Re-FREAM
Re-Thinking of Fashion in Research and Artist collaborating development for Urban Manufacturing

HUB “Sustainable finishing”

Deliverable 6.5

Roadmap of short series for fashion purposes nebulized and laser-marked

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S+T+ARTS LIGHTHOUSE Re-FREAM

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Working Package WP6

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Deliverable 6.5

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Due date of deliverable: 30.11.2021

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Lead Beneficiary for this deliverable: AITEX

Contributions by: Care applications

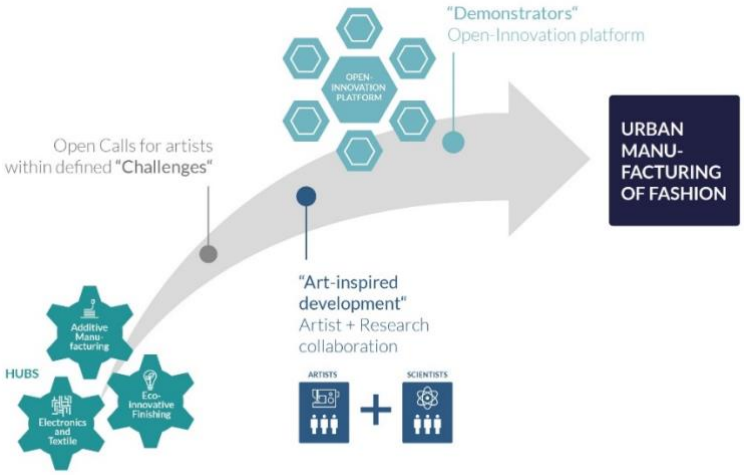
Project co-funded by the European Commission within H2020 Framework Programme		
Dissemination Level		
PU	Public	x
CO	Confidential, only for members of the consortium (including the Commission Services)	
Type		
R	Document, report (excluding the periodic and final reports)	x
DEM	Demonstrator, pilot, prototype, plan designs	
DEC	Websites, patents filing, press & media actions, videos, etc.	

Contents

0 Context Information

0.1 The Re-FREAM Project

Re-FREAM will support **art-driven innovation** in European R&I projects by inclusion of artists in research consortia via linked third-parties. The artistic community receives a strong support from art-related partners like the Art University of Linz (UFG) and the European Institute of Design (IED), creative hubs and facilitators like Wear-IT Berlin (FashionTech), AITEX, ARCA and CREATIVE REGION combined with remarkable technology from IZM Fraunhofer (E-textiles), STRATASYS, HARATECH (3D-printing), EMPA (3D body simulation), CARE APPLICATIONS (Garment nebulization) and PROFACTOR (Additive manufacturing).



Re-FREAM boosts **art-inspired urban manufacturing**, where the city becomes a new production space. Especially for **creative fashion**, urban manufacturing offers a great opportunity to create an alternative to the much criticized production in low-wage countries.

Three technologies (additive manufacturing, electronics on textiles and eco-innovative finishing of fashion) will be explored together. **In co-creation** 20 awarded Artist/ Researcher teams, digitalized manufacturing of fashion will be developed up to TRL 5 to enable small-scale production of fashion in urban environment. An **Open-Innovation Platform** will finally link the know-how and the communities of the hubs, will offer access to relevant facilities and make the Re-FREAM art-inspired urban manufacturing working model sustainable.

0.2 Document history

Version	Date	Change/Reason for change
V1.0	07.10.2021	Draft template prepared for partner input
V1.1	22.11.2021	First version sent to coordinator for review
V1.2	23.11.2021	Second version with few modifications regarding wording
V1.3	29.11.2021	Review and finalization by PRO
V1.4	30.11.2021	AIT accept changes and ends Deliverable

0.3 Purpose and Scope of Deliverable Report D6.5

Finalization of the roadmap for short series for fashion purposes including extra steps like washing (water-based, enzymatic, etc.) or cleaning (e.g., by ozone) for definition of a suitable final performance of the fashion goods.

