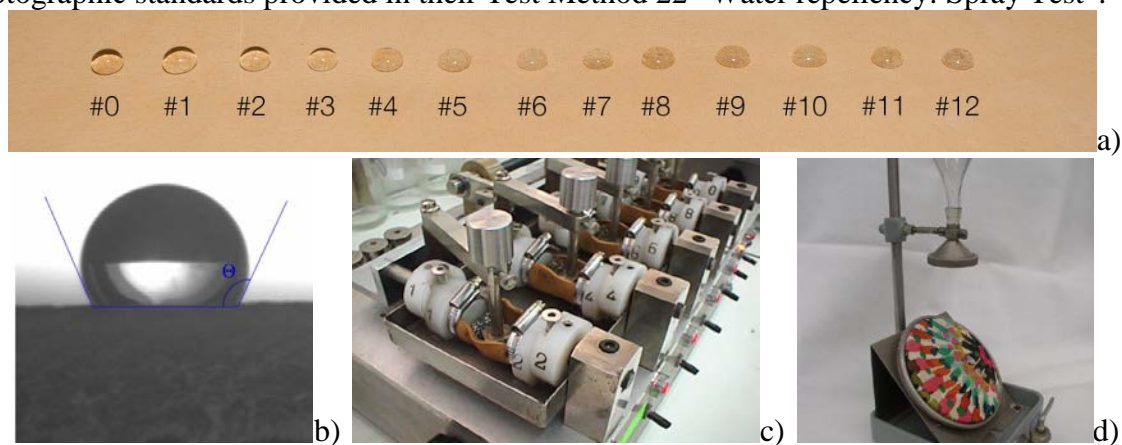


Figure 5.7. Different water resistance assessment methods.

The effectiveness of stain resistant treatments by MLSE[®] was assessed in treated leathers and textiles according to EN ISO 14419 “Textiles - Oil repellency - Hydrocarbon resistance test”. Test procedure is similar to the aqueous liquid repellency test described above. Drops of standard liquids of decreasing density and surface tensions (γ), are placed on the substrate surface and observed for absorption, wicking and contact angle.



Figure 5.8. Assessment of oil repellence properties (EN ISO 14419).

The oil repellency grade is defined as the highest numbered test liquid which is not absorbed by the substrate surface.

In addition, **fire resistance** of leathers was assessed according to EN 15090 “Footwear for firefighters”. In this test, limited flame spread and ignition is assessed after subjecting the material to a small defined flame for 10s. These properties are measured as the length of time (in seconds) for which the material continues to flame (afterflame time) and the time for which a glowing combustion occurs after cessation of flame (afterglow time), respectively.

With regards to textiles, different tests depending on their intended use were carried out:

- Curtains: According to EN 1101 “Textiles and textile products - Burning behaviour - Curtains and drapes - Detailed procedure to determine the ignitability of vertically oriented specimens (small flame)”. If no ignition occurs, then EN 13772 “Textiles and textile products - Burning behavior - Curtains and drapes - Measurement of flame spread of vertically oriented specimens with large ignition source”.
- Upholstery: According to EN 1021-1 “Furniture - Assessment of the ignitability of upholstered furniture - Part 1: Ignition source smouldering cigarette” and EN 1021-2 “Furniture - Assessment of the ignitability of upholstered furniture - Part 2: Ignition source match flame equivalent”, or according to the related BS 5852 “Methods of test for assessment of the ignitability of upholstered seating by smouldering and flaming ignition sources”.

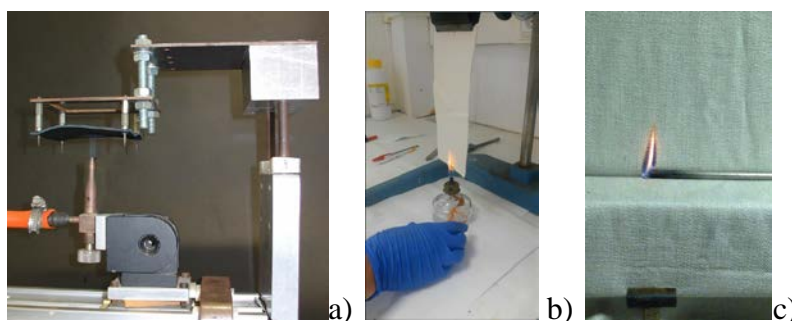


Figure 5.9. Different fire resistance assessment methods.

Furthermore, the antibacterial and antibiofouling (related to hydrophobicity) character of treated and untreated leathers was evaluated in different microorganism’s cultures, after 18-24 h incubation. Biofilm formation was monitored by means of a modified version of the microtite plate assay previously described by O’Toole and Kolter.

Antifungal activity was assessed according to ASTM G21-13 “Standard Practice for determining resistance of synthetic polymeric materials to fungi”. Materials were put into contact with a mixture of spores of five fungi and were incubated at 28°C for 28 days. Cellulose film was used as control material. Antifungal activity was visually assessed.

Apart of the effectiveness of the MLSE[®], their effect on other properties of the treated materials of great importance for their application in footwear and house wares were

evaluated, such as water vapour permeability, softness, bondability, tear strength, hexavalent chromium content, sewability, among others. Furthermore, the significance of the effect was evaluated by statistical analysis.

After treated materials characterisation, main achievements obtained as a result of MLSE[®] treatment are summarised as follows:

Leathers:

- *Aqueous liquid repellency*: #3 → #9
- *Water resistance under repeated linear compression*: 1 min → > 60 min
- *Water absorption under repeated linear compression*: 130% → 12%
- *Contact angle*: 0° → 130°
- *Flame persistence time*: 0 s → 0 s
- *Glow time*: > 2 s → 0 s
- *Fire Behaviour*: Deformation, charring, holing, must be extinguished → deformation
- *Oil resistance*: #3 → #7
- *Bacterial resistance*: antibacterial treatment inhibits cell growth
- *Morphology*: grain side is made smoother
- *Potential undesirable effects*:
 - *Cr(VI) content*: not affected
 - *Water vapour permeability*: not affected
 - *Softness*: MLSE[®] treatment can affect softness in some leathers. Under selected conditions, only slight reduction not affecting suitability
 - *Tear strength*: not affected
 - *Bondability*: not affected

Textiles:

- *Aqueous liquid repellency*: #0 → #12
- *Resistance to surface wetting*: #0 → #5
- *Contact angle*: 0° → 140°
- *Flame spread*: must be extinguished → flame is autoextinguished
- *Oil resistance*: #0 → #6
- *Morphology*: not affected

Action B3 has made adequate progress according to the schedule envisaged in the proposal. It started in May 2015 and finished in May 2017. Deliverable B3 entitled “Report on the physico-chemical characterisation of the functionalised textiles and leathers in the demonstration plant” has been released and is included in Annex 5 to this Final Report.

5.1.6. Action B4. Validation of the technology. Goods prototypes manufacturing

The main objective of Action B4 has been demonstrating the feasibility of the MLSE[®] technology for the production of textile and leather products with long-lasting functional properties. In this sense, results obtained on trials carried out on treated materials - and the selection of the best performing ones - gave rise to the manufacturing tests.

For the production of footwear prototypes, leathers from different origin (bovine, goat, lamb and pig) were selected, taking into account the intended uses. In addition, different finishings (both chemical and mechanical) were selected. For such purpose, CCI, in collaboration with INESCOP, contacted several of their member footwear companies, in order to carry out the validation activities.

Several footwear models have been designed for TEXTILEATHER project, including children's, men's, women's and professional footwear. The designed shoes have been manufactured using materials from TEXATHENEA, NEWPORT but mainly from CCI member tanning companies. These materials have been treated by MLSE[®] within Action B2 development.

In the case of textiles, the choice was 100% cotton, printed, woven textiles. Differences among references lie in both pattern design and ink (colours) and the impact of these on the functional properties of the material were studied. In this task TEXATHENEA had the collaboration of ATEVAL and INESCOP.

Such materials were provided to MTiX for treatment within Action B2, under processing conditions optimised in that Action. Before being subject to material treatment, the preparation stage took place, especially in the case of leathers. Due to the specifications of the MLSE[®] equipment (in particular regarding the feeding system for discrete materials), and following the request of the technology provider, leathers were cut to a specific size (297 x 420 mm) in order to comply with the current technical limitations of the equipment. It is worth mentioning that this has led to significant material wastes, that will however be avoided with a new equipment specifically developed for treatment of leathers equipped with a conveyor belt for continuous material feeding.

Treatments to be carried out on every type of material were decided and communicated to MTiX. Decisions were based on the intended use of the material and the type of footwear/products that would be manufactured thereof. Following receipt of treated materials, and previously to the production of prototypes, the different materials were assessed at INESCOP facilities as part of Action B3.

In the case of footwear manufacturing, functional materials and patterns sets were supplied to the footwear companies involved in this validation Action for the production of the different prototypes. In this multi-step process, the different manufacturing phases (clicking, closing, lasting, assembling, finishing, etc.) were carried out according to their conventional manufacturing procedures, without any modification.

In general, good performance of leathers and textiles has been stated when manufacturing most prototypes. Differences in handling were negligible among MLSE® treated materials and those commonly used by the companies, and modifications in the operation conditions were not necessary.

Some constraints have only arisen with some leathers used in the manufacture of some occupational models, namely, health shoes and clogs. The encountered failures can be caused by two different reasons: a lack of elasticity of the leather, or the application of a too high lasting strain. Having in mind that leathers used in the manufacture of prototypes were much thinner than those used in their actual production line; it has been considered that a reduction of the applied lasting strain could have avoid the arisen problems. In fact, such problems have not been observed in other prototypes manufactured with the same leather references.

Figure 5.11 to Figure 5.13 show the different footwear prototypes that have been manufactured within LIFE TEXTILEATHER project.



Figure 5.10. Footwear prototypes: Town footwear. **A:** Model #1, upper: Techno Washed; **B:** Model #1, upper: Crust Goat; **C:** Model #2, upper: Tex1; **D:** Model #2, upper: Tex2; **D:** Model #3, upper: Green Split; **F:** Model #3, upper: Serraje; **G:** Model #4 with two different finishes.



Figure 5.11. Footwear prototypes: Children's boots (Model #5).



Figure 5.12. Footwear prototypes: Occupational footwear. **A:** Women's uniform (Model #6); **B:** Women's uniform (Model #7); **C:** Men's uniform (Model #8, upper: cordero); **D:** Men's uniform (Model #8b, upper: cabra); **E:** Health (Model #9); **F:** Health: clog (Model #10, upper: cordero); **G:** Health: clog (Model #10b, upper: cabra); **H:** Health and catering (Model #11); **I:** Safety (Model #12); **J:** Safety (Model #13).

In order to assess the general performance of MLSE[®] treated materials when they are used in the manufacture of footwear, prototypes have been assessed according to the some of the following properties:

- Upper-sole adhesion (non-stitched models), according to EN ISO 17708
- Flex resistance of uppers (leather models), according to EN ISO 17694
- Water vapour permeability of complete upper assembly, according to EN 13515
- Tear strength of upper (leather, non-perforated-upper models), according to EN 13571
- Upper's seams strength (seamed-upper models), according to EN 17697.
- Colour fastness to rubbing, according to EN ISO 17700:2005
- Electrical resistance and resistance to water, according to EN ISO 20344:2011

Last but not least, wearing trials have been performed on some models in order to assess whether MLSE[®] treatments affect comfort properties in footwear. In general, good performance has been reported by the tester panel.

Besides, worn footwear has been visually assessed in order to evaluate any damage of uppers, the appearance of stains due to its normal use, etc. None of these undesired effects have been observed at the moment of the drafting of this document.

Children's wear trials were carried out using a collaborative robot, which can simulate the children's gait movement.

It has been proved that footwear manufacturing processes do not affect the performance of MLSE[®] treated materials. Most of them comply with the requirements for the different types of footwear that have been produced. Besides, wear trials have shown that MLSE[®] treatment does not affect comfort properties of materials and/or footwear constructions.

Regarding house ware prototypes, the first thing to do is adapting the design to the product to be manufactured. According to the final product, some dimensional adaptation in design and in cutting marks will be needed so that the product has the right final measurements once finished. In the developments referred to this project, certain properties were envisaged for the products to be manufactured: cushions and tablecloths. In this case, water and stain resistant properties were sought.

The functionality contemplated in both cases was different since, in the case of the tablecloth, these properties allowed it to be easy to clean (materials used in our products are made of natural fibres with a high degree of liquid absorption) and prevent oil and wine stains from being too hard to eliminate. As for the cushions, there are two distinct functionalities: one intended to cushions and upholstery fabric for outdoor use with hydrophobic properties and consequent resistance to all weather conditions, thus preventing the water from penetrating into the filling and producing mould; and the other related to cushions and upholstery fabric that repel everyday stains which could be easily cleaned with a damp cloth. It is to be noted that these properties of natural fibres are normally found in textiles made with synthetic fibres, which will therefore make the difference against competitors when putting this new product on the market.

Figure 5.14 shows the house ware prototypes manufactured by TEXATHENEA.



Figure 5.13. House ware prototypes produced: tablecloths and cushions.

