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PRESS RELEASE

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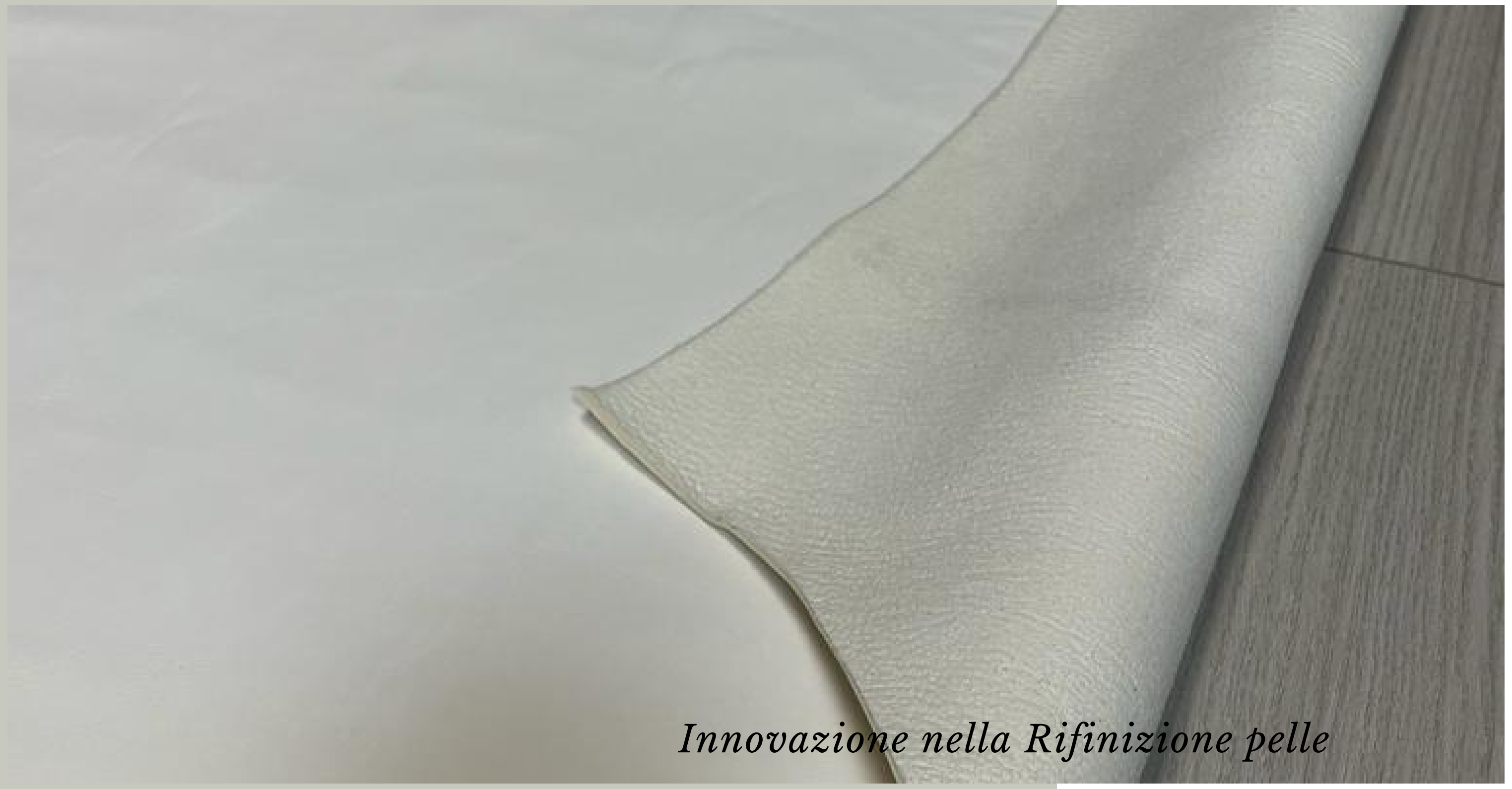
MATERIAL

Biodegradable & Compostable Leather

LEATHER SPECIFICATIONS &
ECOLOGICAL TREATMENTS PAGE 10/26



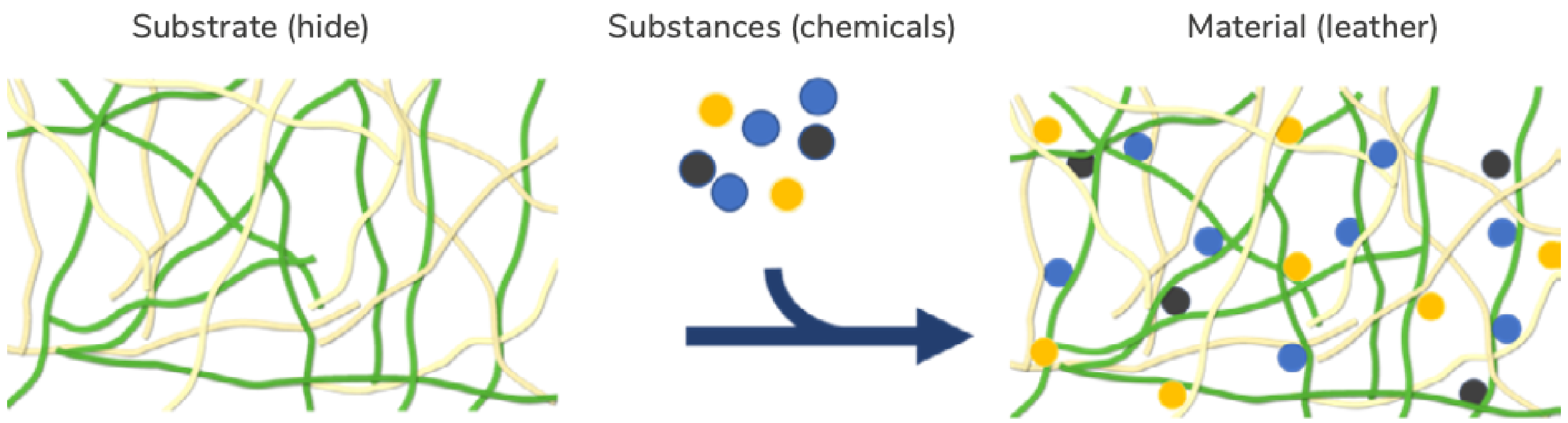
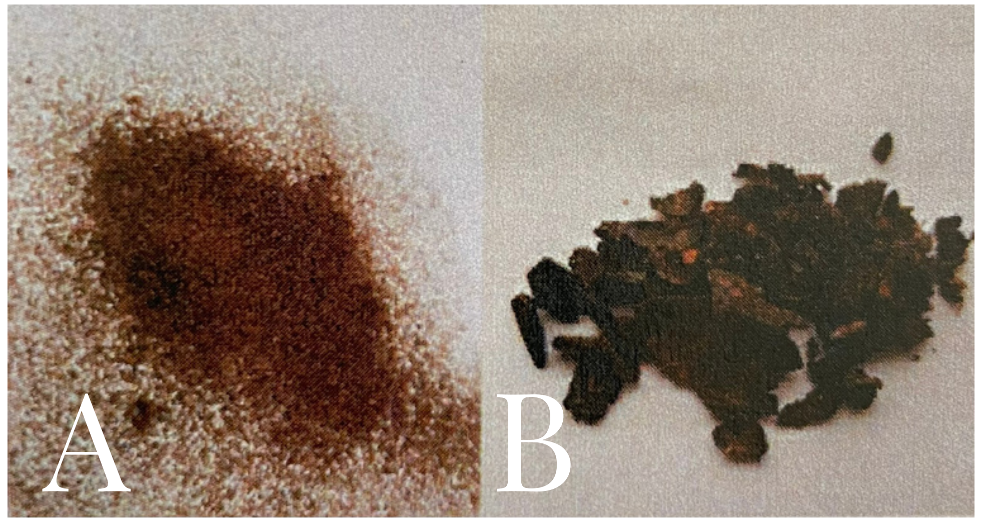


Figure 1. Substrate and substances combine into material

LEATHER IS A MATERIAL THAT DERIVES FROM THE CIRCULAR ECONOMY AS IT IS A BY-PRODUCT OF THE FOOD INDUSTRY.

WHAT CAN MAKE IT DIFFERENT AND COMPOSTABLE IS THE TANNING PROCESS.

THE INNOVATIVE FEATURE OF THIS PATENT IS THE USE IN THE TANNING OF ZEOLITE A MINERAL FOUND IN NATURE ALSO USED FOR FOOD SUPPLEMENTS THAT ALLOWS THE MATERIAL AT THE END OF ITS LIFE CYCLE TO RETURN TO EARTH DUST.



A) Zeology tanned leather leading to use usable compost

B) Conventional tanned leather as non usable material for compost

LINING MATERIAL

Recycled Polyester 65%

ECOLOGICAL PRINTING SPECIFICATIONS PAGE 29/30

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AS WELL AS FOR ITS PHILOSOPHY, THE "SORRY I'M DIFFERENT" BRAND IS ALSO RECOGNIZED FOR THE CUSTOMIZATION OF THE LININGS AND FABRICS WITH WHICH IT BUILDS ITS GARMENTS.
THE LININGS INSIDE THE GARMENTS TELL STORIES AND CURRENT ISSUES, LAUNCH DIRECT MESSAGES ON IMPORTANT THEMES SUCH AS ECOLOGY, SUSTAINABILITY, RECYCLING OR UNUSUAL MOODS CREATED ON A THEME FOR EACH PROJECT.