1 Executive summary

This deliverable reports the development of the roadmap for short series for fashion purposes with the technologies available in HUB "Sustainable finishing" (mainly contributed by AITEX and Care applications), hereinafter referred to as ECO-processes Hub. This deliverable is public, and so, it will be published in the Re-FREAM website but also included in the RECODE platform.

The bespoken roadmap will serve as a guide for future collaborations of artists that are interested in co-creation with sustainable technologies in AITEX and Care applications. Thanks to the roadmap, the potential collaborator is able to get an idea of how the co-creation process will be and which cross cutting technologies and processes are available to add value to their fashion collection while being environmentally respectful. The co-creation projects within this Hub (see also Deliverable 4.4, or entries on the webpage) supported the development of the roadmap, results and examples of respective stops are supported by examples out of these projects.

2 ECO-processes Hub Roadmap

The following roadmap has been designed in order to produce a short series for fashion purposes nebulized and laser marked in collaboration with ECO-processes Hub companies: AITEX and Care Applications. This roadmap is published on the Re-FREAM website: Re-FREAM ECO-processes Hub Roadmap – Re-FREAM and in the RECODE platform: https://recodefashion.com/project/eco-processes-rd/ as part of the Open Innovation Platform (accessed on 29.11.2021).

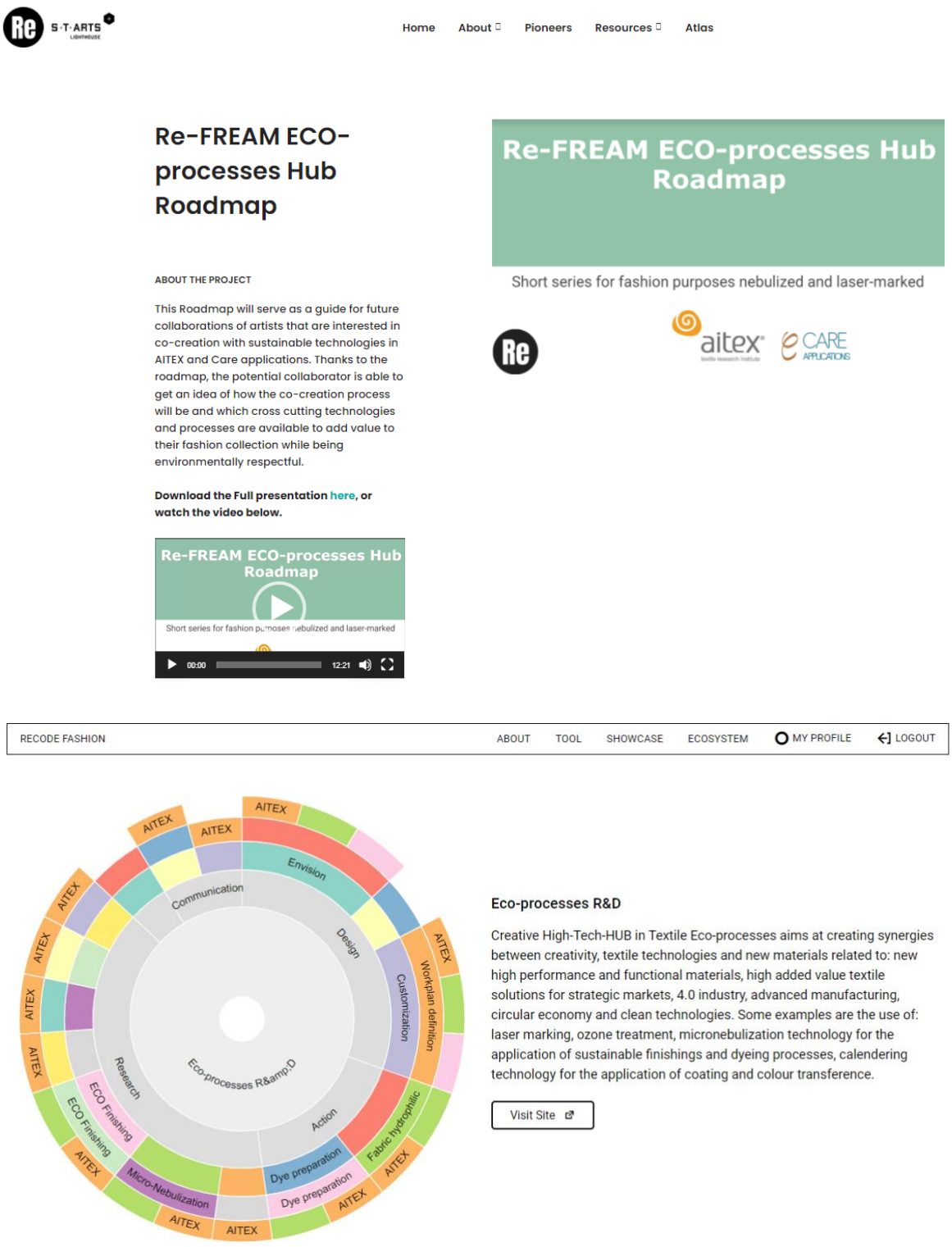


Figure 1: Screen-shoot of the Roadmap published in Re-FREAM and RECODE platform

Roadmap has the following stops (which will be further described in the sections below).

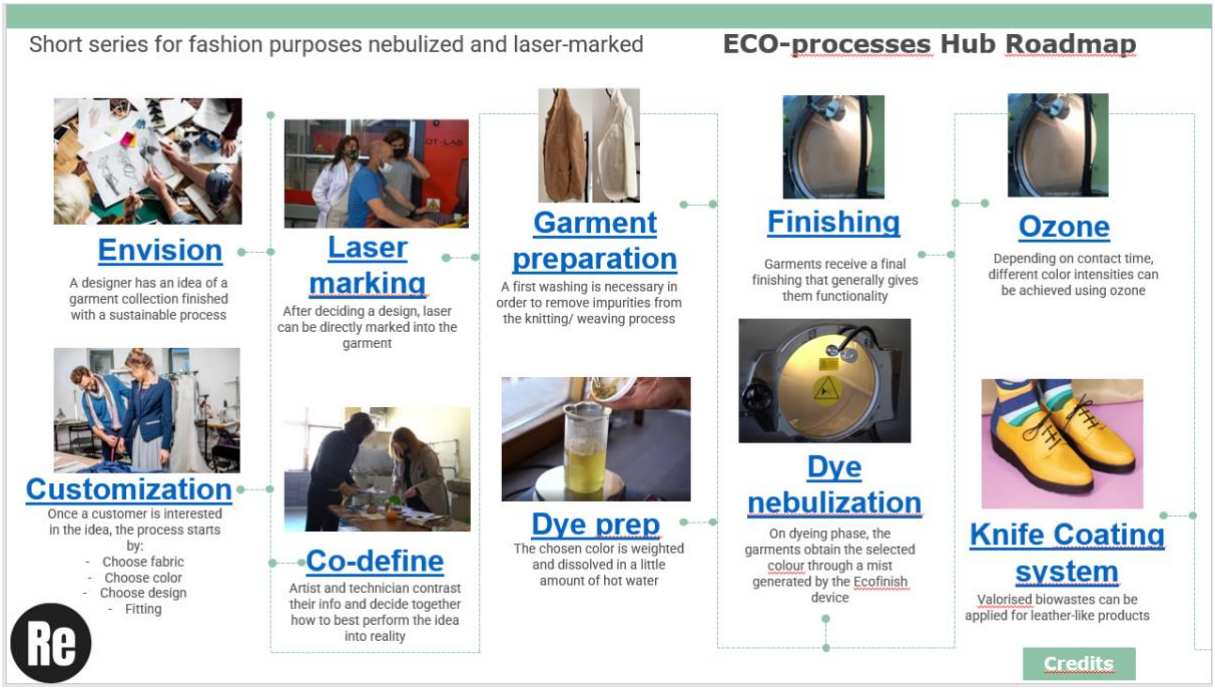


Figure 2: Screen-shoots of the roadmap

The following sections will describe each step that need to be followed to obtain a sustainable collection or garment, which uses the most innovative technologies at the same time as being respectful with nature.