The process of manufacturing the house ware prototypes does not include any stage where pressure, heat, steam or bonding with an adhesive is performed, which could affect the performance of MLSE[®] treated textiles and the products made thereof.

For this reason, testing on prototypes was limited to the assessment of seam tensile properties, according to EN ISO 13935-1. Only seams in cushions could be assessed by means of this procedure. No differences were observed among MLSE[®] treated and non-treated materials.

In general, good performance of MLSE[®] treated textiles has been stated when manufacturing house ware items.

Action B4 has made adequate progress. It started in December 2015 and, due to the slight delay in Action B2 and the unforeseen events regarding MTiX, this Action has been extended until May 2017. Deliverable B4 entitled “Report on validation of the technology, goods prototypes manufacturing and characterisation” has released and is included in Annex 5 to this Final Report.

5.1.7. Action C1. Socio-economic and environmental impact assessment

In order to assess the **environmental impact** of the implementation actions, the following indicators for actions B1 to B4 have been established:

- ***Percentage of reduction in water consumption*** in the finishing process
- ***Percentage of reduction in power consumption*** in the finishing process
- ***Percentage of reduction in chemicals consumption*** in the finishing process

A preliminary study was provided by the MLSE[®] supplier, which has been taken as starting point in order to assess this environmental impact.

The said study compares ***the traditional wet process*** for waterproofing treatment in textiles, based on the use of perfluorinated compounds (PFC), with the baseline conditions for the treatment with the ***Multiple Laser Surface Enhancement (MLSE[®]) technology***. Main features of each process are:

- ***The traditional wet process*** involves the treatment of the fabric with water solutions of PFC and other additives, followed by drying and curing.
- ***The treatment with MLSE[®] technology*** is reported as a dry process, carried out at atmospheric pressures using inert and reactive gases (N₂, O₂, Ar and CO₂).

According to that analysis, main benefits of the implementation of MLSE[®] in waterproofing treatment of textiles are:

- ***The MLSE[®] process is able to provide textiles with the same waterproofing and stain resistance performance than the traditional process, avoiding the use of PFCs.***
- ***The MLSE[®] process requires the use of no hazardous chemicals and is essentially waste- and pollution-free.***
- ***A significant reduction in power consumption is achieved by the use of the MLS process vs the traditional process (99.6% reduction).***
- ***Carbon footprint is reduced in over 90% with respect to the traditional process.***

Within Action C1, a series of questionnaires were scheduled in order to collect the feedback from the textiles, tanning and footwear companies, both project beneficiaries and other companies interested in the technology. Through the said questionnaires, an estimation of the impact of the implementation of TEXTILEATHER project in terms of reduction of consumption and environmental costs for the different finishing processes will be made at the end of the project.

A copy of the survey and a detailed analysis of the answers received are included in 6 to this report. Main conclusions of this first survey were:

- Both industries have indicated that environmental issues are important in the development of their activities:
 - o Tanning companies: Average score of 8.55
 - o Companies of fabrics: Average score of 8.46
- 93% of the fabric companies and 64% of the tanneries have reported to have staff dealing with environmental issues.
- Every textile company has stated that they are aware of the environmental legislation applying to their activities, whereas only a 73% has reported to know this legislation.
- The environmental criteria “absence of hazardous substances” is the most considered by both industries when designing a new product.
- In both sectors, most companies reported to evaluate the environmental impact when a change in the manufacturing process is made, being slightly higher in the case of textiles (80% of textile vs 73% of tanneries). Nevertheless, the tanning industry gives a higher average score to the environmental impact (8) than the textile companies (7.2).
- Only a 45% of the tanneries reported to carry out finishing processes, while over 86% textile companies perform this kind of treatments. Companies stating that they do not make use of restricted chemicals in their finishing processes were 60% (tanneries) and 73% (textile).
- Most companies consider that technological and/or economical investments are necessary in order to reduce current processing consumptions.
- As far as the companies are concerned, costs savings, improved company image and a reduction of waste management needs are the main benefits of investing in process consumption reducing technologies.

After the monitoring team visit and in view of the survey results , the conclusion is that the results were not determinant and comparable to obtain a measure of the impact, so it was decided to make a study comparing with the case of textiles. the impact of the costs and power consumption of energy, water and chemical products of the MLSE® processes with those of the TEXATHENEA company and in the case of the leather skins through the determination of the carbon footprint and the Financial Feasibility. Listed below are detailed the main results obtained from these comparative studies.

Textiles

The comparison of consumption between the MLSE® process (data provided by MTiX) and the traditional processes (Consumption data of TEXATHENEA). The savings of consumption are:

- Energy: 97.39%
- Water: 99.96%
- Chemical Products: 99, 25% (FR) and 96.84% (Waterproof).

The comparative between the process costs for a square meter between the technologies is as follows:

So the savings obtained between a process to use the process MLSE® respect the traditional are:

- For Fire Retardant finishing: 90,78%
- For waterproof finishing: 91.26%

Leathers

The aim of this study was to compare the environmental impact of two treatments to produce water resisting properties (hydrophobic) in leathers, in terms of carbon footprint. The two processes addressed were:

- The conventional wet process using PFCs bases water proofing treatment
- The innovative MLSE® technology.
- The assessment builds on previous work carried out by INESCOP in the framework of LIFE TEXTILEATHER project, as well as previous work carried out by the technology supplier, the company MTIX.

This work evaluated the carbon footprint as environmental impact in terms of:

- Use of hazardous chemicals
- Use of energy
- Use of water

The main results of this study are:

CARBON FOOTPRINT COMPARISON. SimaPro software was chosen to carry out this Carbon Footprint calculation. SimaPro stands for System for Integrated Environmental Assessment of Products. Included in SimaPro is a set of methods of carrying out the impact analysis of the inputs. More precisely, CO2Shoe tool developed under the LIFE CO2Shoe project (LIFE12/ENV/ES/315) which is a specific tool to determine carbon footprint in the footwear industry and related industries. The tool has been validated by AENOR (Spanish Standardisation Association) to ensure its correct operation.

○ Life cycle inventory (LCI) MLSE® versus conventional finishing system

Life cycle inventory of the MLSE® finishing system		
Substance	Value	Units
Nitrogen	0,0009	kg/ m of finished leather
Polysiloxane	0,0125	kg/ m of finished leather
Water consumption	0,2375	kg/ m of finished leather
Energy consumption	0,0167	kWh/ m of finished leather

Life cycle inventory of the conventional finishing system		
Substance	Value	Units

Life cycle inventory of the conventional finishing system		
Substance	Value	Units
Acrylic resin	0.1071	kg/ m of finished leather
Water proofing agent	0.0040	kg/ m of finished leather
Ethyl acetate	0.2816	kg/ m of finished leather
Ammonia	0.0071	kg/ m of finished leather
Water consumption	5.3550	kg/ m of finished leather
Formic acid	0.0536	kg/ m of finished leather
Electricity consumption	0.5834	kWh / m of finished leather
Natural gas consumption	5.6771	kWh / m of finished leather
Gasoil consumption	0.3303	MJ / m of finished leather
Fuel consumption	4.7126	MJ / m of finished leather

Carbon footprint results	kg CO ₂ eq.
MLSE® process	0.0526
Conventional process	3.1286



As a result of the environmental impact assessment carried out, it can be concluded:

- The MLSE® process provide similar waterproofing performance as the traditional wet process, without the use of hazardous chemicals (such as PFCs)
- Significant reduction in carbon footprint of the MLSE® process versus the conventional process in the leather industry.

Socio-economic impact

In order to assess the **socio-economic impact** of the project the type of employment generated by this technology has been taken into account. The implementation of more cost-effective technologies such as MLSE® technology can also benefit the employability in the involved industrial sectors creating more skilled jobs.

MLSE® treatments are categorized into recipes, which define all process parameters and associated machine settings to effect the required MLSE® treatment on any specific fabric substrate. These recipes are stored locally and can be loaded as required.

Once MLSE® processing is finished, the operator completes the batch, recording any relevant comments; the system then generates a batch certificate, which not only records time, operator and volume details, but also logs the device parameters used during processing. This provides full traceability for the treatment cycle.

The system includes a remote access interface, for each batch of fabric processed, a batch ID is created. This is a unique, one time processing event. All details associated with the batch (e.g. volume, system in-feed/output method, customer details etc.) are entered into the system, referencing a specific, locally stored “recipe.” The operator then initiates the start of the batch,

which automatically starts the constituent machine devices in sequence, sets gas flows and machine speeds and initiates the processing.

Once MLSE® processing is finished, the operator completes the batch, recording any relevant comments; the system then generates a batch certificate, which not only records time, operator and volume details, but also logs the device parameters used during processing. This provides full traceability for the treatment cycle.

The system includes a remote access interface, allowing MTIX Ltd to offer expert support for system operation or to help in diagnostic capability for production issues; accessible directly from their MLSE® head office.

The running of an MLSE® system requires three levels of personnel:

1. Operators - capable of loading the machine, logging predefined batch schedules against specific fabric batches, starting and stopping the system, monitoring MLSE® treatments, noting any error signals that occur.
2. Technicians - capable of investigating fault screens, identifying simple problems and carrying out routine maintenance procedures. Communicating with MTIX Ltd experts and carrying out any maintenance instructions identified following a remote access intervention.
3. Textiles and Leather Specialists – capable of creating batches, linking existing recipes to textiles and leather substrates, creating batch schedules based on production requirements. Potentially building up the expertise to modify recipes for specific textiles and leather structures, different origin, different process, etc.

Action C1 has progressed adequately. It has been done throughout the project. In the annex 6 "Development of action C1 Socioeconomy and environmental evaluation" has all the information of the realization of this action

5.1.8. Action E2. Networking activities

The aim of the networking with other projects is to establish a “knowledge network” with projects of interest, related to textiles and leather finishing technologies. This "knowledge network" will act as a vehicle for information and expertise exchange. The actions carried from the Midterm Report were:

ATEVAL

- ✓ LIFE13 Kick-off Meeting (Madrid, 9th of September 2014). 150 attendants.
- ✓ Meeting of Member of the Valencian Region CALL LIFE+ 2013 (Valencia, 23rd of September 2014). 20 attendants.
- ✓ Workshop “How to know if I meet the environmental requirements applicable in my company” (Ibi, 9th of November 2014). 60 people attended the event.
- ✓ Networking with SHOEBAT project (Elda, 1st of April 2015).
- ✓ Networking with ECONANOTEX project (Turku, 16th of April 2015). 40 people attended the event.

- ✓ SUSTEXNET project workshop and training seminar. 4th November 2015. 30 people attended the event.
- ✓ Networking LIFETAN project (Elda, 11th March 2016)
- ✓ Networking “Fuzzy mathematics for evaluating environmental impacts in wearing apparel companies” project (Castellon de la Plana, 6th of April 2016, Castelló de la Plana)
- ✓ Networking with Sustainable Market Actors project: Responsible Trade (SMART) (6 de Abril, 2016, Castellon de la Plana, España)

INESCOP

- ✓ LIFE InfoDay – Networking Event (Valencia, 10th of July 2014). 80 people attended the event.
- ✓ Workshop “How to know if I meet the environmental requirements applicable in my company” (Ibi, 9th of November 2014). 60 people attended the event.
- ✓ LIFE InfoDay – Networking Event (Valencia, 14th of July 2015). 90 people attended the event.
- ✓ Contacts with other LIFE projects have been established by means of LinkedIn LIFE+ Group. Furthermore, networking actions have been made with LIFE microTAN project.
- ✓ THINK01 – A NEW WAY OF SHARING (Barcelona, 28th April 2016). Contact between textile researchers and designers to introduce new technologies in future design concept).
- ✓ CEN/TC 161/VG 10 MEETING (Kettering - UK, 25 May 2016) focused on protective footwear and evaluation methods.
- ✓ INDUSTRIAL TECHNOLOGIES 2016 - Creating a Smart Europe (Amsterdam – The Netherlands, 22 - 24 June 2016)
- ✓ Workshop “Step2Sustainability” (Elda – Spain, 21 July 2016)
- ✓ FOCUS SME and Entrepreneurship (Alicante – Spain, 3 November 2016)
- ✓ Workshop Footwear and Health (Elda – Spain, 28 November 2016)
- ✓ SWITCH –MED SIDE EVENT (Tunisia. 2th December 2016)
- ✓ Towards Sustainable Footwear Workshop (Elda – Spain, 18 May 2017)
- ✓ LIFE INFODAY – Networking event (Paterna – Spain, 30 May 2017)
- ✓ SCP/RAC (2017) – Regional Activity Centre for Sustainable Consumption and Production. It is an international cooperation with Mediterranean countries on development and innovation of the productive sector and civil society from more sustainable consumption and production models. MLSE® has been introduced to this Centre through SwitchMed initiative which supports and connects stakeholders to scale-up social and eco innovations in the Mediterranean.