100% VISCOSE MATERIAL

ECOLOGICAL PRINTING SPECIFICATIONS PAGE 29/30

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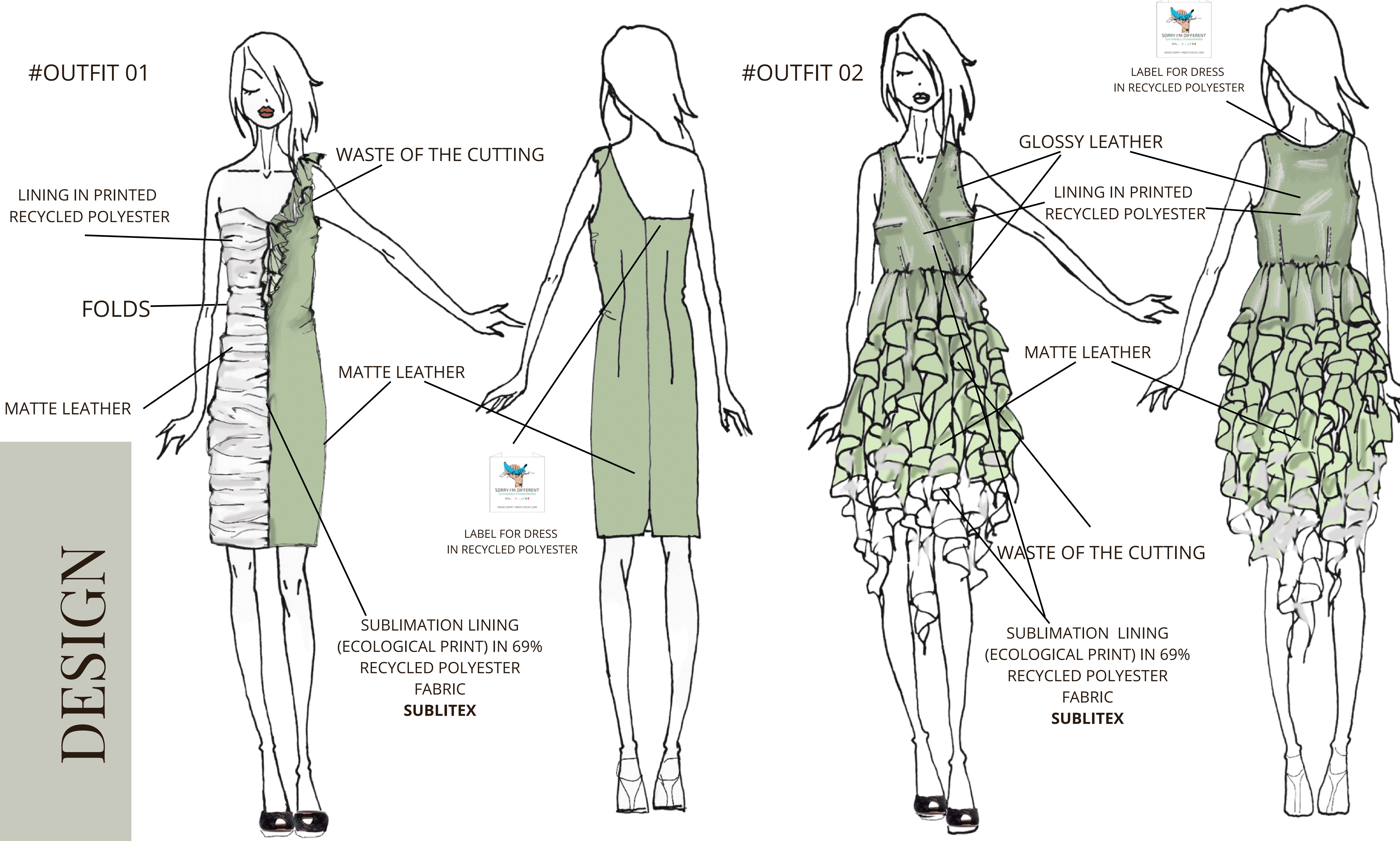
DESIGN

SORRY I'M DIFFERENT



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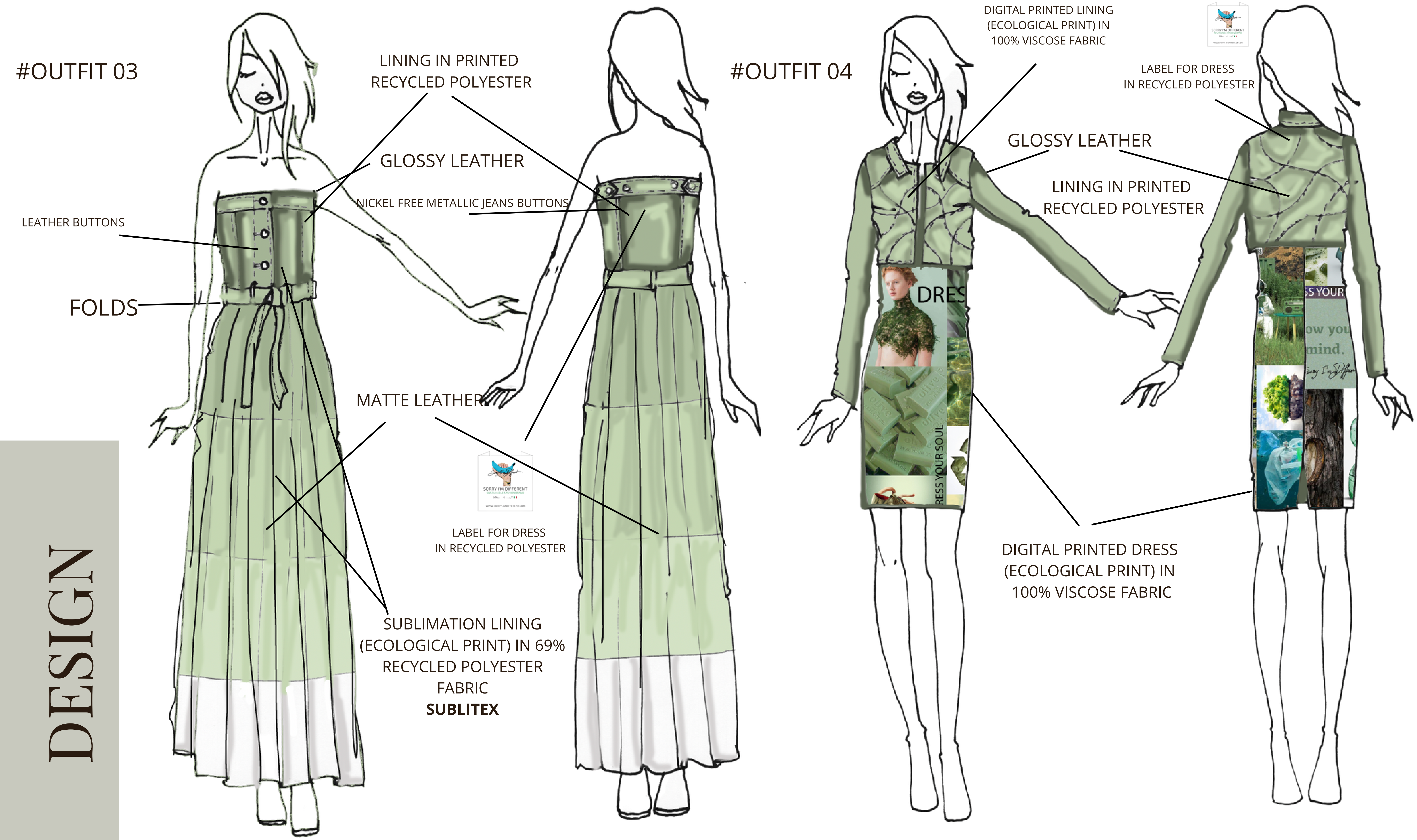

SORRY I'M DIFFERENT

OUR VISION

SORRY I'M DIFFERENT BRAND

A DIFFERENT VISION OF FASHION

The Brand's goal is to create an ecosystem between companies / industries to increase the value of production and local products, extend the life cycle of materials, increase the value of timeless and seasonless clothes, reduce the amount of polluting products for the environment.

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BIODEGRADABLE AND COMPOSTABLE LEATHER SPECIFICATIONS

Zeology and biodegradability

Biodegradability of Zeo White

In this paper the biodegradability for Zeo White is described.

- The paper focusses on Zeology tanned intermediate.
- Testing of biodegradability of Zeo White is done for both biodisintegration (break down) and bioassimilation (uptake and growth).

The biodisintegration of Zeo White is found to be rapid and results in almost complete compostability and aqueous biodegradation. Zeo White compost is well bioassimilated and shows a positive effect on plant growth.

The overall biodegradability of leather is influenced by the selection of chemistry applied throughout the leather making process. For end-of-life scenarios such as oceans, water effluent treatment plants, and compost, Zeo White is expected to be biodegradable.

Biodisintegration

Zeo White leather will rapidly biodisintegrate into fine pieces if purposely or accidentally placed into the environment. The biodisintegration of Zeo White under industrial composting conditions gave a proper compost within 15 days. The test demonstrates that the tannage stabilises the leather for in-use, but in the biosphere, the microbes can easily access and use enzymes to disassemble the collagen protein structure.

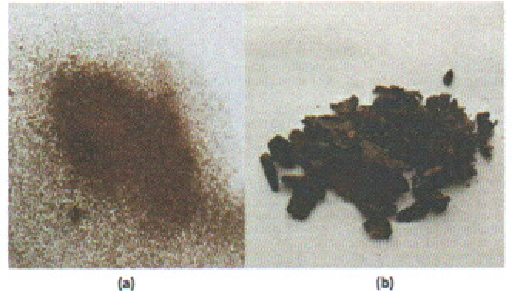


Figure 1. The biodisintegration of (a) Zeology tanned leather leading to usable compost and (b) conventional tanned leather as non usable material for compost.

