



Security Paper

Surface treatment solutions & developments

Michele Mazzi



DISCLAIMER

While we believe that the information contained herein is accurate and reliable, it is presented without any guarantee or responsibility of any kind and does not constitute any representation or warranty of Lamberti SpA, either expressed or implied. Various factors may influence the performance of water based binders and chemical additives, including other materials used, formulation, and processing conditions, all of which must be considered by the user in producing or using the products. The user should not assume that the data indicated herein are exhaustive or complete or that no other measures may be necessary. The information provided herein does not relieve the user from the responsibility of conducting their own tests and experiments, and the user assumes all risks and liabilities (including, but not limited to, risks related to results, patent infringement, regulatory compliance, and health, safety, and environment) associated with the use of the products and/or information contained herein.



Agenda

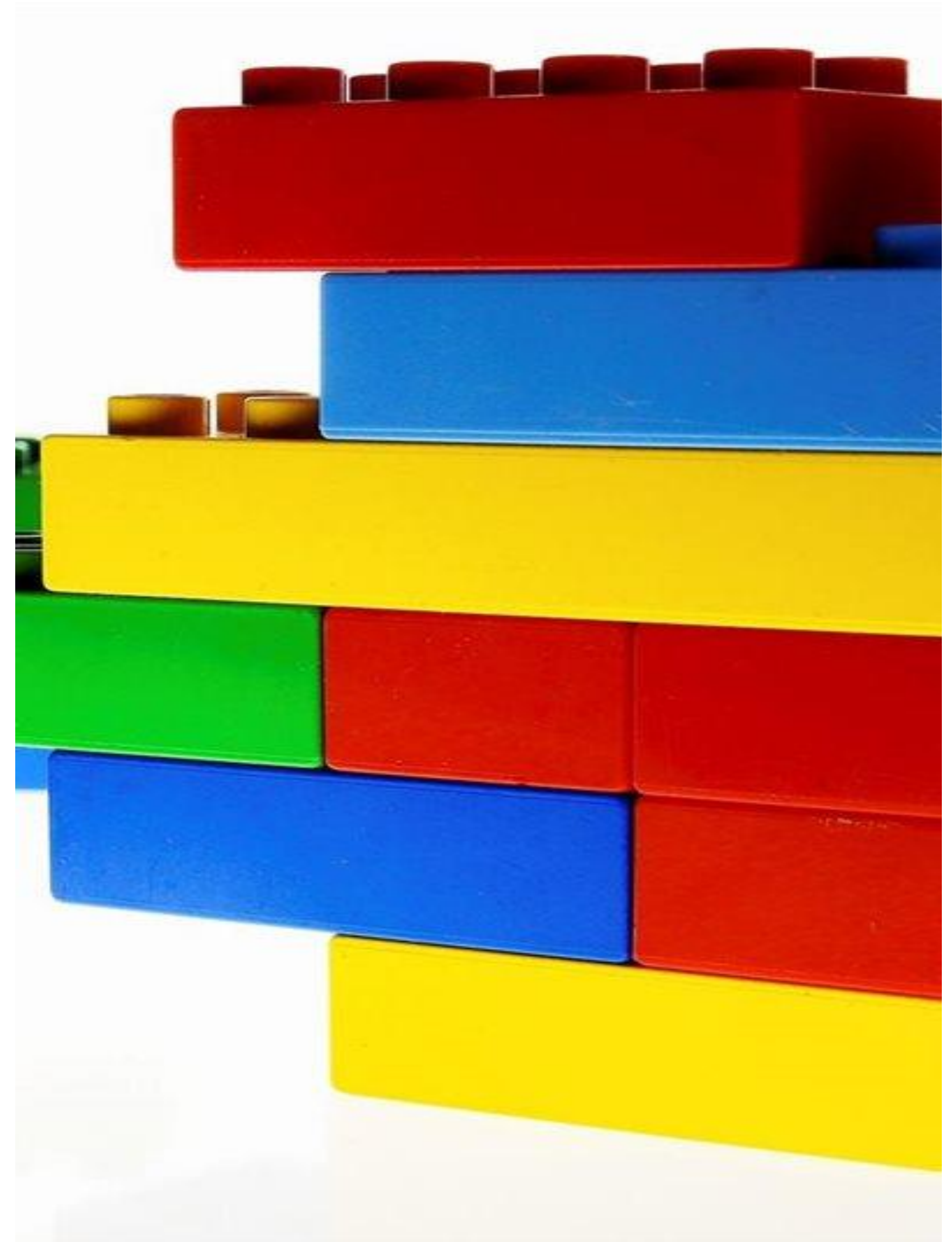
- **The story so far:** a brief summary on ESACOTE WB PUD for security paper
- **New developments:** a look to the future trends in security paper surface treatments