Meeting of Members of the Valencian Call LIFE+ 2013 (Valencia, 23th September 2014)



Workshop “How to know if I meet the environmental requirements applicable in my company” (Ibi, 9th of November 2014)



Networking with SHOEBAAT project (Elda, 1st April 2015)



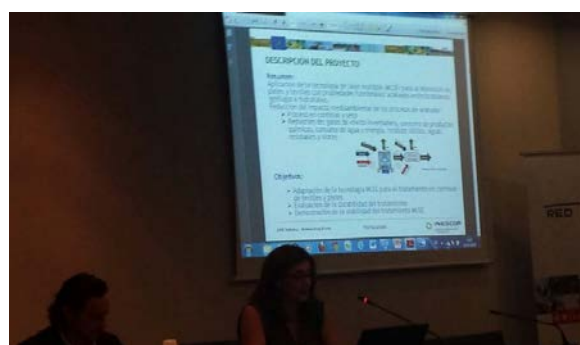
Networking with ECONANOTEX project (Turku, 16th April 2015)



SUSTANEX project workshop and training seminar. (valencia, 4th november 2015)



LIFE InfoDay – Networking Event (Valencia, 10th of July 2014)



LIFE InfoDay – Networking Event (Valencia, 14th of July 2015). 90 people attended the event.



THINK01 – A NEW WAY OF SHARING (Barcelona, 28th April 2016)



INDUSTRIAL TECHNOLOGIES 2016 - Creating a Smart Europe (Amsterdam – The Netherlands, 22 -

CEN/TC 161/VG 10 MEETING (Kettering - UK, 25 May 2016



Workshop “Step2Sustainability” (Elda – Spain, 21 July 2016)



FOCUS SME and Entrepreneurship (Alicante – Spain, 3 November 2016)



A group of people are gathered in a meeting room. A man in a dark suit is standing on the right, gesturing towards a large projection screen. The screen displays a presentation slide with a blue background and a central graphic. Several people are seated around a long table in the foreground, facing the presenter. The room has a wooden panelled wall and a large window with light-colored curtains. The ceiling is equipped with fluorescent lights and a projector.

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Furthermore, a search of LIFE+ projects of interest with the same thematic has been made in LIFE database by ATEVAL. Details on the project selected (name of the project, contact person, objectives and beneficiaries) have been collected.

As a result, during the reporting period, a series of projects with the same scope of the project TEXTILEATHER have been identified as well as entities which are working therein. Some contacts have been established with the partners of these projects.

Project Name	ACRTONYM	Website Link	Duration	Leather Partner	Common issues with TEXTILEATHER	Contacts
Life BioNaD - Naturalised dyes replacing commercial colorants for environmentally friendly leather dyeing and water recycle	BioNaD	http://lifebionad.com/	01-JAN-2014 to 30-JUN -2016	Chemical Institute of organometallic compounds of CNR	Reduction in consumption of energy and water, and wastewater pollutant.	dulivo@pi.iccom.cnr.it
LIFE SHOEBAAT - Promotion of best available techniques in the European footwear and tanning sectors	ShoeBAT	http://www.life-shoebat.eu	01-OCT-2013 to 30-SEP -2016	Inescop	Environmental improvements in the footwear and leather companies	formacion@inescop.es iferrer@inescop.es
LIFE DYES4EVER - Demonstration of cyclodextrin techniques in treatment of waste water in textil industry to recover and reuse textil dyes	Dyes4ever	http://www.dyes4ever.eu	01-JUL-2013 to 31-DEC -2015	Aitex	Reduce the chemical dosage in industrial wastewater	kmolla@aitex.es
LIFE CO2SHOE- Footwear Carbon Footprint	CO2SHOE	http://www.co2shoe.eu	01-OCT-2013 to 30-SEP -2017	INESCOP	Control reductions atmospheric emissions	iferrer@inescop.es
LIFE ECODEFATTING - Environmentally friendly natural products instead of chemical products in the degreasing phase of the tanning cycle	ECODEFATTING	www.life-ecodefattening.com	1-OCT-2014 to 30-SEP -2016	Chemical Department "Ugo Schiff" - Florence Universit	Reduction of use of chemical products, of water consumption and reduction of wastewater pollutions.	massimo.corsi@unifi.it
GREEN LIFE - GREEN LIFE: GREEN Leather Industry For the Environment	GREEN LIFE	www.greenlifeproject.eu/	01-JUN-2014 to 31-MAY -2017	DANI S.P.A.	Reduction in the consumption of water, energy, chemicals and volume of wastewater.	guido_zilli@gruppodani.it

Safe use of nanomaterials in the textile finishing industry.	ECOTEXNANO	www.life-ecotexnano.eu	01-OCT-2013 to 30-SEP-2016	Leitat	Environmental tool for the application of nanomaterial by finishing processes	vjamier@leitat.org
Planificación integrada y gestión sostenible de infraestructuras de saneamiento	SANEPLAN	http://www.saneplan-life.eu/	01-SEP-2013 to 28-FEB-2017	FUNDACIÓN INSTITUTO TECNOLÓGICO DE GALICIA	water supply, information system, integrated management	saneplan-life@itg.es
Mitigation of microplastics impact caused by textile washing processes	LIFE - MERMAIDS	-----	01-JUL-2014 to 31-DEC -2016	Italian National Research Council(CNR)	Environmental management - Cleaner technologies, Industry-Production - Textiles – Clothing, Water - Water quality improvement	mave@ictp.cnr.it
New generation of ecological fire-resistant plastics	PHOENIX	http://www.phoenix-eu-project.eu/		Aimplas	non-halogenated flame-retardants, replace hazardous chemicals, produce sustainable fire retardant additives	mimoreto@aimplas.es
COHESIVE BANDAGES BASED ON NATURAL FIBRES, WITH ANTIMICROBIAL AND HYDROPHOBIC PROPERTIES BY MLSE TECHNOLOGY - SMEs Instrument (1 st phase)	VENDA	---	From 2015-05-01 to 2015-11-01	Calvo Izquierdo	In VENDA NATU-haft project, Calvo Izquierdo aims at implementing the MLSE technology in their manufacturing system to produce antimicrobial and hydrophobic bandages for sanitary use, based on natural fibres.	e.monteaquedo@calvoizquierdo.es
Eco friendly tanning cycle	LIFETAN		01-OCT-2015 to 30-SEP -2017	Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile	The LIFETAN project will demonstrate innovative natural products and technologies for the degreasing, fatliquoring, bating (softening), dyeing and tanning phases of leather production. It will build on the results of previous LIFE projects that substituted toxic chemicals used during the leather tanning cycle to produce significantly more sustainable products	
Multiple Laser Surface Enhancement (MLSE) of textiles: An Eco-Innovation Project	MLSE Eco-I project	http://www.textile-training.com/projects/mlse-home.html	10/07/2013 to 09/01/2016	HUDDERSFIELD & DISTRICT TEXTILE TRAINING COMPANY LIMITED	The Multiple Laser Surface Enhancement (MLSE) system is a revolutionary break through which enables fibres and fabrics to be converted for enhanced hydrophilicity, hydrophobicity, fire retardancy and antimicrobial functionalities without	enquiries@textilehouse.co.uk

					the use of chemicals or water.	
Mitigation of the environmental impact caused by current DWORs (Durable Water and Oil Repellents) used in the textile finishing industry by analyzing their non-toxic alternatives	MIDWOR-LIFE	http://www.midwor-life.eu/	01 – SEPT – 2015 to 30 – AUG - 2018	TEXTILS.CAT Agrupacio d'Empreses Innovadores	Mitigation of the environmental impact caused by current DWORs (Durable Water and Oil Repellents) used in the textile finishing industry by analyzing their non-toxic alternatives	projectes@textils.cat
FUZZY MATHEMATICS FOR EVALUATING ENVIRONMENTAL IMPACTS IN WEARING APPAREL COMPANIES	Nils Science and Sustainability Programme (ES07)	http://www.sogres.uji.es/investigacion/proyectos.html		Universidad Jaume 1 Castellón – Grupo SoGReS-MF	Development of a measuring instrument to improve the knowledge and the impacts of textile industries on the environment	munoz@uji.es
Sustainable Market Actors: Responsible Trade	SMART – H2020	http://www.jus.uio.no/ftp/english/research/projects/smart/	01/03/2016 to 28/02/2020	UIO-University of Oslo – Department of private law	The overarching objective of SMART is to do research that will serve to promote global, sustainable development within a circular, low-emission economy compatible with the planetary boundaries and in line with the international development goals	munoz@uji.es
	SUSTEXNET	http://www.sustextnet.eu	From 01/01/2014 to 31/12/2015	AITEX	SUSTEXNET is aimed at the establishment of a cooperation network among main textile agents across the Mediterranean basin to increase the competitiveness and sustainability in the whole textile sector.	miriam.martinez@aitex.es
RESearch centers of Excellence in the Textile sector	RESET	https://www.interreg-europe.eu/reset/	From 01/04/2016 to 31/03/2021	Commune di PRATO	RESET informs stakeholders and policy makers about these good practices would allow those solutions to be adopted in other regions. One of the technologies considered as a good practice is the MLSE process. RESET addresses 2 key themes along with life Textileather Water consumption and	enrico.venturini@tecnotex.it

					energy saving, sustainable company organisations New sustainable chemistry, including reduction of chemical substances	
Footwear carbon footprint	CO2SHOES	http://www.co2shoe.eu/en/	From 01/10/2013 to 30/09/2017 (48 months)	INESCOP	The main objective of the project is to develop a carbon footprint calculation tool for the footwear sector, which allows the measurement of the greenhouse gas (GHG) emissions produced by each pair of shoes.	

ATEVAL is the responsible for this Action. Both ATEVAL and INESCOP have contacted those projects considered of interest for TEXTILEATHER development.

5.1.9. Action E3. After-LIFE Communication Plan

This Action has focused on the development of an After-LIFE Communication Plan.

Main strategy and activities have been planned in order to:

- Communicate and disseminate LIFE TEXTILEATHER objectives and achieved results.
- Increase awareness on the implementation of more resource efficient and sustainable technologies in both textile and leather sectors to reduce their environmental impact.
- Promote the use MLSE[®] technology as an alternative to conventional methods in order to replicate project results.
- Transfer the project results in other sectors.

Besides, during the establishment of the after-LIFE Communication strategies, the following aspects have been taken into account:

- Target audience: textile and leather companies, other interested industries, decision-makers, general public...
- Communication tools: demonstration plant, project website, video, partner's newsletters, leaflets...

Action E3 has made an adequate progress according to the schedule envisaged in the proposal. It started in June 2016 and finished in May 2017. Deliverable E3 "After Life Communication Plan" has been released and is appended to this report within 7.3 Dissemination annexes (Annex 7)

5.2. Dissemination actions

5.2.1. Objectives

The dissemination of the project results has been considered as critical. The project and its results have been made public on a European level. The necessary information has been provided to other institutions and bodies to be encouraged to transfer the project to their respective European regions. We have given much importance to the dissemination in Europe to facilitate understanding of results and extrapolation to all European countries. As the dissemination coordinator ATEVAL and also INESCOP like a partner have good contacts with European Bodies, targeted dissemination activities have allowed promoting and raising interest in the project results among the European audience and through its contacts with European bodies and networks. This has been achieved by presenting the project at seminars and conferences related with the project and with the sectors involved: textile and leather.

The main target groups of this project are finishing, textile and leather companies, however, other stakeholders will be taken into account: industrial association, research entities, machinery companies, environmental agencies...which have been invited by the partners to the dissemination events which the partners have organized/participated in Brussels and other European countries.

Every dissemination material and action must include a reference to LIFE+ programme funding and/or LIFE logo.

5.2.2. Dissemination: overview per activity

The D package “Comunication and Dissemination actions” has begun in June 2014, as expected. During the entire project, the following dissemination activities were carried out:

ACTION D.1 : Creation of project web-side. (Deliverable D.1)

The project website (www.textileather.eu) was launched in November 2014, achieving the envisaged Milestone. This web site is available in English, Spanish and Italian languages and is structured, so that the user can obtain access to all relevant information (project objectives, actions, advances, press releases, dissemination actions, news, events, etc).

Likewise it has created a new "Project advances" section, where the results that are obtained in the project are showed



Funcionalización de textiles y pieles mediante el proceso innovador MLSE

El proyecto demostrará la viabilidad técnica, medioambiental y económica de la tecnología MLSE (Múltiple Láser Surface Enhancement) como tratamiento superficial de textiles y cueros para la obtención de acabados funcionales

Español
Italiano

HOME THE PROJECT PARTNERS NETWORKING BLOG DOCUMENTS CONTACT PROJECT ADVANCES

PROJECT ADVANCES

PROGRESS

The following activities have been carried out during the first year of LIFE TEXTILEATHER project:

Selection of parameters to be optimised in the treatment of textile materials.

This task involved the selection of textiles to be enhanced with MLSE™ technology. Selected materials included fabrics more commonly used for domestic upholstery including: curtains, cushions, tablecloths, etc., and footwear (linings, uppers, insoles, etc.). Taking into account the characteristics of these textiles, a series of fundamental parameters has been established for the adaptation of the MLSE™ demonstration plant. Furthermore, the companies have set out the parameters to be finally met by the textile materials with regard to the different intended uses.