Bioassimilation

Through the growth of plants or micro-organisms the biodisintegrated Zeo White leather is bioassimilated into the ecosphere. The plant growth tests of the Zeo White compost produced vibrant looking plants, that were almost equal to the viability of the control, figure 2a. The zeolite leather-containing compost performs close to equal with conventional growth compost. For the bioassimilation by micro-organisms in aqueous conditions, the Zeo White pieces showed rapid uptake of the leather substituents into biomass as measured by the gas monitored in this test. The zeolite material appears to be broken down by simple primary enzymes that allow easy assimilation of the amino acids into the bacterial cells, especially compared to conventional leathers (Figure 2).

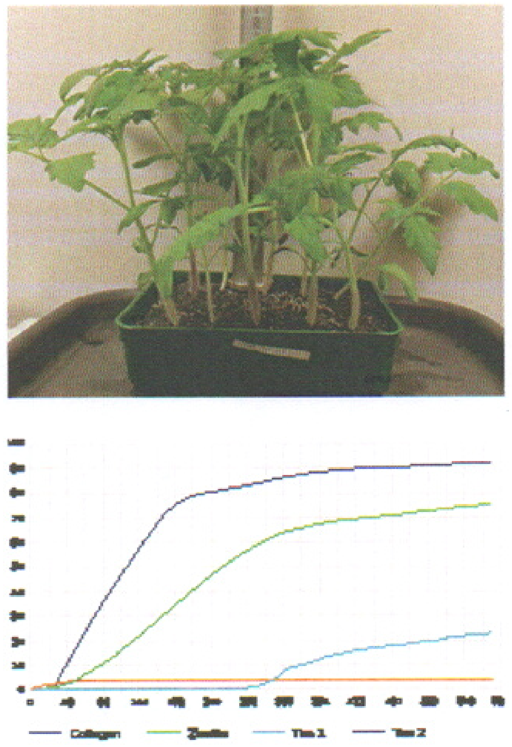


Figure 2. Bioassimilation based on a) Plant Response Test for Zeo White based compost, and b) the aquoues biodegradation by micro-organims[4] for different materials: untanned collagen, zeolite tanned, conventional Tanning 1 and 2.

Limitations

The biodegradability of a material can be hindered by the choice of the chemicals applied in its production. All of the above results obtained are for pure Zeo White tanned material treated made with properly selected harmless chemistries. In case of leather articles, such as waterproof leather or finished articles, the selected chemistry will have an impact on the leather's overall biodegradability. Zeo White leather offers a blanc canvas to create fully biodegradable leather with, and to achieve this the choice of additional chemistries has to be carefully made.

End-of-Life scenarios & Ecotoxicity

The overall biodegradability of Zeo White material is explored for different end-of-life scenarios, figure 3. Under aqueous, aerobic conditions, such as seas and oceans, ponds and effluent treatment plants, the micro-organisms will quickly biodegrade the tanned material. When the Zeo White is entered into a natural, home or industrial composting conditions than it will give compost that has a positive effect on plant growth. To date (2020-12), we have not yet obtained data for the anaerobic end-of-life scenarios, such as landfill.

A careful screening of persistent chemistry that could pose toxicological issues is standard practice for composting systems. A screening of the zeolite material showed that there are no components present that would cause concern if the zeolite containing compost were used to enhance soils.

For end-of-life scenarios such as oceans, water effluent treatment plants, and compost, Zeo White is expected to be biodegradable and will have a positive effects on the soil composition.

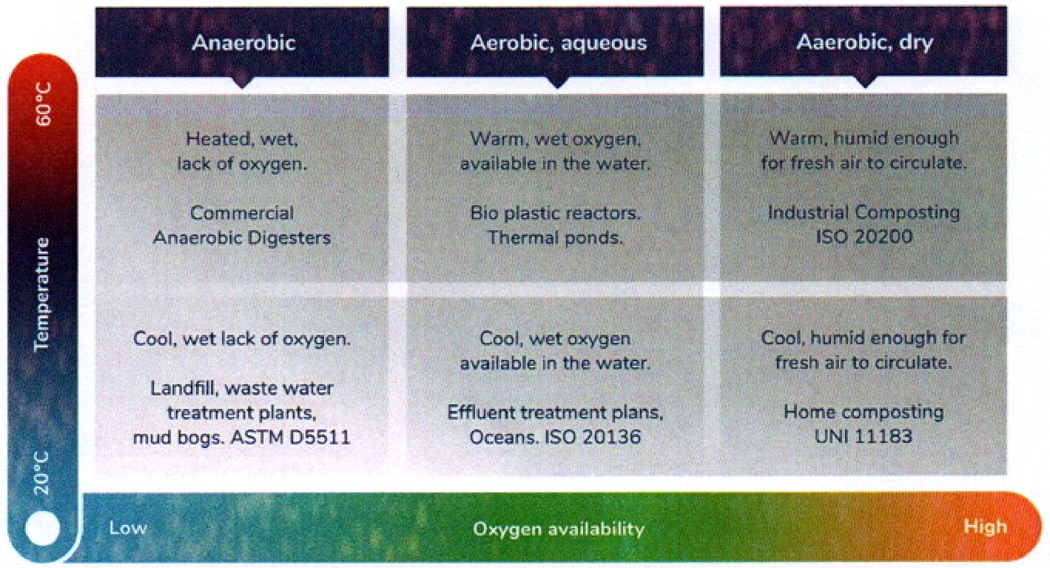


Figure 3. The range of end-of-life environments and the test used to simulate them.

Notes & References

1. Test result based on ISO 20200:2015. Plastics. Determination of the degree of disintegration of plastic materials under simulated composting conditions in a laboratory-scale test (ISO 20200: 2015). International Standards Organisation, Geneva, Switzerland

2. Compost evaluation based on BS EN ISO 14995:2006, Plastics. Evaluation of compostability. Test scheme and specifications (BS EN ISO 14995:2006). The standard expects that after 90 days in a biodisintegration environment that no more than 10% of the starting mass is held back by a 2 mm sieve at the end of the degradation. Similar Compost evaluations exist according to ISO 13432 for packaging materials, and ISO 17088 for plastic materials, or ASTM D6400 for the US.

3. The PRT test grows plants in a soil medium that contains the breakdown products of the material being tested. The growth of the plants is observed and compared to controls. The plants grew in the growth media that contained the ISO 20200 Zeo White leather compost.

4. Test results based on the ISO 20136:2017 biodegradation test (bioassimilation or ultimate biodegradability) processes material in an aerobic aqueous environment. The test measures how much CO_2 has evolved. Leather -- Determination of degradability by micro-organisms (ISO 20136: 2017). International Standards Organisation, Geneva, Switzerland.

5. The ecotoxicity (ECO-TOX) test screens for restricted substances that would impact environmental health. The test outcomes are often compared to EU and North American standard soil/compost standards.

Can leather be biodegradable?

1. Nera and biodegradability

What is Nera's position on biodegradability?

We agree with Leather Naturally. Hides and skins are mostly a by-product that is dependent on the meat and dairy industry. Transformation into leather is the best use for those hides. The leather industry is creating a product that is both natural and long lasting - leather is unique in its ability to combine beauty, comfort and practicality. Biodegradable on itself is not the whole answer, it is merely a step towards a circular material.

Shouldn't leather be durable instead of biodegradable?

Leather should be durable AND biodegradable. After long usage, re-use, repair and recycling, at its end-of-life leather eventually ends-up in a waste stream and for a circular design it then needs to be biodegradable. This way we allow the material to be biodegraded, composted and eventually bioassimilated by plants, for example. Biodegradable leather is a step towards circular leather.

2. Test methods

What is the difference between the available test methods?

In the table we have differentiated the most common test methods, representing different end-of-life environments. The difference in these methods is found in conditions, e.g. humidity, temperature and whether oxygen is present (aerobic) or not (anaerobic).

What test method(s) should I use?

Conditions determine biodegradability of materials, hence these conditions determine the optimal test method. Conditions could be humidity, temperature and whether oxygen is present (aerobic) or not (anaerobic). ISO 20200 for example is a test method where the material is exposed to warm, humid aerobic environment as seen in industrial composting. Where method UNI 11183 simulates home composting at almost the same condition but now in a cool environment. The test method to use thus depends on the expected or relevant end-of-life environment.

Figure 1. The range of end-of-life environments and the test used to simulate them.

3. Chemical choices

What substances are most suitable for biodegradable leather?

Other than with plastics or synthetic materials the hide from which leather is made is biodegradable, a great start. By turning hides into leather we want the material to become durable for a limited time only, the choice of substances used throughout the leather production process influence this. Nera is performing a more extensive research on the optimal choices when picking these substances.

Is Zeology tanned leather more biodegradable than chrome or glutardialdehyde (GDA) tanned leather?

Before hides/skins are tanned, they are naturally biodegradable. The tanning process changes the chemistry inside the leather fibers to make it more difficult for the enzymes from bacteria and fungi to break them down. Any leather can be composted but the speed of degradation and environmental impact depend on the tanning chemistry used. The tanning technologies developed in the past mainly focused on the durability (and longevity) of the leather; however, current society asks for an additional sustainability property – leather that biodegrades into components that can enter natural cycles once again. Zeology tanned leather does biodegrade quicker than the traditional tanning technologies (Tan 1 & Tan 2) as shown in the graph. The Zeology tanned material appears to be broken down by simple primary enzymes that allow easy bioassimilation of the amino acids into the bacterial cells, especially compared to conventional leather types.