The story so far

A brief summary on ESACOTE WB PUD for security paper

ESACOTE: WB PUD for security paper surface treatment

- ✓ Binary colloidal system based on fully reacted polyurethanes
- ✓ Anionic, non ionic and cationic solutions
- ✓ Particle size distributions between 30 nm and 200 nm
- ✓ Highly flexible film with chemical and mechanical resistances
- ✓ Compliance with latest HSE requirements
- ✓ Low VOC and VOC free grades available



ESACOTE: Performing solutions for «durable» and «anti soil» banknotes paper

- ✓ Double folds
- ✓ Crumpling porosity
- ✓ Ink adhesion
- ✓ Water repellency
- ✓ Soil/Grease hold out
- ✓ Chemical resistances



ESACOTE: 2K formulation based on free -NCO for long lasting performance

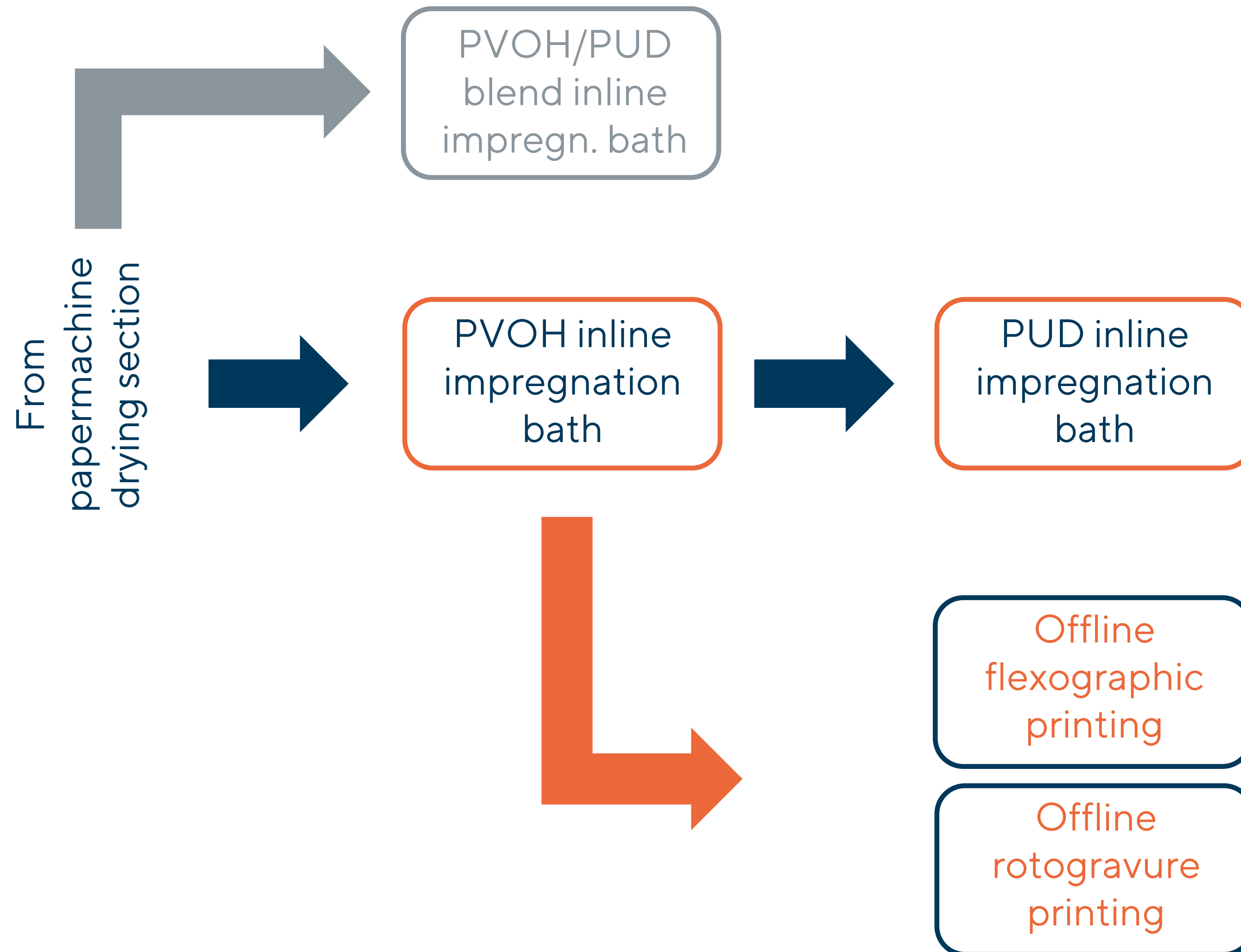
In order to enhance performance, it is important to add a crosslinker before application.