As a result of this action, the following parameters have been established for the subsequent adaptation of the MLSE™ system:

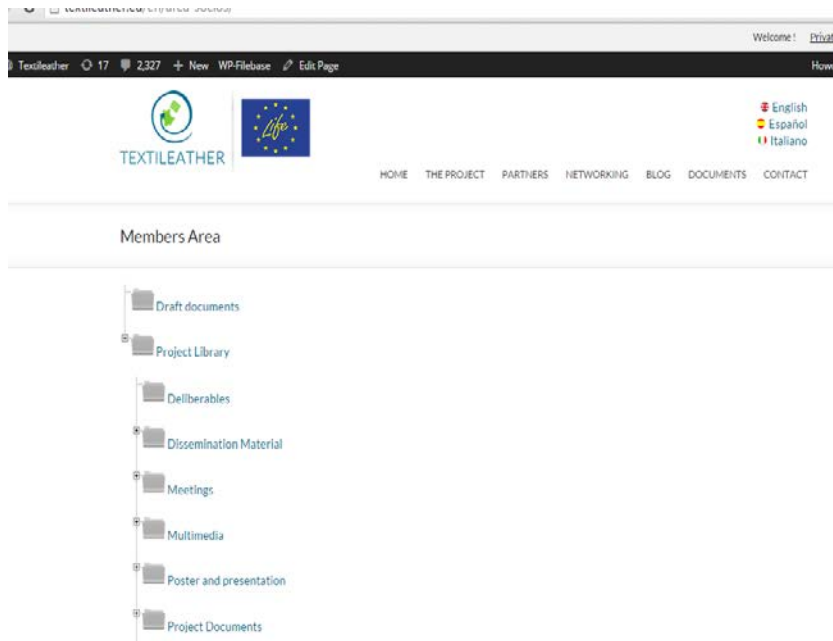
- Fabric structure
- Chemical nature
- Weight of fabric
- Material dimensions (width and thickness)
- Technical requirements of functional properties
- Financial viability
- Limitations relating to the production process



The project web-site is continuously updated with new information regarding LIFE Textileather results, dissemination activities and events of interest. ATEVAL is in charge of the setting up and updating the Textileather web.

The “*public area*” contains general information on the project, partners, dissemination actions, press releases and deliverables classified as public. A mailing list is included so that interested parties may receive updates and news related to the project through a newsletter.

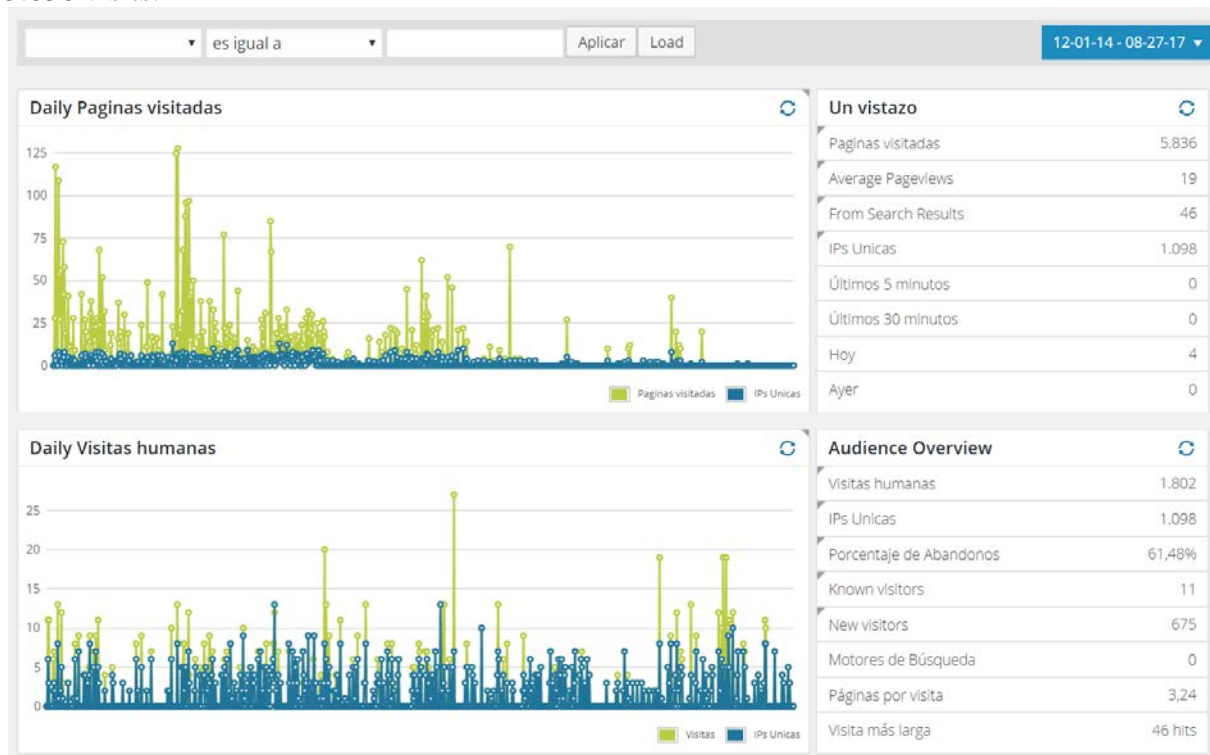
A “*private area*” is restricted to partners and the Commission and is password protected to access to confidential information of the project: Grant agreement, Partnership Agreement, technical & financial reports, non-public deliverables, documents and gallery of the project process, etc...



Shot screen of Members Area

Below, different graphics are presented extracted from the website of Textileather, where the monthly evolution of the visits, downloads; countries that visit the web, etc. are shown.

The impacts achieved so far in the web from the beginning of the project until now have been 5.836 visits.



Statistics for www.textileather.eu. Monthly visitors.

Top Pages		Top Traffic Sources	
Resultados 1 - 20 de 262	> >>	Resultados 1 - 20 de 288	> >>
/	16,93%	Direct Access	16,42%
/en/	6,05%	https://www.google.es/	6,03%
/blog/	4,69%	https://www.google.com.co/	0,74%
PARTNERS	4,30%	https://www.google.com/	0,70%
Acceder	3,43%	https://www.google.it/	0,69%
Ateval	2,54%	https://www.google.com.mx/	0,63%
CLUSTER CALZADO INNOVACIÓN (CCI)	2,54%	http://www.icesp.es/Accesso/Accesso/medios/medios	

Statistics for www.textileather.eu. Pageviews.

Países que más visitan		Visit Duration	
Resultados 1 - 20 de 73	> >>	0 - 30 segundos	64.98%
Spain	73,18%	31 - 60 segundos	5.38%
United States	5,91%	1 - 3 minutos	10.16%
Italy	5,79%	3 - 5 minutos	3.55%
Colombia	1,46%	5 - 7 minutos	2.05%
Mexico	1,29%	7 - 10 minutos	2.77%
Germany	1,27%	Más de 10 minutos	11.10%
Peru	0,89%	Average time on site	01:56

Statistics for www.textileather.eu. Audience

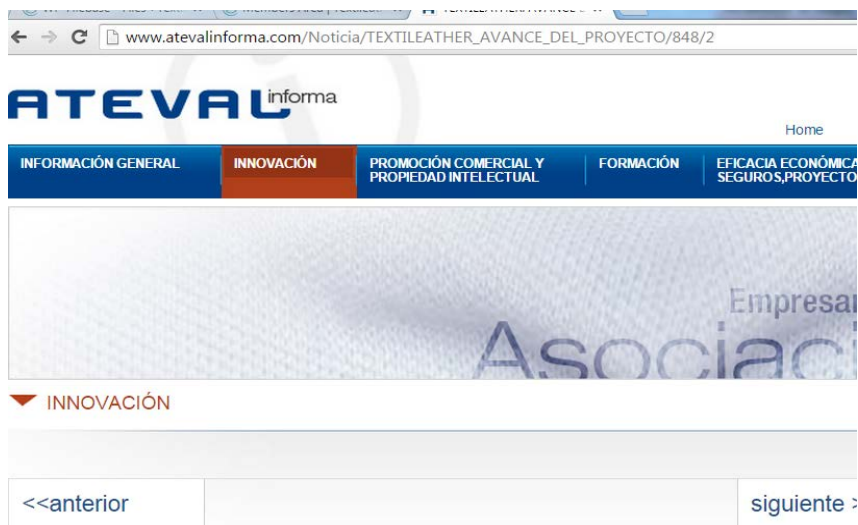
In the “partners website” it also appears information about the TEXTILEATHER project.

www.ateval.com (4,500 visits per year)

www.texathenea.net (around 22,000 visits per year)

www.inescop.com (over 93,000 visits per year)

www.clustercalzado.es (over 6,500 visits per year)



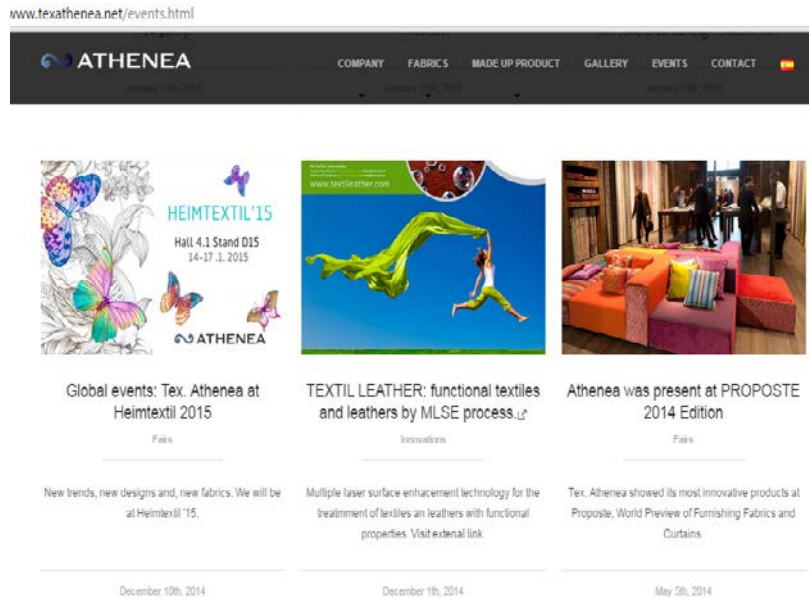
14/09/2015

TEXTILEATHER: AVANCE DEL PROYECTO.

Presentamos el primer Newsletter del proyecto TEXTILEATHER en el que encontrarán información de las acciones realizadas: momento, el progreso del proyecto, resultados esperados, etc.

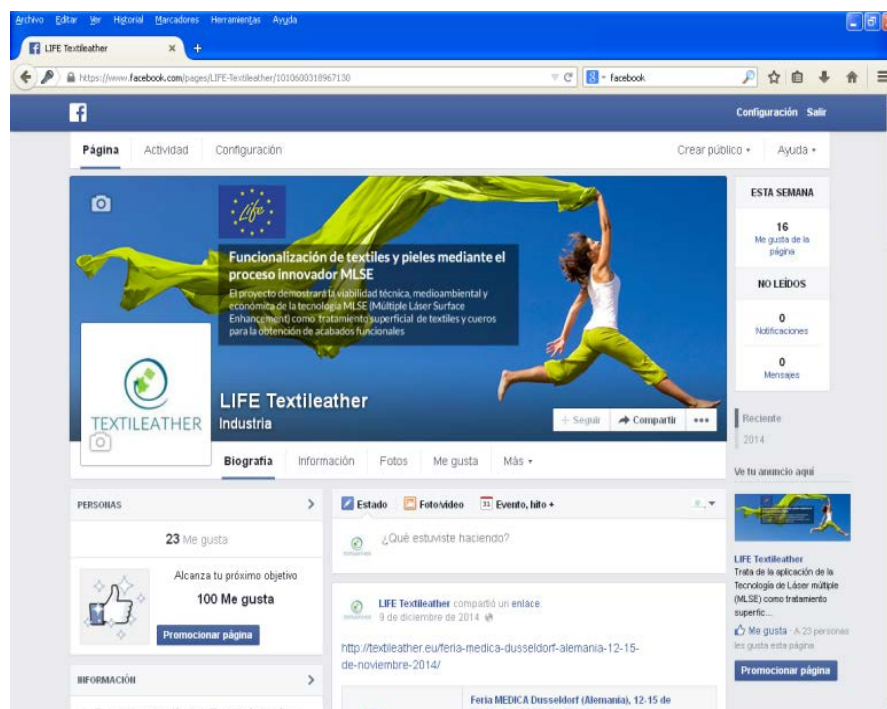


“El proyecto LIFE TEXTILEATHER se basa en la aplicación de la Tecnología de Láser múltiple



In addition, “social networks” are used to advertise the project further and the profile are posted to the most popular. Specific pages area used:

- Facebook (<https://www.facebook.com/pages/LIFE-Textileather/1010600318967130>)
- Twitter (<https://twitter.com/ltextileather>)
- LinkedIn (<https://www.linkedin.com/groups?home=&gid=8215451&trk=anet ug hm>)





Furthermore, a Quick Response Barcode (QR) has been generated for the URL of the project website. This code has been included in every new dissemination material.