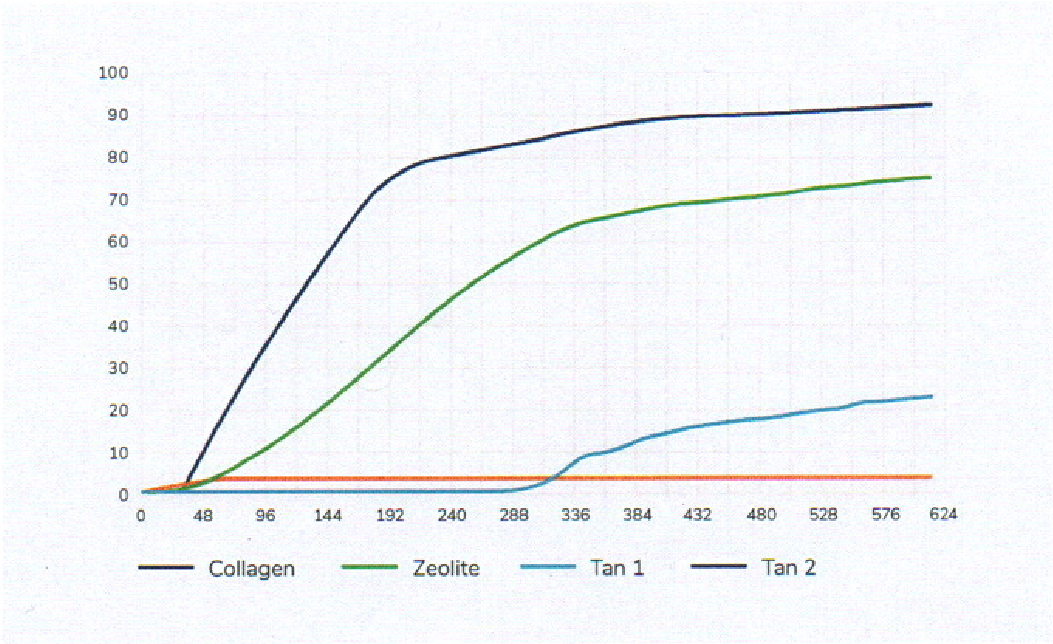


Figure 2. Bioassimilation based on a) Plant Response Test for Zeo White based compost, and b) the aquoues biodegradation by micro-organims4 for different materials: untanned collagen, zeolite tanned, conventional Tanning 1 and 2.

4. Terminology

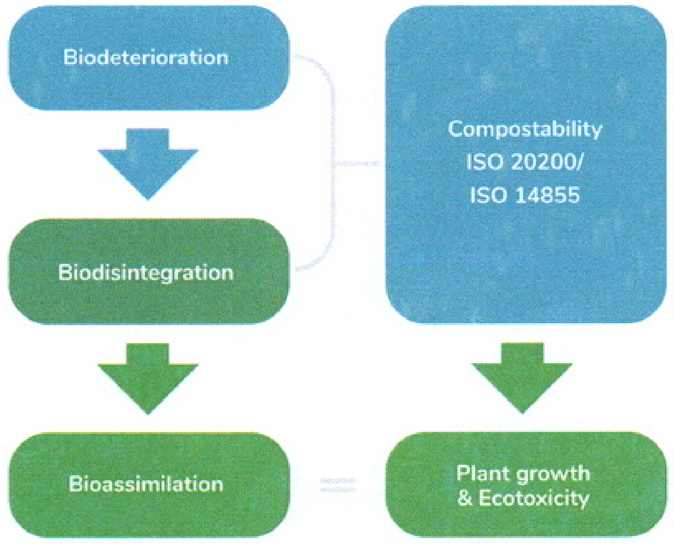
There are so many terms that relate to biodegradability. What means what?

Chemical producers test the biodegradability of the individual substances and the terminology used is designed to interrelate with the metrics specified in their test methods. A leather manufacturer, on the other hand, cannot adopt all the terms that the chemical industry uses when describing substance because in some of the definitions they reference test methods that are not used when testing leather. In the table we have set apart the terminology, described their definitions and clarified to what material is relates.

GLOSSARY FOR LEATHER AND CHEMICALS		
Term	**Definition**	**Relates to**
Degradation	The process by which any material or substances is broken into simpler components through non-enzymatic methods using chemical (e.g., acid), physical (e.g., wave action), or both (e.g., light).	Leather and chemicals
Biodegradationt	The process by which organic materials or substances are decomposed by micro-organisms into simpler components such as carbon dioxide, water, and ammonia.	Leather and chemicals
Composting	Biodegradation in a: humid; organic; aerobic; high temperature (industrial), ~60°C; or aerobic room temperature (home), ~25°C; environment.	Leather
Ultimate biodegradability	The level of degradation achieved when the test compound is totally utilised by microorganisms resulting in the production of carbon dioxide, water, mineral salts and new microbial cellular constituents (biomass).	Leather and chemicals
Readily biodegradable	An arbitrary classification of chemicals which have passed certain specified screening tests for ultimate biodegradability; these tests are so stringent that it is assumed that such compounds will rapidly and completely biodegrade in aquatic environments under aerobic conditions, see OECD 301 for specific screenings.	Chemicals
Inherently biodegradable	A classification of chemicals for which there is unequivocal evidence of biodegradation in any test of biodegradability.	Chemicals

What is the difference between 'biodegrading' and 'composting'?

Biodegradation passes through 3 stages: Biodeterioration (e.g., black spots on bananas – surface breakdown), biodisintegration (e.g., the banana becomes soft due to bacterial breakdown, material breaks into smaller pieces) and bioassimilation (e.g., the banana is broken into compost mass, taken into biomass – also called ultimate biodegradability). Compostability is a specific case of a biodegradation process and mainly covers the first two stages of biodegradation as seen in the graph.



5. Timeline of biodegration

How long does it take for leather to biodegrade?

The depends on a large variety of parameters. The main parameters are the what materials were used to produce the leather: what was used to tan the hide, what was used to soften the leather and what finishing was used. Other than that the conditions in which the leather is placed have a large impact as well (e.g. humidity, temperature and whether oxygen is present or not). A shoe will not biodegrade while somebody is wearing it but once it is put in e.g. a warm, humid environment over a longer period of time biodegradation will start.

Biodegradability and disintegration of leather

A sustainable leather value chain not only focuses on the production of the materials but also on their end-of-life scenarios. Society asks for a re-focus on the sustainability of leathers that are more biodegradable, and not just durable. Explaining the biodegradability of leather in specific and understandable terms is a key element to the sustainability of the leather industry. This whitepaper lays out the differences in the terminology and draws a distinction between chemical and whole material testing.

Executive Summary

The understanding of what substances that leather breaks into after usage and whether they are benign or harmful is important information for consumers who want to make purchases that fit their environmental preferences. Relevant test results are useful for consumers to understand the impact their product will have at the end-of-life stage.

The differences in the terminology depict a major distinction between the testing of the separate chemical substances and whole-material testing. Practitioners in the leather industry should be familiar with the jargon used, the end-of-life scenarios, and with the basic testing that is used to simulate the different end-of-life environments.

A key advancement in the future success of leather will depend upon the development of a balance between long-lived leathers and ecological benign short-lived leathers.

Sustainability at end-of-life

The end-of-life of a leather article is a vital part of its sustainability. Video footage of ocean plastic has highlighted just how important it is that materials can degrade under natural conditions with minimal interference[1,2,3]. The biodegradability of leather is something that leather manufacturers and fashion houses are increasingly interested in. The end-of-life (bio)degradation of materials depends on the environmental conditions: wet or humid, with or without air, hot or cold. These situations are simulated using different standard test methods[4,5]. Explaining the biodegradability of leather in easy to understand terms is a key element to the end-of-life sustainability of leather.

Before hides/skins are tanned, they are naturally biodegradable. The tanning process changes the chemistry inside the leather fibers to make it more difficult for the enzymes from bacteria and fungi to break them down. Any leather can be composted but the environmental impact depends on the tanning chemistry used. The tanning technologies developed in the past mainly focused on the durability (and longevity) of the leathers; however, current society asks for an additional sustainability property – leather that biodegrades into components that can enter natural cycles once again[6,7]. The tanning industry (both leather manufacturers and chemical companies) has recognized this re-focus and is increasingly researching and creating new tanning technologies that are supporting more biodegradable, ecologically benign leathers.

Biodegradability - three areas for testing

Materials such as leather are composed of multiple components. The substrate (the hide) that provides the strength can be tested for its own biodegradability, and the substances (the chemicals) contained in the material also can be tested for their biodegradability[6-12]. Finally, the material such as leather composed of substrate and substances results in a separate area for testing.

Chemical producers test the biodegradability of the individual substances and the terminology used is designed to interrelate with the metrics specified in their test methods[6,9]. A leather manufacturer, on the other hand, cannot adopt all the terms[8,18] that the chemical industry uses when describing substance because in some of the definitions they reference test methods that are not used when testing leather.