The crosslinking agent is added to WB PUD and it reacts with both carboxyl and hydroxyl groups.

Polyurea polymer is formed and inter penetrating network (IPN) takes place in the system leading to higher mechanical and chemical resistances while keeping great flexibility.

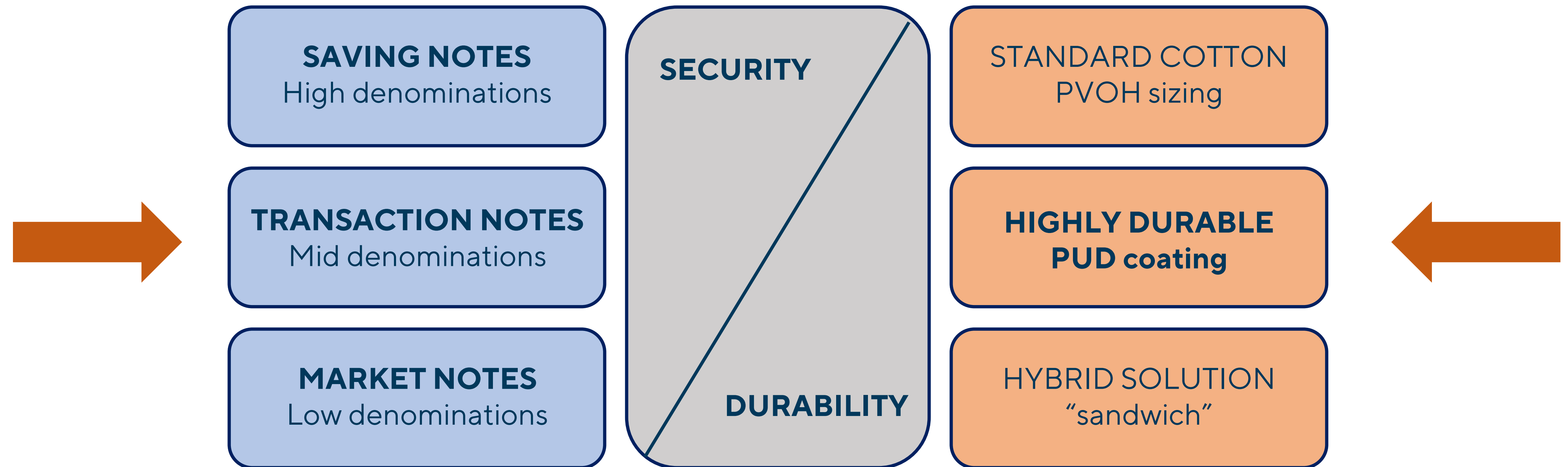


ESACOTE: application techniques



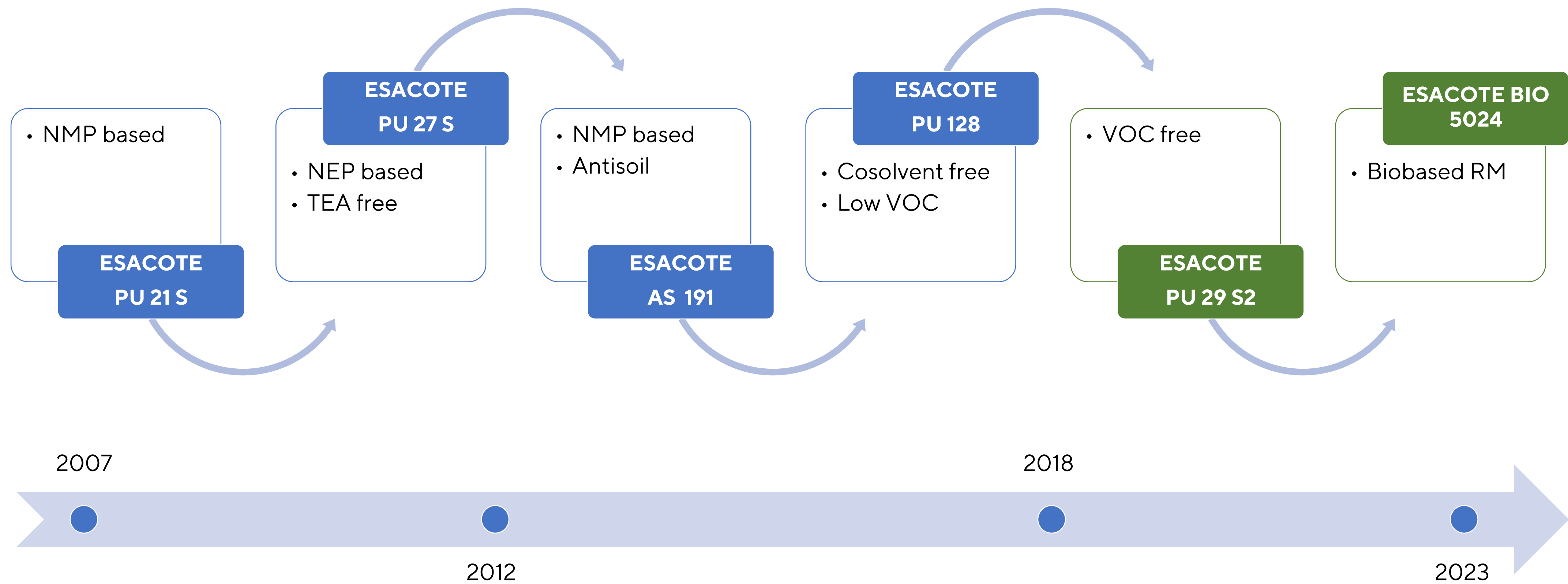
- State of the art application is based on an inline PVOH sizing for reducing paper porosity and an offline printing step usually performed by flexo or rotogravure
- An alternative applications method could be to have both steps inline using two different impregnation baths. In this way it is possible to achieve very good performance almost equal to offline application
- It is also possible to apply in one single step blending together PVOH and PUD, however this process will reduce final performance.

Banknotes segmentation





ESACOTE: the story so far



Albizzate R&D capabilities about evaluation of surface treatments for security paper

- ✓ Surface treatment application by rod coater
- ✓ COBB evaluation (water & oil)
- ✓ Dynamic contact angle measurement (water & oil)
- ✓ Ink adhesion test
- ✓ Blocking evaluation
- ✓ Chemical resistances



Product range

Water based PUD based for durable banknote paper



ESACOTE® PU 128

Chemical description

Polyurethane in aqueous dispersion.

Main use

ESACOTE® PU 128 is an anionic aliphatic polyurethane for surface treatment.

Typical values

Appearance at 20 °C: Opalescent liquid

pH (as received): 7.0 – 9.0

Viscosity (as received, Brookfield RVT @ 25 °C, 50 rpm, mPa·s): 200 max

Solid content (%): 31.0 – 33.0