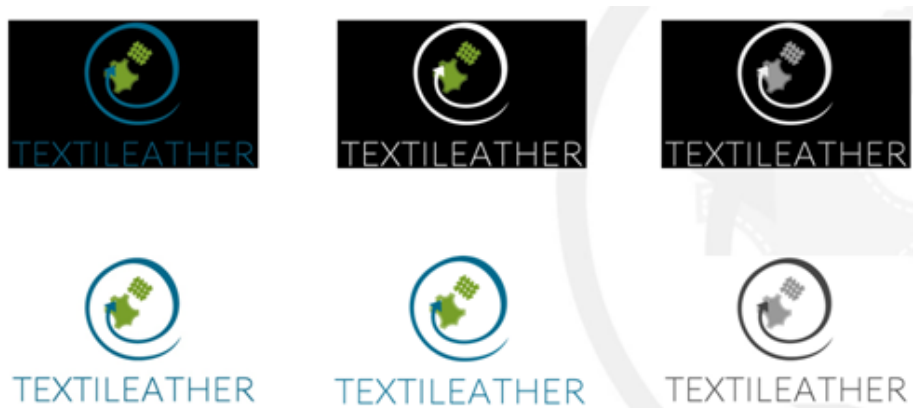


ACTION D.2: Preparation of dissemination material, including Project Notice Boards.

The dissemination material generated so far has served to publicize the project, its objectives and expected results at fairs, conferences and other events, which the partners have assisted. It has also been publicized in the headquarters of the partners.

Project corporate image (Deliverable D.2.3)

A project corporate image has been developed. The logo as representing the project has been used in every dissemination material, including the project website. ATEVAL has been the responsible of developing the corporate image of the project.



Notice boards (Deliverable D.2.1)

“TEXTILEATHER notice board” was created on November 2014 by ATEVAL, which includes the LIFE logo clearly visible. It is shown in visible places in all the beneficiaries’ headquarters and has been drawn up to be shown at important events such as international fairs, seminars, conferences, as well as in the final events of the project.

This notice board is available in 3 languages (English, Spanish, and Italian) and it includes the LIFE logo as well as the logos of all the beneficiaries in the project; the project website address and the main email contact addresses so that interested parties can obtain more information on the project. It also includes a summary of the project objectives, as well as the expected technical and environmental results.



Leaflets and posters (Deliverable D.2.2)



Three project leaflets were jointly developed by ATEVAL and INESCOP, including key information on the project and is intended to be used as dissemination material among the different stakeholders.

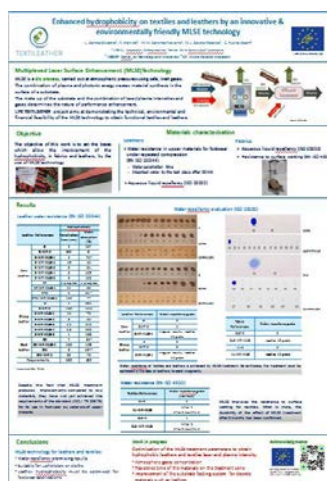
The first project leaflet was made on November 2014, and gives a general explanation on the project, the objectives and the expected results (2.500 copies). A second Leaflet was produced in July 2015, describing the actions that have been carried out to date and the first results obtained so far (1.500 copies). In May 2017 was developed de third Leaflet (2.000 copies). This describes the actions developed and the results obtained in the project.

Everyone has been used as dissemination material in all the dissemination events and social networking. The reaction of the attendants was very positive and the majority took it away. The leaflets are also available in three different languages.



Other dissemination materials (Deliverable D.2.3)

Furthermore, templates and other supporting material were designed to disseminate the project.



INESCOP created a **1st Poster** to showing the project in specialized congress and conference as:

- Training School “Strategies to study fire behaviours and fire retardant mechanisms” (February 2016).

INESCOP and ATEVAL have created a **2nd Poster** to present the project in the even “Life WATER PLATFORM MEETING” 24-25 of May 2016 in Manchester.



A poster including project results was also presented at National Congress on Environment – CONAMA 28 November – 1 December 2016)

the 30 (Madrid,

PowerPoint presentations have been produced by each partner to be used in dissemination events such as seminars and conferences in which the project partners have participated.

- ✓ “Functional textiles and leathers buy innovative MLSTM process”. Presented in AIJU-IBI-Alicante.
- ✓ Life 13 Kick off Meeting, 10-09-14, Madrid. KOLIFE13 TEXTILEATHER-

- ✓ Networking event_lifetextileather-July 2014- Valencia.
- ✓ MANU-KET Platform Meeting (Bilbao, 26 February 2015)
- ✓ 4th Freiberg Leather Days – Leather up to date (Berlin, 18th / 19th of June 2015)
- ✓ Networking event _ Life Textileather_ July 2015- Valencia.
- ✓ Sustexnet project workshop and training seminar. (4th November 2015).
- ✓ Workshop “Environmental improvements of leather” (Valencia, 17th December 2015).
- ✓ 64 Congress of the “Asociación Química Española de la Industria del cuero”- AQUEIC (Barcelona, 5-6th May 2016).
- ✓ Workshop “Sustainability in the footwear industry “Green week-Elda 16 June 2016)
- ✓ 5th Freiberg leather days (Freiberg- Germany, 15-16 June 2016)
- ✓ Man- Made fiber Congress –Dornbirn (20-22 September 2016)
- ✓ ECOFIRA (Valencia 28-29 September 2016)
- ✓ FOCUS SME and Entrepreneurship (Alicante – Spain, 3 November 2016)
- ✓ II Bits of Innovation, free event held during the celebration of the Week of Science (Elda, 15-17 November 2016) XVI International Scientific-Technical Conference MAT ECO SHOE 2016. (Cracow, 21-22 November 2016).
- ✓ SWITCH –MED SIDE EVENT (Tunisia. 2th December 2016)
- ✓ Consejo Intertextil Español (29 March 2017)
- ✓ Final event: Conference“ Hacia un calzado sostenible”(Elda, 18 May 2017)
- ✓ LIFE INFODAY – Networking event (Paterna – Spain, 30 May 2017)
- ✓ Final event: Conference "Nuevos Patrones - La evolución textil hacia la moda" in “Círculo Industrial de Alcoy” (31 May 2017).

The first Newsletter was made in September 2015 with the project description, objectives and description the project progress (1.500copies).

The second Newsletter has been made in May 2017. It contains the results obtained in the project. The newsletters were prepared by ATEVAL and INESCOP, CCI, ATEVAL distributed to the main stakeholders. These deliverables have been published in Spanish, English and Italian.



Other **promotional material (merchandising)** for the project have been produced in order to give it the maximum diffusion possible among both the general and the specialized public.

ATEVAL and INESCOP have developed and distributed their merchandising material like: Pen-drive, Bags for shoes, Shopping bag, Notebook.



Finally, INESCOP has produced **3 short videos** on the tests performed to assess MLSE[®] treated materials and on the preliminary results on MLSE[®] treatment on textiles and leathers.

- Resistance to surface wetting of textiles (UNE-EN ISO 4920:2013):
<https://www.youtube.com/watch?v=YqOt4BPXJAU>
- Preliminary results on textiles treated with MLSE[®] technology:
<https://www.youtube.com/watch?v=QWUAh80QOIE>
- Preliminary results on leathers treated with MLSE[®] technology:
<https://www.youtube.com/watch?v=Kh1h0tyfyjM>

And a **Final Video** with the objectives and results obtained (three languages):
<https://www.youtube.com/watch?v=iyhBGrbUBUM&t=141s> (> 350 visits)

For the **final event** of the project in Alcoy 31-May -2017, ATEVAL sent invitations and a brochure of the meeting to the invited guests ATEVAL also prepared a Photocall with the logo of the project and the life program.(170attendants)



In addition, every dissemination material produced in project is enclosed in 7.3 Dissemination annexes (annex 7)to this report.

ACTION D.3: Participation in fairs and congress (Deliverable D.3.1)

The aim of the dissemination of the project through fairs and congresses, related with the sectors involved (textile and footwear industry), is to facilitate understanding of results and extrapolation to all European countries. As a result, a wide dissemination of project is expected.

- ATEVAL disseminated the TEXTILEATHER project in different fairs and congress:
 - MEDICA Trade Fair Dusseldorf (Germany, 12th-15th of November 2014). Around 130.000 visitors, the project was disseminated through the project leaflets.
 - HEIMTEXTIL Trade Fair Frankfurt (Germany, 12th-15th of January 2015). Over 68.000 attendants. The project was disseminated through the project leaflets.
 - TECHTEXTIL Trade Fair Frankfurt (Germany, 5th-6th of May 2015). Around 28.500 professional visitors from 102 countries. The project was disseminated through the project leaflets.
 - NEGOTEC Congress (Alcoy, 11th of June 2015). More than 80 participants. The project was disseminated through the project leaflets.
 - ATEVAL TECHNICAL MEETING (Madrid, Barcelona, Ontinyent, June 2015)
 - HOME TEXTILES PREMIUM (Madrid, September 2015) through the project leaflet. 4000 people attended the event who received information about TEXTILEATHER progress through leaflets distributed in the stand of ATEVAL. The project was disseminated through the project leaflet (100).
 - MEDICA FAIR 2015 (Dusseldorf, 16th to 19th November 2015) at ATEVAL stand. The booth has received around 100 visits. The project was disseminated through the project leaflet. 137.000 people attended the event.
 - HEIMTEXTIL FAIR (Frankfurt, 12th-15th January 2016). 69.000 people attended the event. The project was disseminated through leaflets (50).

- 11th Annual public conference of the Textile ETP. RegioTex (Brussels, 13th-14th of April 2016). 100 participants. The project was disseminated through the project leaflet.
 - Go Global Congress (Valencia- June 2016). 200 assistants and was disseminated through leaflets.
 - HOME TEXTILES PREMIUM Fair (Madrid, September 2016). 4.000 assistants and was disseminated through leaflets distributed in the stand of ATEVAL.
 - 55 Edition “Man-Made Fibers Congress” in Dornbirn (Austria, September 2016). The project was exposed through a presentation to 100 assistants.
 - MEDICA Trade Fair Dusseldorf (Germany, 15th -17th of November 2016. More than 135.000 visitors. The project was disseminated trough leaflets.
 - The project was exposed along with the presentation of the "Study of the economic impact of industry" in the Center "Caixa Ontinyent" with the presence of 120 attendees. (Ontinyent, February 2017). (100 leaflets were disseminated).
 - Session “Europe and the Reindustrialization Textil Valencian” (Ontinyent, February 2017). Leaflets were given to 90 assistants.
 - Conference “Industry 4.0” (Ontinyent-Valencia, February 2017). 80 assistants. Disseminated trough leaflets.
 - CONSEJO INTERTEXTIL ESPAÑOL (Ontinyent, March 2017). ATEVAL presented the project and organized a networking with the Interreg Europa RESET project.
- INESCOP disseminated the TEXTILEATHER project in different fairs and congress:
- Technical workshop “Innovación en curtidos”. Valencia (Spain) 18th June 2014. 26 people attended the event (managers and technicians of companies in the tanning sector). The project was disseminated through the project leaflets and PowerPoint presentation.
 - Co-shoes International Workshop. Elche (Spain), 22nd-23rd October 2014. The event attracted some 2400 visitors, and it is estimated that over 350 visited the stand of INESCOP. The project was disseminated through the project leaflets and notice boards.
 - MANU-KET Platform Meeting (Bilbao, 26th of February 2015). The event was followed by more than 100 attendants. The project was disseminated through the project leaflets and PowerPoint presentation.
 - Co-shoes International Workshop (Elche, 22nd – 23rd of April 2015). At this event, LIFE TEXTILEATHER project was disseminated among the more than 500 visitors at INESCOP’s corporate stand through leaflets.
 - 4th Freiberg Leather Days - Leather up to date (Berlin - Germany, 18-19 June 2015). More than 200 participants. The project was disseminated through the project leaflets and PowerPoint presentation.
 - Workshop “Innovación y tecnologías avanzadas al servicio del cuidado del pie: prevención, diagnóstico, diseño, calzado, plantillas y materiales” (INESCOP: 20-21 July 2015. Elda (Alicante).
 - INESCOP organized the Course “Antimicrobial: their efficiency in footwear” (Elda, 30th September 2015). During this course, the work that is being made within LIFE

TEXTILEATHER project to demonstrate the use of MLSE[®] technology for providing footwear materials with antimicrobial properties was presented.