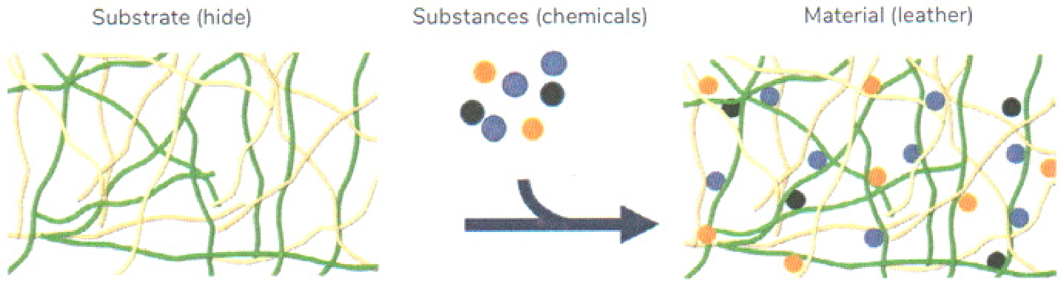


Figure 1. Substrate and substances combine into material

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GLOSSARY FOR LEATHER AND CHEMICALS		
Term	**Definition**	**Relates to**
Degradation	The process by which any material or substances is broken into simpler components through non-enzymatic methods using chemical (e.g., acid), physical (e.g., wave action), or both (e.g., light)[7,8,9,10,11].	Leather and chemicals
Biodegradationt	The process by which organic materials or substances are decomposed by micro-organisms into simpler components such as carbon dioxide, water, and ammonia[7,8,9,10,11].	Leather and chemicals
Composting	Biodegradation in a: humid; organic; aerobic; high temperature (industrial), ~60°C; or aerobic room temperature (home), ~25°C; environment[5,10,11,14].	Leather
Ultimate biodegradability	The level of degradation achieved when the test compound is totally utilised by microorganisms resulting in the production of carbon dioxide, water, mineral salts and new microbial cellular constituents (biomass)[8,9,10,11].	Leather and chemicals
Readily biodegradable	An arbitrary classification of chemicals which have passed certain specified screening tests for ultimate biodegradability; these tests are so stringent that it is assumed that such compounds will rapidly and completely biodegrade in aquatic environments under aerobic conditions, see OECD 301 for specific screenings[8].	Chemicals
Inherently biodegradable	A classification of chemicals for which there is unequivocal evidence of biodegradation in any test of biodegradability[8].	Chemicals

Testing of chemicals

The main test used to measure the biodegradability of chemicals (substances) is the Organisation for Economic Cooperation and Development (OECD) 301 method[9]. OECD 301 is not used to measure the biodegradability of leather because it is a composite of hide and chemicals. Companies have been measuring the biodegradability of chemicals for decades and this method tests whether organic compounds can be broken into carbon dioxide and water and how easily that is achieved[6,8]. The terms for 'inherently biodegradable', 'readily biodegradable', and 'ultimately biodegradable' are defined in OECD 301[8] and apply to chemicals only.

Which chemicals are biodegradable, and which are not, is more complex than initially thought. Each chemical needs to be checked to be able to determine the ability to biodegrade in a fast, or slow manner - or whether the time it will take will be too long for the test[8]. It is essential to separate the tests for chemicals from those used for leather[10].

Stages of biodegradation

Biodegradation of a material such as leather undergoes three different stages[7,9,19]:

1st stage: Biodeterioration, (e.g., black spots on bananas – surface breakdown)

2nd stage: Biodisintegration (e.g., the banana becomes soft due to bacterial breakdown, material breaks into smaller pieces)

3rd stage: Bioassimilation (e.g., the banana is broken into compost mass, taken into biomass) – also called ultimate biodegradability.

During the first two stages, leather breaks down into smaller components. In the third stage, these components are assimilated as nutrients by microorganisms. Materials that remain at the 1st or 2nd stage are not ultimately biodegradable and persist in the environment, typically as small pieces or scraps[6].

Compostability is a special case of biodegradability[11]. Compostability is the capacity of a material to be

biodegraded into compost and it relates to the first two stages of biodegradation. It requires specific environmental conditions where ecological toxicity criteria are applicable. Composting produces biomass that is nutrient-rich and can be used for soil enhancement. The growth of biomass, based on the compost from the biodegraded materials, closes the material cycle.

Compostability is tested according to the ISO 20200 norm for packaging material which is adapted for testing of leather. The compostability test ranges from mainly the 1st to 2nd stage of biodegradation. By adding a plant growth test to the compostability test, the 3rd stage can be fully simulated.

The ultimate biodegradability of (bio)disintegrated, i.e. ground, leather material under aqueous conditions is tested according to ISO 20136. This test focusses only on the 3rd stage, bioassimilation, for the biodegradability. When a material passes through all three stages of biodegradability then it is fully taken up as new biomass and closes the material cycle.

End-of-life environments

Leather and the articles made from it at the end of their life can be found in environments such as landfills, effluent treatment plants, and composting units or littered in nature[7]. In Figure 2, these environments are compared and the common tests used to simulate the different environments are shown[4,5,13,14]. A single environment could contain oxygen (aerobic) and be relatively dry in which case it could compost (either through high or low-temperature methods). In other environments, the leather could be found in a large amount of oxygenated water and the bacteria present could break down the leather.

A landfill is the most common environmental fate of leather and is typified by no oxygen (anaerobic), sometimes with a large amount of water. The bacteria in these landfill environments can resist high temperature[13].

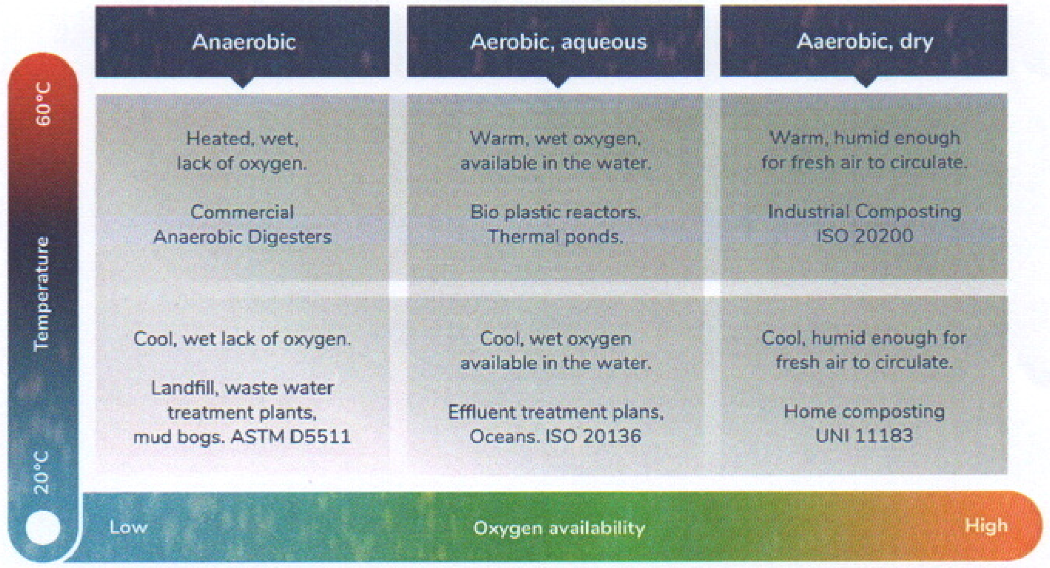

Figure 2. The range of end-of-life environments and the test used to simulate them.

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Low moisture content in leather is a leading determinant of its biodegradability and is generally what makes leather resistant to breakdown during its working life. If the leather is susceptible to biodegradation, then the water content could limit whether that biodegradability takes place.

Like a biscuit, which is very biodegradable, the bacteria and fungi present on that biscuit can never begin their degradation until they get a supply of water. This level is known as water activity. Leather cannot biodegrade in a dry biosphere environment, which may include day-to-day life. End-of-life biospheres are typified by high moisture contents which encourage microbiological growth.

Most types of leather are coated with polymers that range from biodegradable substances to inert plastics. In general, as the polymer becomes more inert chemically, the biodegradability decreases[6,7]. Some of these coatings may take hundreds of years to break down[6].

Test methods

The tests used to understand the biodegradability of leather can be broadly divided into two types: 1) end-of-life simulations that artificially copy different environments, and 2) tests to see if leather in those environments will have a positive or negative impact. Materials such as plastic, biopolymers, textiles, have individual test methods, specifications, and terminology for their biodegradability[10,11]. The ISO 20200 /UNI 11183/ ASTM D5511 biodegradability methods are used for leather but are originally designed for plastics, or other materials[5,13,14].

ISO 20200 /UNI 11183 tests the compostability of materials. The ASTM D5511 method is used to test leather biodegradability behaviour in landfills. ISO 20136 tests the ultimate biodegradability of grinded leather. The ecological toxicity and plant response (OECD 208) tests examine the leather-containing compost to consider the environmental impact of that compost.

See appendix for a full explanation of all test methods and the relevant conditions and criteria, Appendix A.

Conclusion

Stakeholders in the value chain of sustainable leathers and leather articles must have a focus on the end-of-life scenarios of their products. Society now asks for a re-focus on the sustainability of leathers to become more biodegradable, and not just durable. Understanding and explaining the biodegradability of leather in terms of readily biodegradable, ultimately biodegradable, or compostable, is a key element to the sustainability of the leather industry.

This paper has laid out the differences in the terminology and has drawn an important distinction between the testing of chemical substances on the one hand, and whole-material testing on the other hand. Stakeholders in the leather industry can now also understand that biodegradability, is determined both by disintegration as well as bioassimilation. For the different end-of-life scenarios, specific jargon is used as well as specific testing methods. Biodegradability of leather in an aerobic humid condition is tested through a composting test for the biodisintegration, and a plant growth test for the bioassimilation, eventually closing the material cycle. Understanding what components the leather breaks into and whether the breakdown products are benign or harmful is important for consumers who want to make better environmental purchases related to the impact their product will have at the end-of-life stage.

A key advancement in the future success of leather will depend upon the development of a balance between long-lived leathers and ecological benign short-lived leathers.