Product properties

Film characteristics: transparent, medium soft and flexible.

Applications

ESACOTE® PU 128 could be used, in formulations or alone, as surface treatment to improve mechanical and physical properties of paper.

Storage and handling

ESACOTE® PU 128 must be stored at room temperature and protected from frost. We recommend to store it between 10° C and 35° C.

If exposed to temperature below 5°C the product is damaged and need to be disposed.

Shelf life: 12 months from the production date.

Packaging

120 kg drums

1000 kg one way container

Material safety

The Safety Data Sheet must be observed. It contains all relevant information about classification, labelling, transport, storage, handling and toxicology.

ESACOTE® PU 29 S2

Chemical description

Polyurethane in aqueous dispersion.

Main use

ESACOTE® PU 29 S2 is an anionic aliphatic polyurethane for surface treatment.

Typical values

Appearance at 20 °C: Liquid emulsion

Colour: milky

pH (as received): 7.0 – 9.0

Viscosity (as received, Brookfield RVT @ 25 °C, 100 rpm, mPa·s): 100 max

Solid content (%): 29.0 – 31.0

Product properties

Film characteristics: transparent, medium soft and flexible. Amine and solvent free.

Applications

ESACOTE® PU 29 S2 could be used, in formulations or alone, as surface treatment to improve mechanical and physical properties of paper.

Storage and handling

ESACOTE® PU 29 S2 must be stored at room temperature and protected from frost. We recommend to store it between 10° C and 35° C.

If exposed to temperature below 5°C the product is damaged and need to be disposed.

Shelf life: 12 months from the production date.