2.1 Envision

First, the designer or artist comes up with an idea that aims to be sustainable, zero waste and uses cutting edge technologies.

Then, they can come to ECO-processes Hub entities: AITEX and Care Applications, to create a garment or a collection based on sustainable and highly technological processes, which are personalized, produced on-demand or short series of a fashion collection.

Figure 3: Artist gets inspired by an idea

2.2 Customization

Customization is possible by direct contact consumer-artist or via app, where customer can decide the type of fabric, color or even aroma for example.

Figure 4: Artist working on tailoring

This is the interface of the app developed and property of Alexander Bello in his project Neobotanical Tailoring, where he gives the costumer the opportunity of select fabric, dye and much more on-demand and prior to production, as a sustainable way of fashion production.

Figure 5: Alexander Bello's customization app

2.3 Co-define

The co-creation dialogue should be a "conversation", literally a joint dancing (from the Latin cum versare). This "dance" needs a well-designed place (and process), where common languages can be emphatically established, shared goals are emerging throughout the path, hypothesis and solutions are iteratively explored, verified and eventually discarded.

Figure 6: Artist and technician co-defining next steps

According to that, the playspace should be arranged in a way that supports the immediate action, making ideas become reality. But always taking into account the technical viability.

This co-define phase results in a workplan including foreseen activities and expected outputs to be reached at the end of the co-creation. This is the starting point of the path that will jointly walk artists and scientists to arrive at a final goal.

2.4 Laser Marking

Laser technology is known for denim applications in industry, as replacement of conventional dry processes like sand blasting, hand sanding, destroying, and grinding etc.

Inside Re-FREAM co-creation projects, a variety of new materials have been tested for its suitability regarding laser marking. Therefore, there is a wide database of the parameters to use according to different textile (and non-textile) fabrics.

After laser application, a washing is needed to eliminate impurities from the sublimated dyes and/or fabrics.

Figure 7: Some prototypes from Youyang Song and Elisabeth Jayot where Aitex's laser technology has been applied

2.5 Garment Preparation

For an optimal dyeing result, well-prepared garments are necessary before starting the colouring process. Garments come from previous phases with impurities and product remains that are used in the knitting/weaving and manufacturing process to facilitate the processing of the fabric and garment making up. The objective of the preparation is to make the fabric hydrophilic (with a tendency to be wetted by water) to be ready for the next phase.

In this preparation step, the garment is also prepared with products that provide the correct fibre affinity for the next dyeing phase. With the aim that the dye has a high exhaustion, a correct fixation and that it penetrates evenly throughout the garment.

Another preparation step is the mordant, required for certain dyestuffs that have no affinity or ability to bind to the fibre, such as natural 10 dyestuffs. It has the function of creating a bridge between the fibre and the dye.

The dyeing process with the ECOFinish nebulization system is a continuous process that begins with the preparation of the garments and, without needing to be manipulated, the garments go to the next step, dyeing.

Figure 8: Alex Bello fabrics/garments

2.6 Dye Preparation

After having selected the chosen colour shade with the artist, while the garment preparation is processing, the dyestuff preparation is carried out.

In this step, the dyestuff quantity that is necessary for the dyeing phase is calculated, considering the number of garments to be dyed and their weight. Once the material has been calculated, the necessary amount of dyestuff is weighed, and it is dissolved in hot water to aid with the dissolution. Garments might be also prepared with plastic-tags with free stitches or buttoned to avoid garment entangling during the processing.

Once the garments are prepared, the solution of dyestuff and water is introduced into the tank, which will later dose the product inside the washing machine.

Figure 9: Dye preparation pictures

2.7 Dye nebulization

The dyeing phase is in which the garments are coloured to give them the desired appearance and shade.