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Appendix A

TEST METHODS FOR LEATHER AND LEATHER-CONTAINING COMPOSTS			
Method	**Details**		**Relates to**
OECD 301 (A-F) Aqueous ultimate biodegradability of substances [9].	**Conditions**	Aqueous solution (of the substance), 25°C, inoculum, essential nutrients (28 days).	Chemicals
	Why?	Substance undergoes biodegradation in solution to see if they can be broken into CO^2 and water.	
	Criteria	The material will be defined as non-biodegradable, inherently biodegradable, or readily biodegradable (by definition).	
ISO 20200 Industrial thermal/ biodisintegration of plastic (or similar) material [5].	**Conditions**	Test pieces, compost, air, moisture, 58°C, compost inoculum (90-180 days).	Leather
	Why?	The material undergoes biodisintegration in industrial composting to see if it will breakdown.	
	Criteria	The test material is said to be biodisintegrated if no more than 10% of the material is retained in a 2 mm rated sieve after 90 days testing.	
UNI 11183 Home thermal/ biodisintegration of plastic (or similar) material [14].	**Conditions**	Test pieces, compost, air, moisture, 25°C, compost inoculum (6 months).	Leather
	Why?	The material undergoes biodisintegration in industrial composting to see if it will breakdown, same as ISO 20200, but at ambient temperature.	
	Criteria	The test material is said to be biodisintegrated if no more than 10% of the material is retained in a 2 mm rated sieve after 90 days testing.	
ISO 20136 Determination of degradability by micro-organisms [4].	**Conditions**	Aqueous, 25°C, leather powder, sludge inoculum, some nutrients, and controls (28 days) – CO^2 evolved measured.	Leather
	Why?	To see whether leather can be broken down into CO^2 (and water) at a rate comparable to a collagen standard.	
	Criteria	The collagen control must biodegrade more than 70% during the test. If the leather can match or better than that then the leather is said to be aerobically ultimately biodegradable.	
ASTM D5511 – Landfill simulation to degrade any solid material [13].	**Conditions**	Anaerobic, high solids, 25°C, landfill digestate inoculum, leather (28 days) – biogas measured.	Leather
	Why?	To see if leather can biodegrade in the anaerobic conditions of landfills sites.	
	Criteria	The control must biodegrade into biogas more than 70% during the test. If the leather can match or better than that then the leather is said to be anaerobically ultimately biodegradable.	
Ecotox - Toxicity of resulting leather compost [17].	**Conditions**	Standard tests that check for restricted substances in compost or soil.	Compost
	Why?	The use of leather composts should not add unwanted substances to soil.	
	Criteria	Restricted substance free composts do not include lower metals, halogenated chemicals, pesticides, polycyclic aromatic hydrocarbons, and phthalate esters compared to EU and US soils limits.	
WRAP 3.0, ASTM E1963, OECD 208 - Plant response test (PRT) to leather compost [15,16,17].	**Conditions**	Growth media and leather compost, plant seeds, light, water (28 days), 23°C	Compost
	Why?	PRT tests whether leather compost can bioenrich or biosupress the growth of plants.	
	Criteria	Plant growth, measured by: mass, total number of leaves and the visual observation of the plants are compared to the growth of a positive and negative control.	

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MATERIALS
&
FINISHES PARTNERS

BIODEGRADABLE AND
COMPOSTABLE LEATHER
FINISH SPECIFICATIONS

CODYECO
by royal smit & zoon

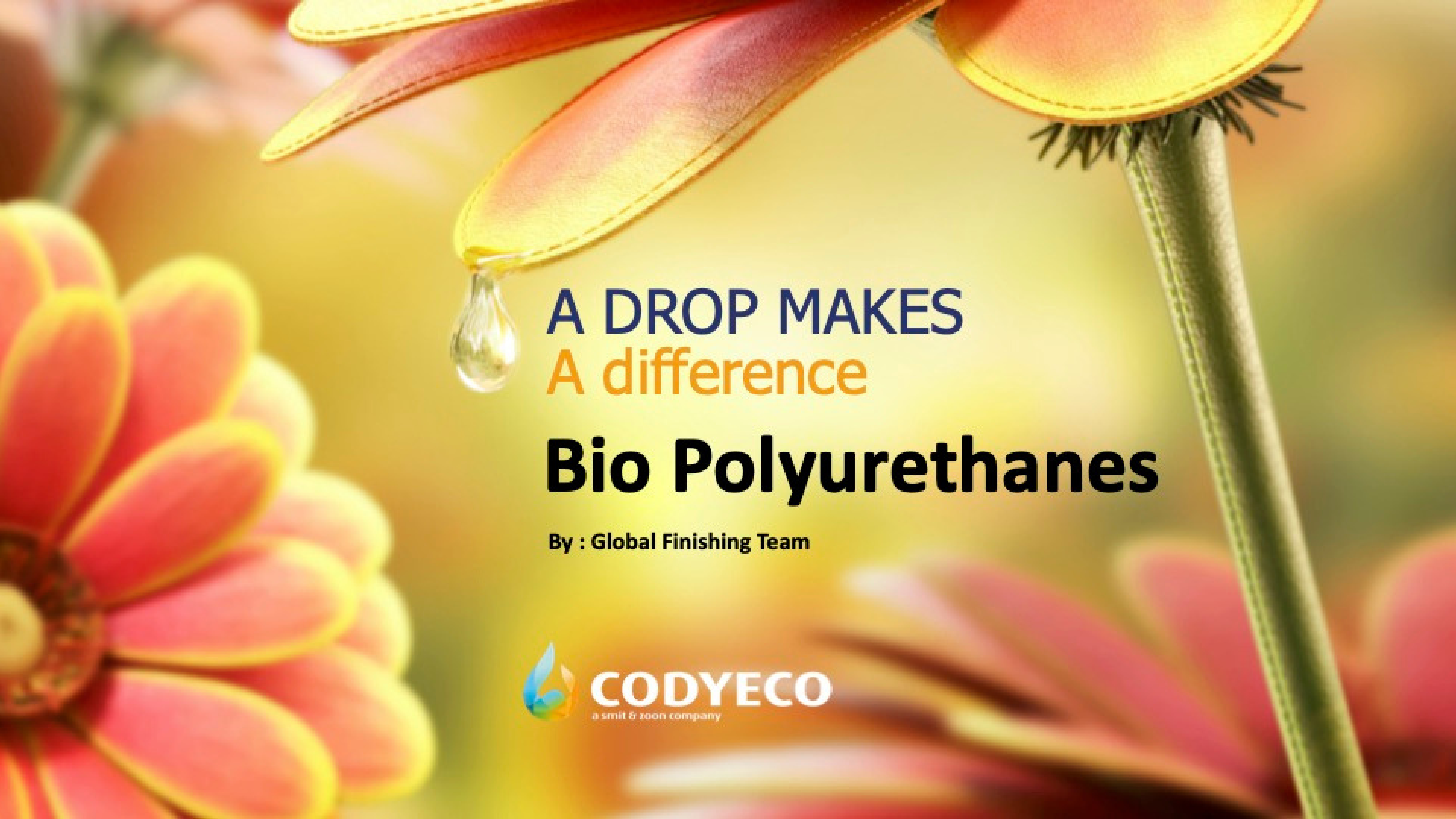
LEATHER WORKING GROUP

TÜV AUSTRIA CERTIFIED

ROADMAP TO ZERO

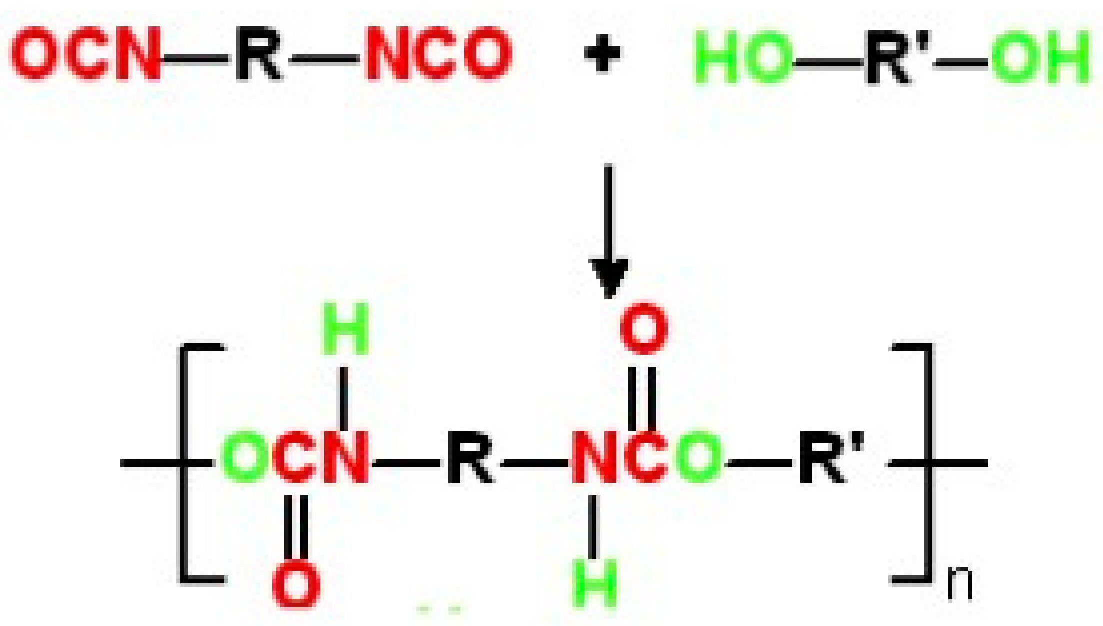
LEATHER NATURALLY MEMBER

LEATHER NATURALLY


A DROP MAKES
A difference
Bio Polyurethanes
By : Global Finishing Team
CODYECO
a smit & zoon company

Bio-polyurethanes

Polyurethanes are one of the most versatile and commonly used polymers in the world and are obtained by a poly-addition reaction as follows:



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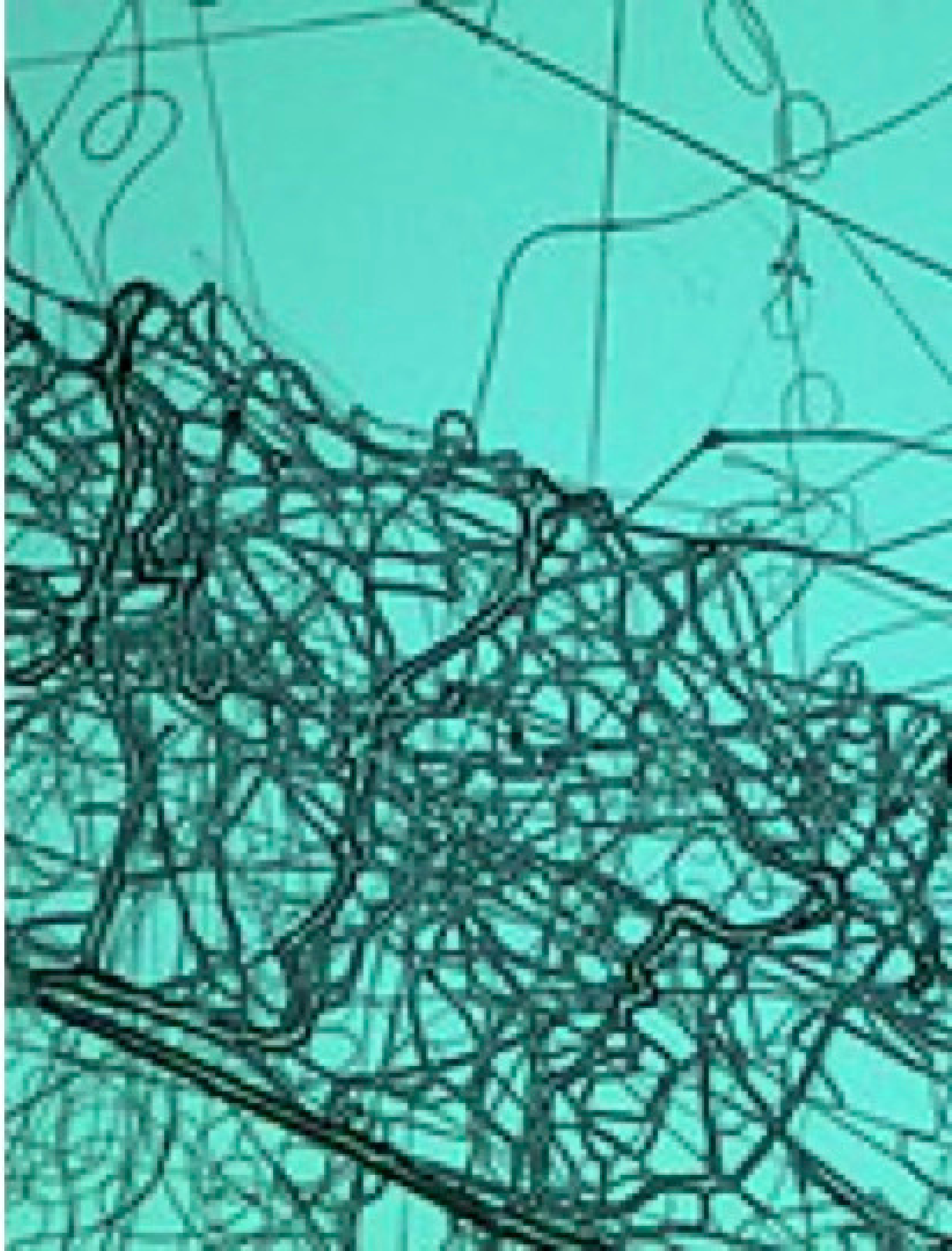

Bio-polyurethanes

With current technology, it is almost impossible to achieve polyurethane with a 100% renewable and sustainable bio-based carbon content. However, it is possible to add quite a bit of bio-based carbon content and reduce CO2 emissions, by using bio polyol.

Bio polyol or natural oil polyol (NOP) is synthesized from various vegetable oils and other renewable sources, for example, pine oil, which is a by-product in the pulp and paper industry. Bio polyol offers a higher bio-based carbon content and a reduction in CO2 emissions.

CODYECO
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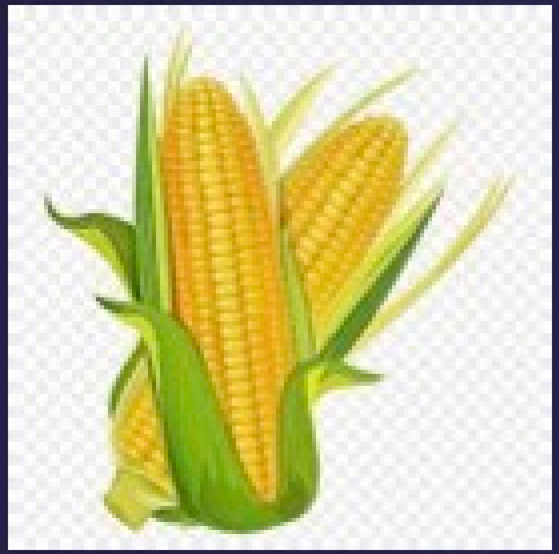
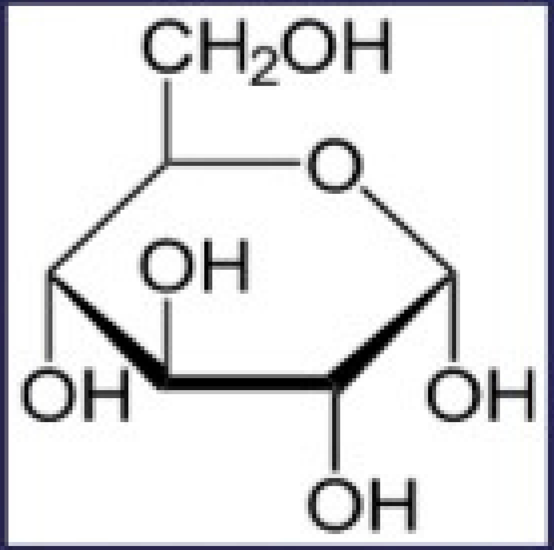
BIO-Polyol production

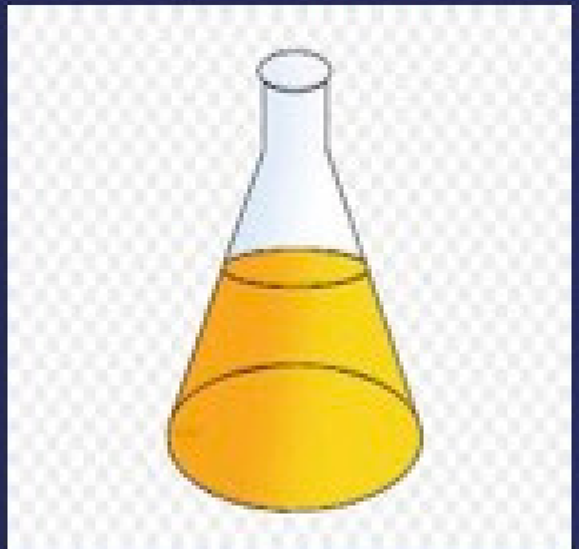
Enzimes

Microorganism

Polymerization







Biomass

Glucose

Bio-Diol Monomer

Bio-Polyol

CODYECO

BIO-PUD Production

Diisocyanate + Bio-polyol

↓

BIO-PUD

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Products:

Technical data Sheet	CODY PUR BIO 100

Aliphatic renewable polyurethane in water dispersion

Properties

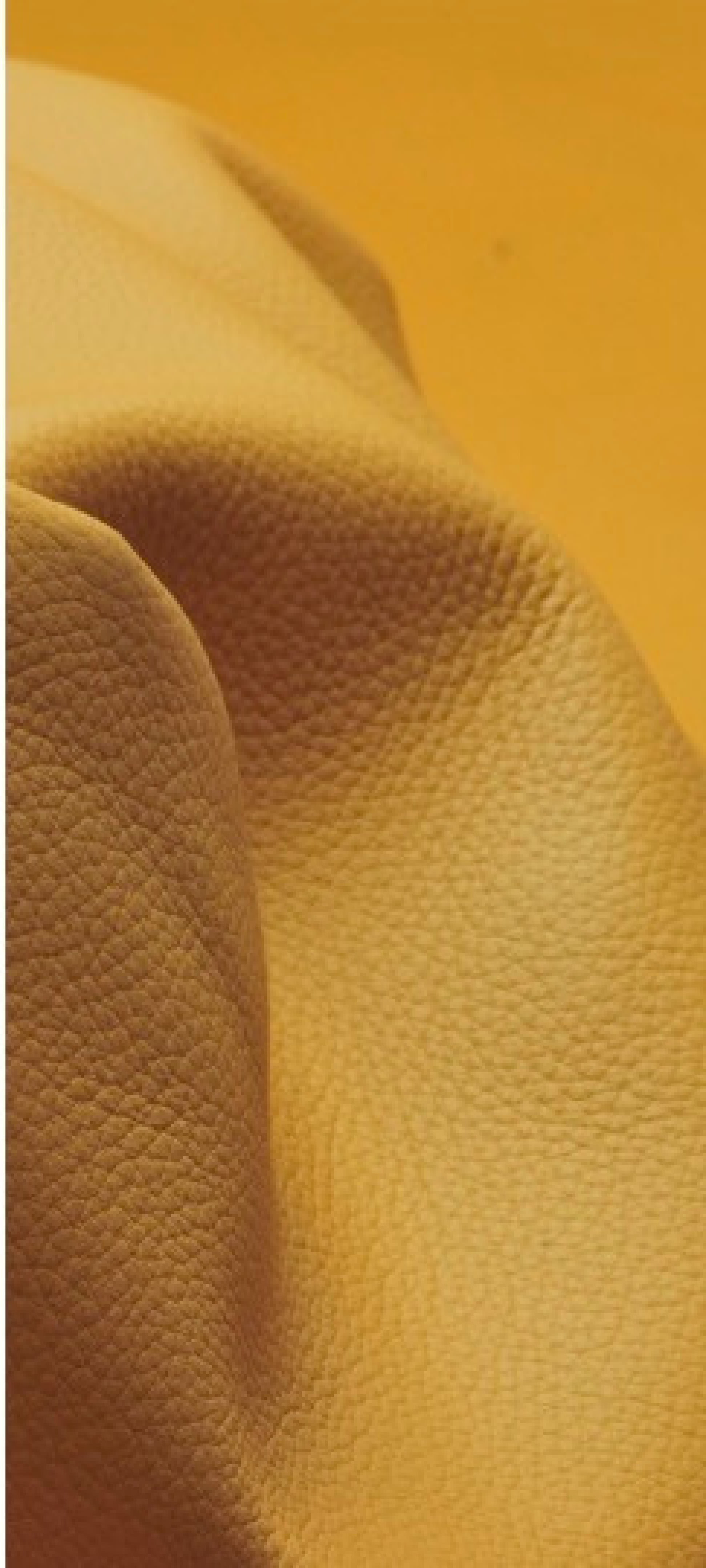
Appearance	: White liquid
Active Substance	: 37 – 39%
pH (Sol. 10%) / Charge	: 7.5 – 9.5 /Anionic
Water solubility	: Fully miscible
Storage	: 12 months in original well closed container