Packaging

120 kg drums

1000 kg one way container

Material safety

The Safety Data Sheet must be observed. It contains all relevant information about classification, labelling, transport, storage, handling and toxicology.

CROSSLINKER 08 LM

Chemical description

CROSSLINKER 08 LM is a water dispersable aliphatic poly-isocyanate based product.

Main use

CROSSLINKER 08 LM can be used as cross-linking agent for acrylic emulsions and polyurethane dispersions.

Typical values

Appearance at 25 °C:	transparent liquid
% NCO content on supplied product:	10.4 – 12.4
Viscosity (cPs) (Brookfield RVT @ 25 °C, 50 rpm spindle 3)	< 700
Solid content, %:	69.0-71.0
Free HDI:	<1000 ppm

Product properties

Solvent content, % :	~ 30% Propylene Carbonate
Density, @ 25°C g/ml:	~ 1.1

Please contact our sales representatives for test methods details.

Storage and handling

CROSSLINKER 08 LM must be kept away from direct light, in closed containers, in dry conditions and at temperatures between +5 °C and +40°C. Since it reacts with humidity, it must be handled under nitrogen atmosphere if any repackaging is needed. If stored under these conditions, CROSSLINKER 08 LM is stable for 12 months after production date.

Packaging

CROSSLINKER 08 LM is available in 160 kg drums or 10 kg pails.

Material safety

Please consult the CROSSLINKER 08 LM safety data sheet before its use.

Regulatory information

In case compliance with specific regulations is required please contact our sales representatives.