The garments are inside the washing machine from the previous preparation phase. The dyeing process starts introducing the dyestuff solution previously prepared into the tank and then nebulizing the product. This dyeing process is carried out through micronebulization technology with the ECOFinish system.

ECOFinish (https://www.youtube.com/watch?v=k7ut-QzXvNk) is a sustainable device that micronizes the water droplets and the product until it achieves a misty effect, thereby allowing its controlled diffusion on the material. It is only applied what the garments are able to absorb. This process generates a large amount of savings up to 90% of water, 90% of chemical products, 85% of energy and 90% of water treatments depending on which kind

of dye process is done. It equals and even improves the quality results obtained by traditional systems that consume a huge amount of resources.

Figure 10: Dye nebulization pictures

Figure 11: New blue prototypes

2.8 Finishing

The finishing phase provides the garments with a series of properties that can be aesthetic but above all functional, such as softening to give a good touch, application of different resins to obtain an easy care, anti-stain or anti-UV or microcapsules with essences to obtain a pleasant smell.

The finishing process is carried out in the same way as the preparation or dyeing process. The product solution is prepared, then it is introduced into the ECOFinish tank and subsequently the water and product solution is nebulized.

Little by little the garments absorb the solution and finally, the garments are removed from the washing machine and after a spin, they are dried in the tumble dryer.

If a resin has been applied, after centrifugation, a next curing step is required in an oven. After the last step, the garments are finished.

Figure 12: Finished prototypes with softening

2.9 Ozone

Ozone provides fashion effects on fabrics and garments dyed with direct, reactive or indigo dyes. Ozone degrades colour and depending on contact time different colour intensities can be achieved. Ozone technology considerably reduces water and energy consumption. It also eliminates the need for toxic processes, such as bleaching with hydrogen peroxide and the use of permanganate.

Figure 13: Ozone process

Cleaning and bleaching effects can be obtained when applying ozone to wet garments. Results obtained are similar to the traditional process with hydrogen peroxide, but achieving better resistance in the fabrics, as chemicals are not used. Is possible to use it in denim and knits. Working in dry, the process improves whiteness and eliminates the back staining of the back of the pockets of the jeans and other possible organic spots.

With this young technology, AITEX have finished denim textile with good result, but we are happy to widen our range.

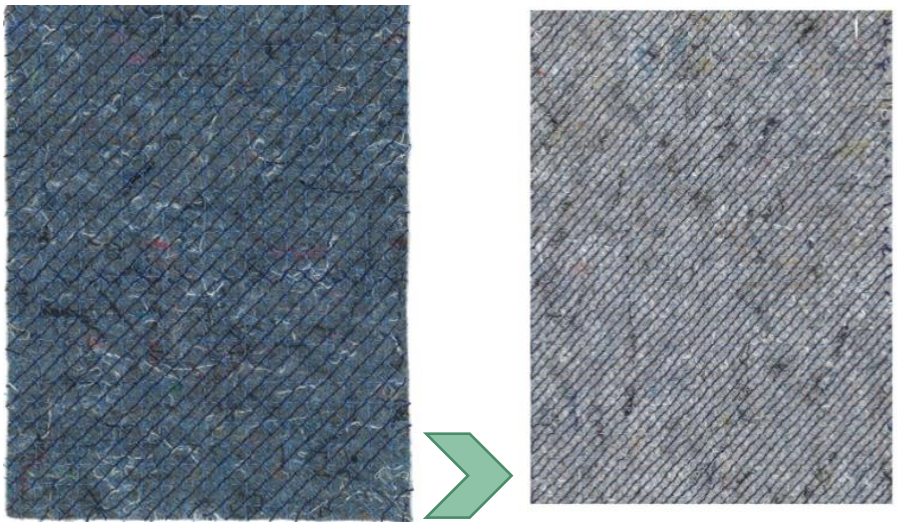


Figure 14: Ozone prototypes from New Blue project

2.10 Knife coating system

Knife coating system for the application of functional coatings on textiles, based on water-based dispersed polymers: bio-based or synthetic.