Characteristic and application

CODY PUR BIO 100 is an aliphatic polyether dispersion containing about 52% of renewable materials which forms a gloss, medium soft and elastic film.
CODY PUR BIO 100 is mainly added into bottoms and pre-bottoms to improve the coverage power and the physical performances, particularly flexes and adhesion.
The product has excellent heat, light and hydrolysis resistance.

Attention: Keep from freezing; preserve between 5 and 40°C-stir well before use

Edition: 09/2021



Products:

Technical data Sheet **CODY TOP BIO 200**

Modified renewable polyurethanes in water dispersion

Properties

Appearance	: Whitish fluid
Active Substance	: 15.5 – 17.5%
pH (Sol. 10%) / Charge	: 7.5 – 9.5/Anionic
Water solubility	: Miscible
Storage	: 12 months in original well closed container

Characteristic and application

CODY TOP BIO 200 is a gloss water-based topcoat containing about 60% of renewable materials particularly developed for upholstery and leather goods articles. It forms a gloss and medium soft film with slightly rubbery and silky and feel.

CODY TOP BIO 200 has good dry and wet rub fastness and excellent flexibility.

It can be used alone or in combination with other matt topcoats.

We suggest its application by spraying after the addition of one of our crosslinkers.

The maximum gloss is obtained with polyaziridine crosslinker.

The product has excellent heat, light and hydrolysis resistance.

Attention: Keep from freezing; preserve between 5 and 40°C-stir well before use

Edition: 09/2021

	RS	% rinnovabilità / BIO
Rexon-Brill H 612 = Cody bind 723	13%	85,50%
Rexon-Brill H 621 = Cody Bind 732	13%	92%
Rexon-Brill H 630 = Cody Bind 741	15%	70%
Rexon-Brill H 673 = Cody Bind 784	20%	70%
Rexon-Brill H 697	12%	89%
Rexon-Brill H 699 = Cody Bind 700	10%	79,80%
Rexon-Brill HK 670 = Cody bind K 781	8%	95%
Rexon-Brill HK 680 = Cody Bind K 791	7%	75,00%
Smitpro 1128	8,50%	94%
Smitpro K 1170	13%	60%
LA 5209	12,50%	75%
LA 5269	21%	22,80%
LA 5330	9,50%	94%
LA 5368	11,50%	60,80%
LC A 77	50%	90%
LC 5340	16,50%	67%
LV 5347 conc	19%	20%
LC 5383	15%	22%
LC 5384	18,50%	83,50%
LC 5400	23%	25%
LV 5337	10%	88%
LV 5342	20,50%	46,80%
LV 5633	40%	87,50%
LV 5670	21,50%	32%
LV 5667	17,50%	86%
LV 5765	25%	87%
Dukoil PL	100%	40%
Dukoil WW	100%	72,90%
Kemitol K 918 = Cody K 1029	100%	100%
Kemitol K 923 = Cody Oil 1034	100%	50%
Kemitol K 950	50%	76,60%

Smitoil 1102	58%	71,50%		
SMITOIL 1115	100%	97,50%		
Smitoil N 1101 = Cody Oil N 2212	45%	75%		
CODY Soft 2111	28%	66%		
Cody Wax 495	20%	99%		
Cody Wax K 2490 = Smitwax K 1363	13%	50%		
Rexon-Wax D 310 = Cody Wax 421	19%	73,50%		
Smitwax 1236	92,50%	48,60%		
SMITWAX 1411	16%	41%		
Snower X 900	23%	48%		
Cartex 100	89%	96,60%		
Bright Black LP	14%	78,50%		
Modifikator KE liquido	11,50%	53,50%		
Modifikator TC	8,50%	48%		
Smitfeel 3196	28%	25%		
Smitfeel 3282 S	55%	100%		
BASEMASK N 5519	24%	33,25%		
SMITBASE K 5012	19%	61%		
SMITLAC NYW 7623	11%	45%		
Smitlac MW 7006 = Smitlac GW 7330	14%	75%		
Smitlac GW 7007 = E.Lack 2022F = E.Lack A	14%	85%		
Smitlac MW 7447	15%	69%		
Cody Pur BIO 100	38%	52%		
Cody Top BIO 200	15%	60%		

FINISHES PARTNERS

LWG CERTIFIED COMPANY THAT USES AN ECOLOGICAL GEL FOR THE FINAL FINISHING OF LEATHER WITH INNOVATIVE MACHINERY THAT SUPPORT THE POLICY OF ECO-SUSTAINABILITY

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TIPO: Linea rifinizione pelle
NUMERO DI SERIE: GOJ01602
ANNO DI FABBRICAZIONE: 2021

GE.MA.TA S.p.a., dichiara che la linea venduta a Bovat SRL matricola GOJ01602 composta da GREENSTARs-1800/3 e tunnel Stardrier-IR-1800 infrarosso con relative testate hanno le seguenti caratteristiche:

La macchina a rullo identifica l'alta tecnologia dello sviluppo di Gemata inglobando l'importante visione ecologica nel rispetto dell'ambiente, della salute e della sicurezza dei lavoratori.
Tale osmosi di tecnologia permette inoltre un saving elettrico grazie all'utilizzo di motoriduttori ad alta efficienza, un confort ergonomico nell'introduzione delle pelli grazie all'utilizzo di un spreader inclinato, congiuntamente sono predisposti dei sensori con tecnologia di radiofrequenza RFID per ridurre tendendo a zero la possibilità di infortuni.
Inoltre la macchina è composta da un collettore di elettrovalvole con cavo multipolare per ridurre il numero di cavi elettrici salvaguardando spazio nelle spalle della struttura e riducendo le ore di montaggio.
In linea con il principio sposato da Gemata le macchine a rullo riducono drasticamente l'impatto ambientale eliminando l'overspray abbattendo notevolmente gli sprechi di acqua e di prodotto.

I forni sono equipaggiati con tecnologia ad infrarosso, ogni comparto prevede pannelli di isolamento termico, set di lampade radianti ad onda media e regolazione indipendente della temperatura permettendo una regolazione fine.
Le lampade IR sono controllate tramite software che ne permette il funzionamento in modalità modulare al fine di ottenere un notevole risparmio energetico, inoltre è presente una funzionalità green stand-by, questa opzione permette, in modalità di non lavoro, alle lampade di abbassare la propria energia entrando in risparmio energetico per poi essere risvegliate tramite un apposito pulsante per riprendere il lavoro. Il connubio della Greenstars con i forni IR permettono un risultato qualitativo ottimale rispettando l'ambiente e mantenendo un equilibrio naturale considerevole.

Trissino, 30/05/2022 GE.MA.TA. S.p.A.

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SCHEDA TECNICA COMPONENTE / COMPONENT DATA SHEET

RAGIONESOCALE /COMPANY NAME	FORMEIDEE SRL				
ARTICOLO / ITEM	Etichetta tessuta "SORRY I'M DIFFERENT" – HD MM.35X35 + PIEGHE LATERALI				
CODICE CLIENTE / CUSTOMER CODE					
CLIENTE / CUSTOMER					
STAGIONE / SEASON					
COMPOSIZIONE / COMPOSITION	100% POLIESTERE RICICLATO				
PESO / WEIGHT					
PAESE ORIGINE / COUNTRY OF ORIGIN	ITALIA				
ISTRUZIONI LAVAGGIO / CARE INSTRUCTIONS (INSERIRE A FIANCO I VOSTRI SIMBOLI CORRETTI / INSERT HERE ON THE SIDE YOUR SYMBOLS CORRECTED)	Lavaggio ad acqua / Water Washing 40	Candeggio / Bleaching	Asciugatura / Tumble drying	Lavaggio a secco / Dry clearing	Stiro / Ironing
LIMITI DI UTILIZZO / LIMITATIONS	TINTO CAPO /GARMENT DYED SI X /NO STONE CON PIETRE / STONE WASHED SI/ NO X STONE CON ENZIMI / ENZIME WASHED SI/ NO X				
CONDIZIONII DI APPLICAZIONE/ CONDITIONS OF APPLICATION					
DATA/DATE 27/05/2022	TIMBRO FORMEIDEE s.r.l.				

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