- In Science Week and Open house Day in INESCOP (Elda, 9th-20th of November 2015), the opportunities offered by the MLSE[®] process developed in the framework of the project TEXTILEATHER were presented and received a great attention from members of research and companies communities.
- The “Bits Innovation” workshop (Elda, 17th-19th November 2015), focused on future challenges of the leather industry sector, permitted to disseminate the innovation as a promising technology for leather finishing operations.
- In the Workshop “Environmental improvements of leather” (Valencia, 17th December 2015), LIFE TEXTILEATHER project was presented as a potential BAT for the tanning industry. The event counted with 30 attendees from tanning industries.
- In Training school “Strategies to study fire behaviours and fire retardant mechanisms” (Barcelona, 1st - 3rd February 2016), LIFE TEXTILEATHER project was presented by INESCOP staff by means of the poster entitled “Fire retardancy leathers and textiles by means of multiplexed laser surface enhancement technology”.
- At INESCOP’s booth in SIMAC Tanning Tech (Milan, 23th-25th February 2016), visited by around 200 people. The project was disseminated through the project leaflet.
- THINK01 – A NEW WAY OF SHARING (Barcelona, 28th April 2016). The project was disseminated through an oral communication.
- 64 Congress of the “Asociación Química Española de la Industria del cuero”- AQUEIC (Barcelona, 5-6th May 2016). Project results were disseminated to 35 attendants through an oral communication.
- Visit of the Valencian Institute of Business Competitiveness (Elda - Spain, May 2016)
- 5th Freiberg leather days (Freiberg- Germany 15-16 June 2016). 210 delegates from 17 countries. The project was disseminated through a presentation.
- Workshop “Sustainability in the footwear industry “Green week-2016 (Elda 16 June 2016). The project was disseminated through a presentation
- INDUSTRIAL TECHNOLOGIES 2016 - Creating a Smart Europe (Amsterdam – The Netherlands, 22 - 24 June 2016). 125 participants. The project was disseminated through the project leaflet.
- Workshop “Step2Sustainability” (Elda 21 July 2016). The project was disseminated through leaflets and a presentation.
- MOMAD Metropolis (Madrid – Spain, 9 - 11 September 2016). The event counted with 185.000 visitors. LIFE TEXTILEATHER project was disseminated among the visitors at INESCOP’s corporate stand.
- 6th EUCHEMS European Chemistry Congress (Sevilla, 11-15 September 2016)
- ECOFIRA (Valencia 28-29 September 2016). Inescop had its own stand and held a conference in which the project was presented.
- XII Workshop on Materials Processing with Laser Technology (Porriño-Pontevedra, 29-30 september). TEXTILEATHER partners presented part of the results of the project in the communication entitled “Materials fuctionalisation by MLSE[®] technology”.
- III International Workshop Co_Shoes and Futurmoda Fair (Elche-Alicante 5-6 October 2016). LIFE TEXTILEATHER project was disseminated among the visitors at INESCOP’s corporate stand.

- International Footwear Congress (Elda-Alicante 7th October 2016). More than 200 attendees participated in the event. Flyers of the project will be located in a public area where visible for all attendees. Furthermore, a slide of the project including title, main objectives and partners was shown in a plasma TV during the whole conference.
 - FOCUS PYME. European trends in textiles and footwear. Sustainability and Innovation.(Alicante, 3th November 2016).(1.600 participants).
 - II Bits of Innovation, free event held during the celebration of the Week of Science (Elda, 15-17 November 2016). 70 attendees. The project was disseminated through leaflets and a presentation.
 - XVI International Scientific-Technical Conference MAT ECO SHOE 2016. (Cracow, 21-22 November 2016). In this event, LIFE TEXTILEATHER project results were presented by INESCOP's staff in the speech entitled "Materials functionalisation by Multiplexed Laser Surface Enhancement Technology".
 - International environmental congress (Madrid, 28th November- 1 December 2016). More than 7.000 attendees participated in the event. The project was presented through the poster.
 - International Fair SIMAC Tanning tech (Milan – Italy, February 2017). LIFE TEXTILEATHER project was disseminated among the visitors at INESCOP's corporate stand. Through plasma TV and flyers were available at INESCOP's stand.
 - Workshop Footwear and Health (Elda – Spain, 29 March 2017). More than 50 attendees participated in the event. Leaflets were distributed.
 - MOMAD SHOES – International Showroom of shoes and accessories (Madrid – Spain, 4-6 March 2017). 180.000 visitors. The project was disseminated among the visitors at INESCOP's corporate stand focused on sustainable footwear.
- NEWPORT disseminated the TEXTILEATHER project in different fairs and congress:
- LINEAPELLE/SIMAC Fair (Milan, 26th of January 2015). 20.000 professional visitors around the world, principally from Europe. The project was disseminated through the project leaflets.
 - LINEAPELLE/SIMAC Fair (Milan, 10th – 11th of September 2015). 20000 people attended the event, The project was disseminated through leaflets (100).
 - LINEAPELLE/SIMAC Fair (Milan, 22nd – 25th of February 2016). 22000 people attended the event. The project was disseminated through leaflets (100).
- TEXATHENEA disseminated the TEXTILEATHER project in different fairs and congress:
- HEIMTEXTIL Trade Fair Frankfurt (Germany, 12th-15th of January 2015). This year it had over 68.000 visitors. The project was disseminated through the project leaflets.
 - Premier Vision (Paris, 10-12th February 2015). 61.7000 visitors attend the fair this year. The project was disseminated through the project leaflets.

- Proposte Fair (Como, April 2015). This year assisted 6.231 visitors.. The project was disseminated through the project leaflets and poster.
- HOME TEXTILES PREMIUM 2015. Madrid, September 2016. More than 4.000 visitors we estimated that 120 people were informed about our project through the project leaflet and poster.
- In Premier Vision (Paris, 16-17th September 2015), TEXATHENEA presented the TEXTILEATHER project through the project leaflet and poster.
- Heimtextil 2016. Frankfurt, January 2016. More than 68.000 visitors we estimated that 300 people were informed about our project through the project leaflet and poster.
- In Premier Vision (Paris, 16th - 18th of February 2016), TEXATHENEA presented the TEXTILEATHER project through the project leaflet and poster. The booth has received around 300 visits. The project was disseminated through the project leaflet and poster. 62.000 people attended the event.

o CCI

- CCI disseminates LIFE+TEXTILEATHER in the Footwear Museum in Elda (Alicante). Since the beginning of 2016, people visiting the Museum and/or the temporary exhibitions that take place in the Museum facilities, are also informed about LIFE+TEXTILEATHER project progress and achievements. During the first three months of 2016, on average around 1,165 people have visited Elda Footwear Museum every month and could get information and know more about LIFE+Textileather project.

Every dissemination activities in important conferences and fairs are enclosed in 7.3 Dissemination annexes (annex 7) to this report.

Example of some events:



MEDICA Trade Fair Düsseldorf



HEIMTEXTIL Trade Fair Frankfurt



TECHTEXTIL Trade Fair Frankfurt

NEGOTEC Congress



Home Textile Premium sept-2015



Heimtextil Fai, Frankfurt Jan-2016



Textile ETP, Brussels April 2016



Go Global, Valencia June 2016

WEDNESDAY, 21.09.2016 Morning	Hall B
FIBERS AND TEXTILES IN AUTOMOTIVE	
Chairman: Stefan Mocheels Hohenstein Institute (D)	
09:00	EVELINE WEBER, SANDRA BAUER Oet AC, Hohenheim (D) Deficient behavior of fashion is cost driver for our cars
09:25	FELIPE CARRASCO, LAURA SANTOS ATEVAL, Valencia (E) Functional textiles and leathers by innovative MLSE process - TEXTILEATHER LIFE
09:50	GAFFAR HOSSAIN W-Ton India research GmbH, Hohenheim (A) Plasma enhanced self-cleaning nanocoating of automotive textiles
10:15	EMANUELE PIVOTTO Sifonema, Santhiemi (I) Polyester yarns for automotive seats
10:40	BREAK
11:00	BIANCA-MICHAELA WÖLFING et al ¹ E. Simon et al., A. Gethard et al., L. Hohenstein Institute (D), Textile Research Center, Hohenheim, 1000, Hohenheim (D) New findings on heat transport processes within car seats
11:25	LÚCIA RODRIGUES et al ¹ M. Gonçalves et al., S. Meier, CITEVE ² , CENITP, Via Nova de Fátima, 11000, Portugal, 11000, Portugal (P) Novel approach for integrating textiles with printed electronics: textile electronics and textile electronics



55.E. Man Made Fiber Congress-Sep-2016

Medica Dusseldorf, Neov-2016



Europe and Reindustrialización-Ontinyent.Feb17



Co-shoes International Workshop (1st Edition)



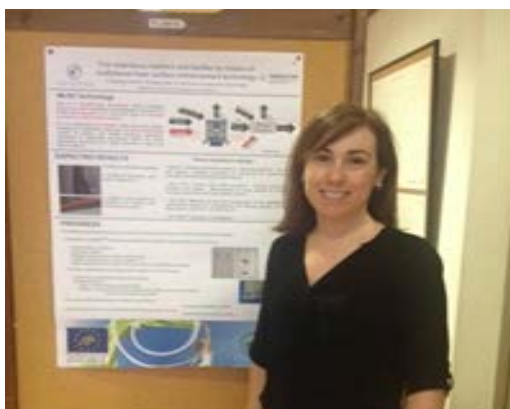
MANU-KET Platform meeting



Co.shoes International , Elche- April 2015



4th Freiberg Leather Day, Berlin, June 2015



Training school, Barcelona Feb-2016



SIMAC, Milan Feb-2016



THINK01, Barcelona April 2016



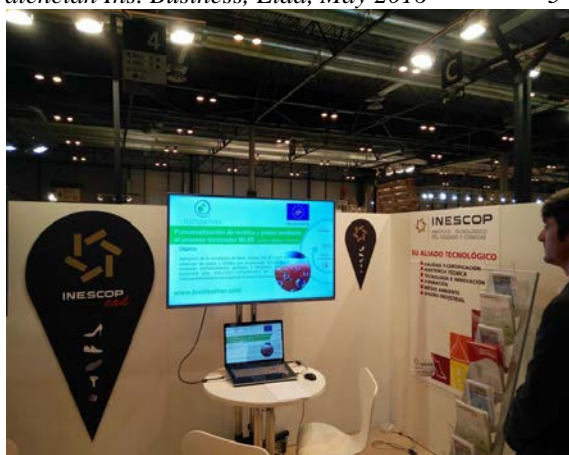
64 Congress: AQUEIC, Barcelona May 2016



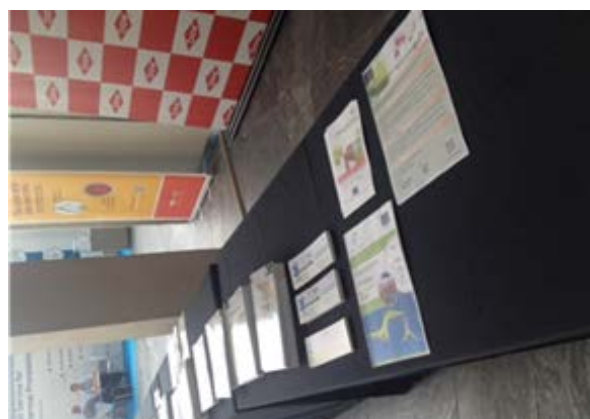
Valencian Ins. Business, Elda, May 2016



5th Freiberg leather day, June 2016



MOMAD , Madrid Sep-2016



6th EUCHEMS , Sevilla, Sep-2016



*XII Workshop "Material Processing"
Pontevedra- Sep 2016*



Premier Vision



HEIMTEXTIL Trade Fair Frankfurt



LINEAPELLE-SIMAC Fair

ACTION D.4: Publications , including el Layman report (Deliverable D.4.1)

○ Publications in technical journals

Technical papers are drafted and published in important journals devoted to textiles and leather.

- ✓ INESCOP Technical Bulletin, n° 241 (October 2014)
- ✓ Revista del Cuero de Colombia (February 2015)
- ✓ Revista del Calzado, n° 197 (March – April 2015)
- ✓ Vigilancia Tecnológica OPTI, Bulletin devoted to the footwear industry, n° 20 (2015)
- ✓ INESCOP Technical Bulletin, n° 277 (June 2015)
- ✓ Publication in LEATHER INTERNATIONAL journal (July 2016)
- ✓ Journal of AQEIC-N°4 -2016 “Leather functionalisation by means of MLSE® technology”. It was published in English and Spanish.
- ✓ INESCOP Technical Bulletin, n° 197 (October 2016)
- ✓ INESCOP Technical Bulletin, n° 199 (December 2016)
- ✓ Publication in the monography “Tanning industry in the light of technological and environmental issues” (2017)
- ✓ Publications in the journal “WORLD FOODWEAR” (July/August 2017).
- ✓ Publication in journal “LEDERPIEL”. (2016).



INESCOP Technical Bulletin, n° 241 (October 2014)



Revista del Cuero de Colombia (Feb-15)



Revista del Calzado, n° 197 (Ap-15)



Vigilancia Tecnológica OPTI, Bulletin devoted to the footwear industry, n° 20 (2015)



INESCOP Technical Bulletin, n° 277



Newsletter and press release (Jul-15)

○ Publications in general journals

A press release on the project was drafted and sent to several newspapers and the Spanish news agency Europa Press by ATEVAL and INESCOP. As a result, it has been published in several printed and on-line newspapers. Deliverable D.4.1 includes links to each press cut.