Coating pastes are formulated and can include functional additives (minerals, powders, colour-changing pigments, nanoparticles, etc.). Coating thickness is controlled. Drying and curing of the coating to reach the final performance.

Valorised biowastes have been also tested for leather-like applications.

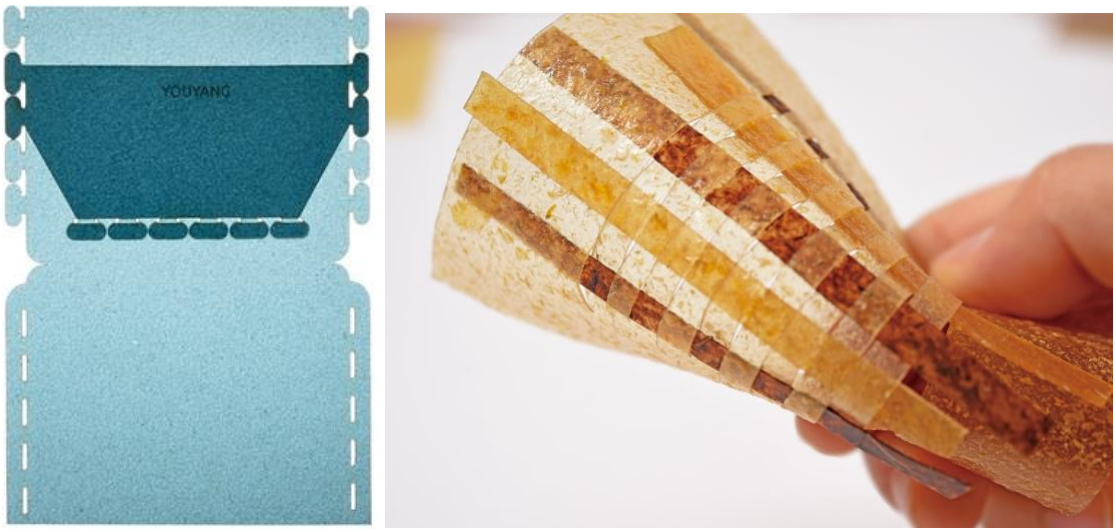


Figure 15: Youyang Song leather like prototypes from food waste

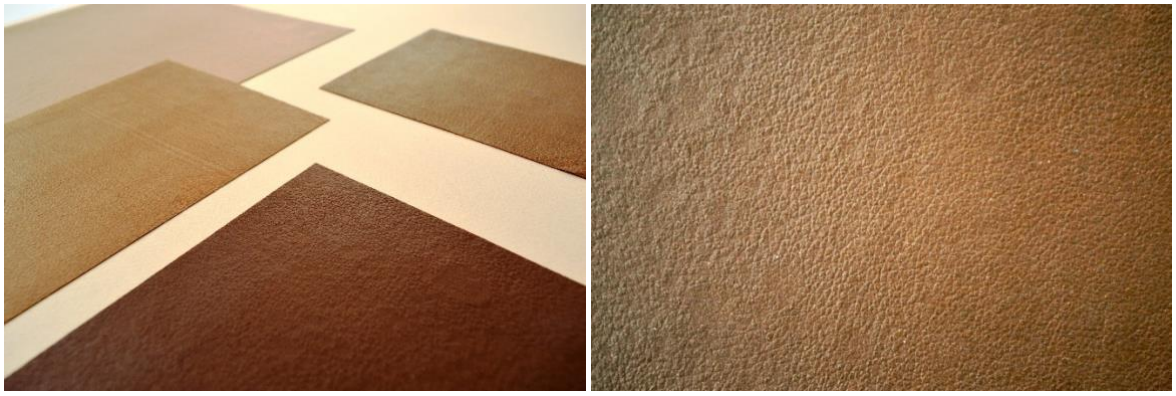


Figure 16: Fabio Molinas leather like prototypes from cork powder waste

2.11 Spraying techniques

Velvet effects can be obtained by the combination of small particles (that may come from valorised wastes) and bio-resins.

Here, formulation is the key, then the technology is as simple as compressed-air spraying.