Life+ TEXTILEATHER project starts its activities

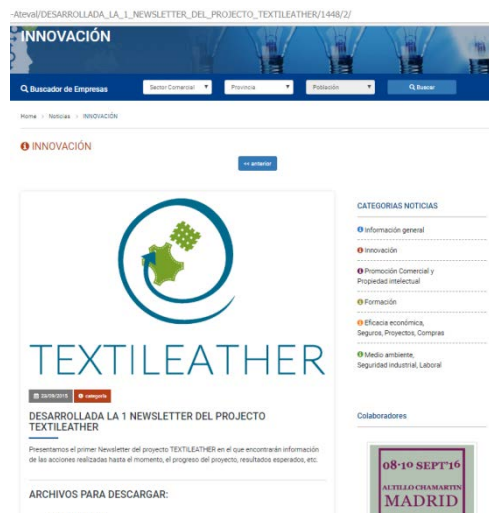
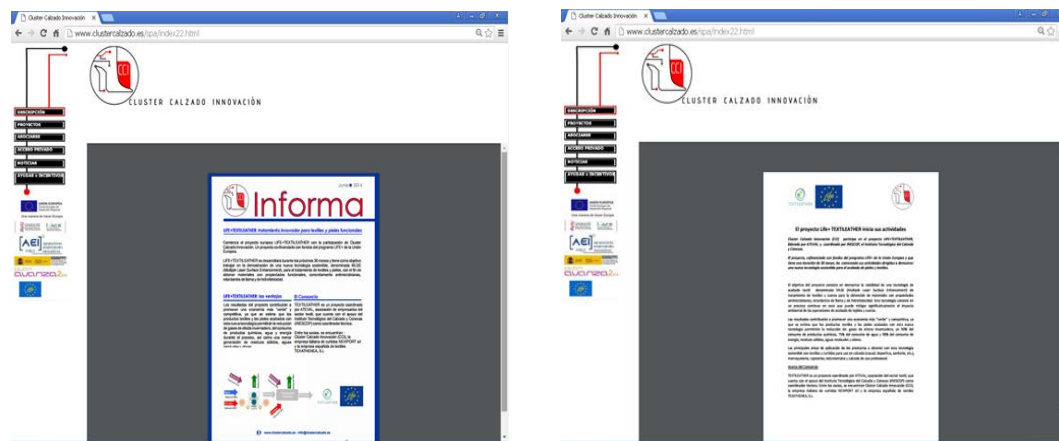
- LO CLAR 15/07/2014
<http://www.locclar.com/index.php/empresas/1854-el-proyecto-life-textileather-inicia-sus-actividades>
- EMPRESA EXTERIOR 16/07/2014
<http://empresaexterior.com/not/49073/el-proyecto-life-textileather-inicia-sus-actividades>
- LA COPE INTERCOMARCAS 15/07/2014
<http://www.copeintercomarcas.com/index.php/component/k2/item/4819-el-proyecto-life%20-textileather-inicia-sus-actividades>
- PINKERMODA 15/07/2014
<http://www.pinkermoda.com/noticia/%EF%BB%BFtextileather-inicia-sus-actividades/76158>
- NCL LA COSTERA 15/07/2014
<http://www.newslacostera.com/el-proyecto-life-textileather-inicia-sus-actividades-en-ontinyent/>
- EL PERIODIC D'ONTINYENT 19/07/2014
www.elperiodic.com/ontinyent
- EL NOSTRE CIUTAT
www.elnostreperiodic.com
- FASHIONWORK
<http://www.fashionwork.es/noticia.asp?idnoticia=151669>
- PORTAL DE INFORMACION 15/07/2014
<http://www.portaldeinformacion.es/index.php/2012-09-29-20-17-11/item/4819-el-proyecto-life%20-textileather-inicia-sus-actividades>
- RADIO INTERCOMARCAS 15/07/2014
<http://www.radiointercomarcas.com/index.php/component/k2/item/4819-el-proyecto-life%20-textileather-inicia-sus-actividades>
- TEXTILEATHER, leather sustainable technology
- LEDERPIEL 21/07/2014
<http://lederpiel.com/textileather-tecnologia-sostenible-para-pieles/>
- DIARIO INFORMACION 22/07/2014
<http://www.diarioinformacion.com/elda/2014/07/22/inescop-avanza-tecnologia-sostenible-pieles/1527452.html>
- ECONOMIA 3 16/07/2014
<http://www.economia3.com/2014/10/16/32135-inescop-coordina-textileather-tecnologia-sostenible-para-pieles-y-textiles-funcionales/>
- Research on antimicrobial and flame retardant textile finishing
- LAS PROVINCIAS 15/07/2014
<http://www.lasprovincias.es/economia/201407/15/investigan-elda-acabado-textil-20140715214542.html>
- LEDER PIEL 17/05/2016
<http://lederpiel.com/ageic-celebra-5-6-mayo-64o-congreso/>

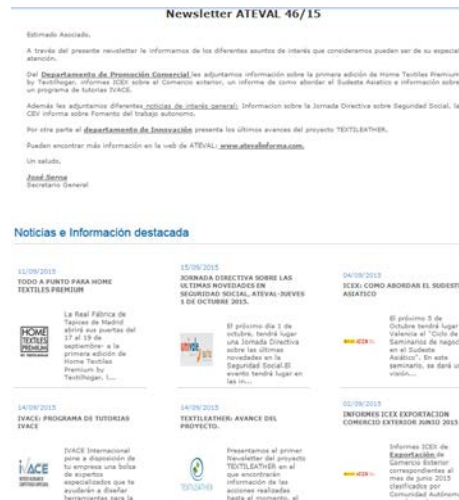
○ Newsletters and press release

The project has been published in the corporate website of the partners, one of the mail tools for dissemination and communication. It was used to inform about latest news affecting the footwear and components sector and the cluster activities carried out during the project. The partners use to disseminate de project the Newsletters created for the project, and news explaining the activities carried out during the project and results obtained.

This has been distributed to the main stakeholders (INESCOP has more than 450 associated companies, CCI has 40, ATEVAL has more 300 associated companies). Furthermore, representatives of local, regional and national administrations are members of the advising board of INESCOP, what ensures a wide dissemination.

Every dissemination activities are enclosed in 7.3 Dissemination annexes (Annex 7) to this report.





○ **Layman's Report (Deliverable D.2)**

Compile the results and conclusions reached by the European TEXTILEATHER Project. It has been made in the three languages: Spanish, English and Italian.



Every dissemination activities are enclosed in 7.3 Dissemination annexes (Annex 7) to this report.

ACTION D.5: Final Event of the project (Deliverable D.3.1)

For the final dissemination of the project, INESCOP and ATEVAL each prepared an event for the presentation of the final results of the project.

○ **INESCOP**

On 18th May 2017, INESCOP held the workshop "Towards Sustainable Footwear", an event organized in the framework of the 2017 edition of Green Week and 25 Anniversary of the European LIFE Programme. In this event, several projects were presented, which are being developed by INESCOP in the area of environmental improvements for footwear and related industries. We took this opportunity to organize the final event of the LIFE TEXTILEATHER in this outstanding framework. Around 40 professionals participated in this event.





Merchandising material was delivered to the attendees.

○ ATEVAL

On 31 May, the TEXTILEATHER project ended its activity and presented its results. ATEVAL organized a special event for this purpose.

The event was held in the "Industrial Circle of Alcoy" with the title Conference New Patterns - the textile evolution towards fashion "on May 31, 2017. The event was attended by important fashion companies and important commercial institutions. 170 representatives attended.



During the event the project was presented through a power point presentation, which detailed the activities carried out and the results obtained. The attendees were very interested in this new technology.



In addition to the presentation, the attendees were given the merchandising material that has been prepared during the project such as brochures, usb, backpacks, key chains, notebooks, etc.



5.3. Evaluation of Project Implementation

In general, the project has made adequate progress according to the schedule envisaged in the proposal approved by the EC. Table 5.14 summarises the results achieved to date and compares them with those foreseen.

Table 5.13 Results achieved vs foreseen

Task	Foreseen in the revised proposal	Achieved	Evaluation
<i>Preparatory Actions</i>			
A1 Selection of parameters to be optimized for textiles treatment	Selection of the experimental MLSE [®] parameters in order to obtain suitable functional textiles for different intended uses.	Establishment of material requirements for different intended uses. Establishment of material features affecting MLSE [®] parameters to be optimised and/or adapted.	Completed.
A2 Selection of parameters to be optimized for leather treatment	Selection of the experimental MLSE [®] parameters in order to obtain suitable functional leathers for different intended uses.	Establishment of material requirements for different intended uses. Establishment of material features affecting MLSE [®] parameters to be optimised and/or adapted.	Completed

Task	Foreseen in the revised proposal	Achieved	Evaluation
Implementation Actions			
B1 Adaptation of MLSE [®] process for textiles and leather treatment	Establishment of adaptation needs.	Establishment of adaptation needs.	Completed
B2 Optimization of textiles and leather treatment in the demonstration plant	Optimal conditions to produce textiles and leathers with fire retardant, waterproofing, oil repellency and antimicrobial properties, according to requirements established in Actions A1 and A2.	<p>Improved water resistance:</p> <ul style="list-style-type: none"> - Textiles up to Spray Rate 5(EN ISO 4920); - Waterproofed leather (EN ISO 5403-1): penetration time > 60 min, water absorption < 20%. <p>Stain resistance properties: leathers and textiles up to Grade 7 (8 being the maximum grade, according to EN ISO 14419)</p> <p>Improved fire resistance properties on leathers and textiles</p> <p>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.</p>	Completed
B3 Characterisation of functional textiles and leathers	Characterisation of MLSE [®] treated textiles and leathers	Characterisation of MLSE [®] treated leathers and textiles by different experimental techniques and methods	Completed

Task	Foreseen in the revised proposal	Achieved	Evaluation
B4 Validation of technology. Goods prototypes manufacturing	<p>Manufacturing of footwear with functional upper and lining material</p> <p>Functional textiles for curtains, upholstery and other household items.</p>	<p>Footwear prototypes manufactured using MLSE[®] treated textiles and leathers include: women's and men's town footwear, children's footwear, occupational and safety footwear.</p> <p>House wares manufactured with MLSE[®] treated textiles: tablecloths and cushions.</p> <p>In general, good performance on productive processes.</p>	Completed
Impact Monitoring Actions			
C1 Socio-economic and environmental impact assessment	Launching of 2 surveys	Launching of 1 survey	Completed
	The savings of consumption	<p>Energy: 97.39%</p> <p>Water: 99.96%</p> <p>Chemical Products: 99, 25% (FR) and 96.84% (Waterproof).</p>	Completed
	Socioeconomic and environmental assessment	Analysis of current status	Completed
Dissemination Actions			
D1 Creation of a project web site	Website launching. Expected visits: 1000	Website launching. Visits: > 5900	Objective achieved
	Social Hubs: Facebook, Twitter and LinkedIn profiles. 500 Friends/followers	Social Hubs: Facebook, Twitter and LinkedIn profiles. 94 friends/followers	Partially completed

Task	Foreseen in the revised proposal	Achieved	Evaluation
D2 Preparation of dissemination material	Project corporate image Notice Boards 3 Leaflets (1500 copies/leaflet) Audio-visual material: project video.	Project corporate image 1 Notice Boards in English, Spanish and Italian 3 Leaflets (6000 copies) Distributed in all events 4 project videos (368 visits)	Completed Completed Completed Completed
D3 Participation in fairs and congresses	Dissemination in 6 Congresses Audience: 1000 Dissemination in 6 Fairs. Potential audience: >250000 Dissemination in other events	Dissemination in 8 Congresses Audience: > 1.500 Dissemination in 24 Fairs. Potential audience: >300.000 professional visitors Dissemination in 15 workshops/seminars. Audience: > 500 Dissemination in 33 conferences and others events Audience. > 3000	Objective achieved Objective achieved Objective achieved Objective achieved
D4 Publications, including Layman's report	≥ 2 technical/scientific journals ≥ 2 Press releases in Spanish and Italian, in general journals ≥ 2 Textileather Newsletter	- 12 publications in technical/sectorial journals. No available distribution data. - 9 publications in ATEVAL/CCI/ INESCOP's technical bulletins. Distribution: > 1500 14 press releases in general journals. Not available distribution data. 12 Internet Articles 2 Project Newsletter. Distribution: 1.500	Objective achieved Objective achieved Objective achieved Objective achieved

	Textileather eBook	No produced	
	Layman's Report	1000 distributed copies	Objective achieved

Task	Foreseen in the revised proposal	Achieved	Evaluation
D5 Demonstration activities (Workshops)	2 Workshops	2 workshops have been organised: <ul style="list-style-type: none"> - Towards a sustainable footwear. Elda, 18 May 2017 (around 40 attendants) - Conference New Patterns - The textile evolution towards fashion "on May 31, 2017.(170 attendants) 	Completed
Management and Monitory Actions			
E1 Project management	Smooth development of LIFE TEXTILEATHER project.	A six month extension was requested due to unforeseen events concerning the technology supplier (MTiX company)	Completed
E2 Networking with other projects	Establishment of information exchange channels with other projects.	Contacts with coordinators and partners of projects of interest	Completed
E3 After LIFE Communication Plan	Communication plan in English, Spanish and Italian.	After LIFE Communication Plan released as Deliverable E3.	Completed

Multiple dissemination activities have been carried out in order to make the project as much visible as possible:

- Over 5000 people (scientific and technical audience) have been reached in congresses, workshops and meetings.
- A potential audience of more than 300.000 people may have been addressed in fairs and by means of different publications.
- The project's website has received over 5.836 visits. Visitors come from at least 10 different countries.