Figure 17: Fabio Molinas Sprayed prototypes

2.12 Complementary technologies

Hot-melt bonding, lamination and calendering

- Dual flatbed lamination system for sandwich (multiple-layer flat materials, up to 4 layers) and rigid materials. Dry system.
- Materials up to 150 mm thick.
- Thermosensitive films and powders are used for bonding.
- Calendering system for transfer printing on polyester, bonding with thermosensitive films and coating with special effect films (e.g., metallization, snakeskin, crush effect, black out, etc.). Dry system.
- Use of hot-melt adhesives for bonding several flexible materials (woven or knitted fabrics, nonwovens, films, membranes, foams, etc.).
- Not water-based or solvent-based. 100% solids, any effluent isn't generated.
- Dot coating application system. It doesn't interfere in the breathability of the materials to be bonded.

Figure 18: Calendering technology and sample

2.13 Final garment

The last step is carried out: the creation of technical sheets, pattern making (*if the dyeing and finishing processes have been developed in fabrics and not garments*) and sewing process.

Final garment is delivered to the customer or ready for distribution.

Figure 19: New Blue final prototypes

Figure 20: Alex Bello final prototypes

Figure 21: Loreto Binvignat final prototype

Figure 22: Fabio Molinas final prototype

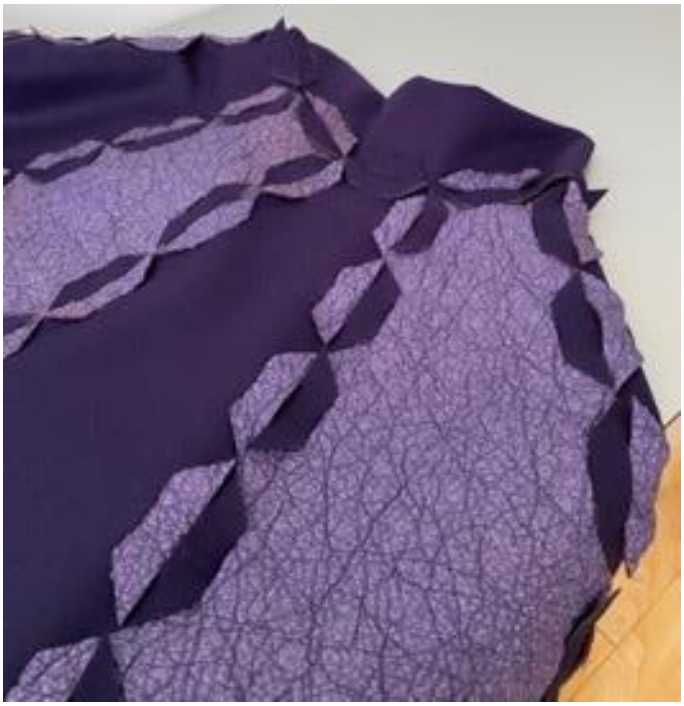


Figure 23: Elisabeth Jayot final prototype

3 Summary and Outlook

In the web, the credits are mentioned, acknowledging all artists that have helped with their inspirational ideas both AITEX and Care Applications technicians.

2020 Artists

Marinero by Jef Montes

https://studioadaptiveskins.com

https://www.instagram.com/jefmontes

Fragments garments by Elisabeth Jayot

https://www.instagram.com/elisabeth.jayot

Leather for vegetarian by Fabio Molinas

Lebiu Design – Genuine cork skin

https://www.instagram.com/lebiu.design

Cooking new materials by Youyang Song

https://youyangsong.com

https://www.instagram.com/youyang_song

2021 Artists

Sustainable Evolution by Loreto Binvignat

www.loretobinvignat.com
https://www.instagram.com/animabyloreto/

Neobotanical Tailoring by Alexander Bello

https://www.instagram.com/alexbello1_work/

New Blue by Tim van der Loo and Sandra Nielsen

https://anewkindofblue.com

https://www.instagram.com/sandranicoline/

https://www.instagram.com/tim_van_der_loo/