5.4. Analysis of long-term benefits

5.4.1. Environmental benefits

a) Direct/quantitative environmental benefits

Textiles and leather industries are considered as water-intensive sectors. The main environmental concern is therefore about the amount of water discharged and the chemical load it carries. Other important issues are energy consumption, air emissions and solid wastes and odours, which can be a significant nuisance in certain treatments.

MLSE® technology is a dry, continuous process that, according to the information provided by its developer (MTiX Ltd company), could reduce significantly the environmental impact of textile and leather finishing operations, especially in the case of waterproofing, fire-retardant and antibacterial treatments.

The comparison of consumption between the MLSE® process for textiles (data provided by MTiX) and the traditional processes (Consumption data of TEXATHENEA). The savings of consumption are:

- Energy: 97.39%
- Water: 99.96%
- Chemical Products: 99, 25% (FR) and 96.84% (Waterproof).

The results of environmental improvements for the skins have been obtained through the calculation of the carbon footprint. The comparative results of traditional process versus process with MLSE® technology is as follows:

Carbon footprint results	kg CO ₂ eq.
MLSE® process	0.0526
Conventional process	3.1286



b) Relevance for environmentally significant issues or policy areas

This project meets the objective of Life+ Environment Policy and Governance in that it will contribute to the development and demonstration of innovative technologies, thus enhancing the knowledge of the most environmentally-friendly techniques in the European textile and leather industries. In this sense, LIFE TEXTILEATHER project will contribute to the implementation, updating and development of the European Union Environmental policy and legislation.

Furthermore, this project supports the principles of the Directive 2010/75/EU of the European Parliament and of the council on industrial emissions (integrated pollution prevention and control -IPPC) that promote measures allowing the reduction in origin of the pollution, as

well as all EU environmental policies as, for instance, the Waste Framework Directive (2008/98/EC) or the Water Framework Directive (2000/60/EC).

What is more, LIFE TEXTILEATHER endorses the "Resource efficient Europe" flagship initiative of the European Commission.

Finally, traditional treatments for textiles and leathers in most cases involve the use of chemicals such as halogenated organic compounds, biocides and organophosphorous compounds, whose use is currently restricted or under consideration at the European Union (REACH and biocides legislations). In this sense, the use of hazardous resource in the functional finishings under consideration is completely eliminated.

5.4.2. Long-term benefits and sustainability

a) Long-term/quantitative environmental benefits

The implementation of the MLSE[®] technology in both textiles and leather sectors is an innovative breakthrough which will enable textiles and leathers to be converted for enhanced hydrophobicity, fire retardancy and antimicrobial functionalities without the use of harmful chemicals or water.

In this sense, MLSE[®] technology as alternative to traditional finishing treatments for textiles and leathers, is a dry and continuous process, which could reduce the environmental impact of conventional materials processing in both textiles and leathers industries, which are considered as water, energy and chemicals intensive sectors.

Therefore, after the completion of the LIFE TEXTILEATHER project, the comparison of consumption between the MLSE[®] process (data provided by MTiX) and the traditional processes (Consumption data of TEXATHENEA). The savings of consumption are:

- Energy: 97.39%
- Water: 99.96%
- Chemical Products: 99, 25% (FR) and 96.84% (Waterproof).

The savings in these processes can reach a saving over the total consumption of the company close to:

- Energy: 8 %
- Water: 2 %
- Chemical Products: 8%

As a consequence, a reduction of the environment costs of the textile and tanning industries is foreseen.

b) Long-term/qualitative economic benefits

Nowadays, one of the major challenges for the textile and leather industries is the introduction of more resource efficient processes to reduce or avoid the use of water, energy, chemicals and to minimise waste. In this context, new technologies that can address the challenges of the European industry are significant because they could support more cost-effective production of high-end products with improved ecological footprint and operating margins.

The implementation of MLSE[®] technology in textiles and leathers companies, apart from economical benefits associated to water, chemical and power consumption reductions, can led to a reduction of the environmental costs of the textile and tanning industries. Furthermore, its implementation can provide them with the opportunity to increase their market share offering high quality materials with functional properties, more eco-friendly and competitive and last but not least improving user comfort and wellbeing. This would allow to the involved companies to cover new market niches.

In addition, MLSE[®] technology would offer the European companies opportunities to process products which have previously been processed offshore due to the restrictions operating across the EU regarding the chemical usage.

The introduction and enforcement of legislation on the use of hazardous chemicals in material processing have a growing influence on processing operations and costs. Here, the introduction of innovative technologies such as MLSE[®] is crucial.

The comparative between the process costs for a square meter between the technologies is as follows:

So the savings obtained between a process to use the process MLSE[®] respect the traditional are:

- For Fire Retardant finishing: 90.78%
- For waterproof finishing: 91.26%

	MLSE Process		TRADITION AL		MLSE [®] as% traditional process	
	FIRE RETARDANT	WATERPROOF	FIRE RETARDANT	WATERPROOF	FIRE RETARDANT	WATERPROOF
Cost (€/m ²)	0,051	0,025	0,556	0,286	9,22%	8,74%

c) Long-term/qualitative social benefits

The environmental benefits of the project are expected to benefit the general health and wellbeing of the population, as well, apart from textile and leather companies' workers health (reduction of exposure to hazardous chemicals).

What is more, innovative materials with functional properties have been identified as key to satisfy increasing demands of consumers in different fields such as health, hygiene, protection and safety, sports, goods (clothes and footwear), etc.

Last but not least, the implementation of more cost-effective technologies such as MLSE[®] technology can also benefit the employability in the involved industrial sectors creating more skilled jobs. The implementation of MLSE[®] systems requires three levels of personnel: operators, technicians capable of dealing with MLSE[®] technology and material specialists with technical knowledge on material science to modify recipes for specific leather and textile features.

d) Continuation of the project actions by the beneficiaries or by other stakeholders

Dissemination of project results will continue after its end. The beneficiaries will take advantage of their participation in conferences, seminars, courses, etc. to continue to disseminate the proposed MLSE[®] technology for the treatment of textiles and leathers as a way to conferring them with functional properties such as waterproofing, fire-retardancy and antimicrobial. What is more, the project website and Social Hub will remain active for at least five year after the end of the project. A detailed dissemination plan will be included in the After-LIFE Communication Plan.

Several textiles and leathers companies have shown their interest in the implementation of the MLSE[®] technology in their material processing. This, the project beneficiaries will support them and any other interested European tannery during this implementation. Help for funding for a first market application at industrial scale would be an asset.

The implementation of the MLSE[®] technology in the textile sector is already possible because the existing equipment is feasible. On the contrary, its implementation in leather sector is still a challenge because the equipment is not able to run with discrete pieces such as leather. Nevertheless, the engineering parameters of such equipment have been established within Action B1 of LIFE TEXTILEATHER project. In addition, the technology supplier is highly interested in its development in a near future. Help for funding will be needed for such development and the assessment of its technical viability.

5.4.3. Replicability, demonstration, transferability, cooperation

After the project completion, the project results will be disseminated in order to promote its **replicability** in European textile and leather companies that are interested in the MLSE[®] technology as a more sustainable and resource-efficient technology vs conventional methods.

Indeed, within LIFE TEXTILEATHER project other stakeholders different from project beneficiaries had the opportunity to carry out some trials with MLSE[®] technology, such is the case of the Spanish textile company ROYO GROUP located in Quart de Poblet, Valencia. Other textile companies interested in this technology have been: Confecciones Euromoda (Bocairent, Valencia), Aupa-Hogar (Albaida, Valencia), Textil Santanderina (Cabezón de la

Sal, Cantabria, Textil Batavia (Betera, Valencia), Textiles Mariola (Cocentaina, Alicante). Orta Anadolu (Estambul, Turkey). Furthermore, different Spanish leather companies such as HIJOS DE OSCAR BOTELLA SEMPERE, S.L (Crevillente, Alicante), INCUSA (Silla, Valencia), PIES CUADRADOS (Aspe, Alicante) and TENERIAS OMEGA (Villatuerta, Navarra) showed great interest by the project results, as well as in the further development of one specific equipment for the treatment of discrete pieces such as leather. What is more, the American company LEAR has recently demonstrated interest in undertaking some trials to obtain stain resistance leathers for automotive sector (**transfereability**).

In addition, MLSE[®] project results have been shown to international corporations such as NIKE showing great interest.

Regarding project beneficiaries, help for funding for a first market application has been applied for TEXATHENEA company under the European call SME Instrument.

MLSE[®] technology has demonstrated to be suitable for the production of a wide range of functional leathers and textiles (**versatile technology**) for different industrial applications, which will enable the transferability of project results to other industrial sectors. The recipe of laser/plasma intensities and frequencies and different environmental gases changes the performance enhancements of the process. Therefore, MLSE[®] process has the potential to work with synthetic and natural materials through a broad spectrum of characteristics including, apart from water, stain and fire resistant or antimicrobial: enhanced adhesion, enhanced printability, improved colour fastness, dielectric strength, etc.

In fact, as a result of the introduction of MLSE[®] technology to the company CALVO IZQUIERDO (Requena, Valencia) devoted to the manufacture of sanitary textiles by INESCOP, the European project VENDA NATU-haft entitled “Cohesive bandages based on natural fibers, with antimicrobial and hydrophobic properties by MLSE[®] technology” was undertaken under the call 2015 SME Instrument Phase 1. Within this project the technical feasibility of the MLSE[®] technology was proven and for its implementation, one personalised equipment must be developed according to the company’s product requirements.

Finally, LIFE TEXTILEATHER project results have demonstrated to be of high interest for the leather and textile industries. Nevertheless, the implementation of the project results has a market barrier because it is a patented technology. For that reason, some project partners are working in close collaboration with MTiX as technology supplier to sign a new agreement for further developments regarding specific MLSE[®] equipment for leather and related services. What is more, MTiX has realized the potential for great synergy between MTiX Ltd and project beneficiaries, in terms of market support, process optimization, performance testing against standards and other valuable assistance for future users.

For such purpose, MTiX Ltd has proposed to install at INESCOP the latest generation MLSE[®] System for leather and textile application development. Up to now, it is still a proposal.

5.4.4. Best practice lessons

LIFE TEXTILEATHER project proposes the implementation of MLSE[®] technology to obtain functional leathers and textiles.

In this sense, the Reference Document on Best Available Techniques in the Textiles Industry (Seville, July 2003) encourages to the search of alternative finishing treatment procedures to the current ones more eco-efficient both from a technical and environmental point of view. In the same line is the Reference Document on Best Available Techniques in the Tanning of Hides and Skins (Seville, July 2003).

Thus, it is believed that MLSE[®] technology can bring some significant benefits to both textile and leather industries in particular for added value products (functional materials), but there is significant development work necessary in delivering solutions for the materials, substrates and performance criteria. LIFE TEXTILEATHER project has focused efforts in the demonstration of the feasibility of the MLSE[®] technology for the treatment of textiles and leathers as a way of providing them with functional properties and high added value.

Within the project, high grades of the functional performances under consideration have been obtained for some kind of materials which allow demonstrate the technical feasibility of the MLSE[®] technology. Nevertheless, the MLSE[®] technology parameters must be optimised for each type of material, both in textiles and leathers, at any case.

In the case of leathers, the performance yield depends on the animal origin, tanning type, side of leather (grain or suede), type of finishing, etc. Therefore, specific recipes should be developed for each material and type and qualified and skilled personnel is required.

5.4.5. Innovation and demonstration value

MLSE[®] technology is an example of technology transfer between industries, which has facilitated a leading edge development in both the processing and the performance of textiles. The use of photonics and plasma in a controlled vacuum environment of gases and sol-gels has long been established particularly for the production of electronic components and metallic and non-textile polymeric substrates and, more recently, for wool cleaning processes.

Therefore, the promising MLSE[®] technology has been considered as a valuable and innovative alternative to the current conventional treatments applied to leathers and textiles.

According to the state-of-the-art, different experimental parameters determine the nature of performance enhancements, its means, the functional treatment, such as laser/plasma intensities, environmental gases (nature, concentration, mixtures, etc.), addition of precursors, etc. Therefore, in the LIFE TEXTILEATHER project, some of the experimental MLSE[®] process parameters will have to be optimised to provide functional textiles and leather treatments in the MTiX demonstration plant located in UK. Furthermore, the current MLSE[®] equipment is available for reel to reel material processing. Leather is a natural material

supplied in discrete pieces. Therefore, an adaptation of the process will be carried out for a successfully treatment of discrete leathers and finished leather goods (such as shoes, linings, insoles, etc.).

Furthermore, the identification of the engineering parameters for building a specific treatment plant for the material wastes considered in this project will enable technology transfer to take place in involved sectors.

This way, LIFE TEXTILEATHER project has been intended to demonstrate, at a semi-industrial scale, the technical, environmental and financial feasibility of the MLSE[®] technology to obtain functional leathers and textiles.

Finally, this project has been contributed to accelerate the uptake of nanotechnologies, advanced materials or advanced manufacturing and processing technologies by SMEs, which is one of the H2020 objectives.

5.4.6. Long term indicators of the project success

Potential quantifiable indicators to be used in order to assess the project success can be:

- *Number of companies using the MLSE[®] technology in the textile sector*
- *Number of companies using the MLSE[®] technology in the leather sector*
- *Number of MLSE[®] equipments installed in European companies*