New developments

Water based PUD based on renewable raw materials for durable banknote paper

WB PUD based on renewable raw materials

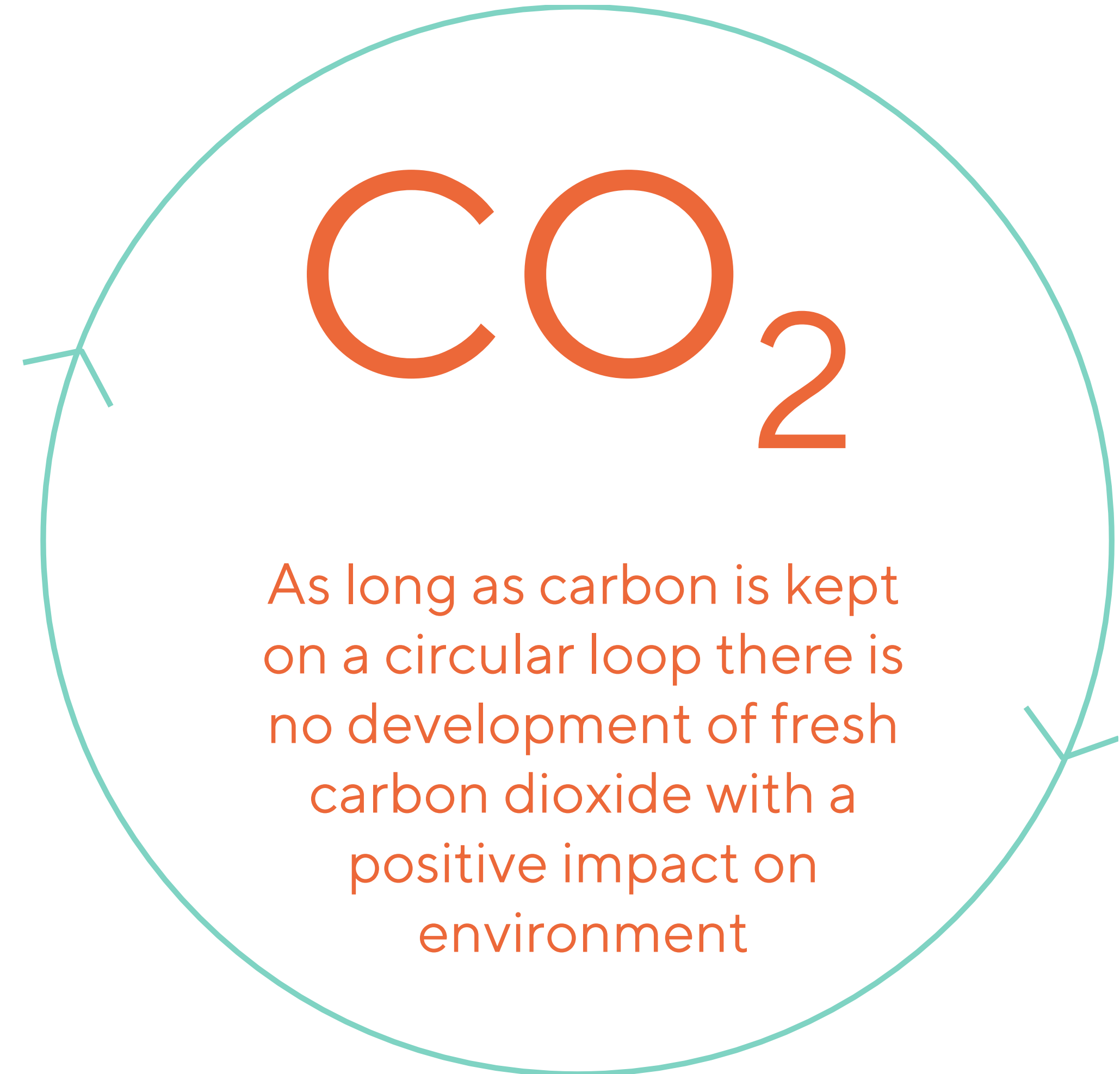
HIGHLY SUSTAINABLE COATINGS TREND

Sustainability nowadays is a real commitment that guides activities of several different industries. «Responsible and sustainable production patterns» and «climate actions» are some of the key targets of so called «2030 Agenda». In such scenario, developing an highly sustainable surface treatment to be applied over an highly sustainable substrate like paper has a very good alignment with aforementioned targets. That kind of surface treatment would also allow to increase the sustainability gap in comparison to polymer notes.



Sustainability challenge

The final goal is to replace materials based on fossil sources with alternative materials based on renewable resources and sustainable biomasses.



ESACOTE BIO: An overlook



HIGH CONCENTRATION OF RENEWABLE RM

- ✓ ASTM D6866
C radioactive isotope
measurement
- ✓ EN16785-2
mass balance based
on the polymer total
composition

TOP CLASS PERFORMANCE

- ✓ Flexibility
- ✓ Hydrolysis resistance
- ✓ Mechanical
performance

EASY TO USE

- ✓ Easily incorporated in
WB formulations
- ✓ Suitable for rotogravure,
flexo, film press and air
knife applications

GREEN CHEMISTRY

- ✓ No solvent inside
- ✓ Low VOC

Highly sustainable solutions

ESACOTE® PU 128

Chemical description

Polyurethane in aqueous dispersion.

Main use

ESACOTE® PU 128 is an anionic aliphatic polyurethane for surface treatment.

Typical values

Appearance at 20 °C: Opalescent liquid

pH (as recived): 7.0 – 9.0

Viscosity (as received, Brookfield RVT @ 25 °C, 50 rpm, mPa·s): 200 max

Solid content (%): 31.0 – 33.0

Product properties

Film characteristics: transparent, medium soft and flexible.

Applications

ESACOTE® PU 128 could be used, in formulations or alone, as surface treatment to improve mechanical and physical properties of paper.

Storage and handling

ESACOTE® PU 128 must be stored at room temperature and protected from frost. We recommend to store it between 10° C and 35° C.

If exposed to temperature below 5°C the product is damaged and need to be disposed.

Shelf life: 12 months from the production date.

Packaging

120 kg drums

1000 kg one way container

Material safety

The Safety Data Sheet must be observed. It contains all relevant information about classification, labelling, transport, storage, handling and toxicology.

ESACOTE® BIO 5024 development product (DP)



Chemical description

ESACOTE® BIO 5024 is an anionic waterborne dispersion of an aliphatic polyurethane based on polyether diols.

Main use

ESACOTE® BIO 5024 can be used as binder for clear and pigmented coatings providing:

- high gloss and clarity,
- mechanical and water resistance,
- good balance of elasticity and hardness.

Typical values

Visual Appearance at 25 °C: opalescent liquid

pH at 25°C 7.5-9.5

(on supplied product, ASTM E 70):

Viscosity (cPs) < 600

(Brookfield RVT @ 25 °C, 50 rpm spindle 2):

Solid content, %: 34.0-36.0

Product properties

Solvent content, %: 5.5% (DPGDME)

Density, g/ml ~1.04

Minimal film forming temperature, °C: ~0

Film aspect transparent, medium hard and flexible

Koenig Hardness (s) ~60

Please contact our sales representatives for test methods details.

Sustainability features

ESACOTE® BIO 5024 is made with raw materials from vegetal sources, obtained from plant-derived substances.

Biobased Carbon content C¹⁴/C_{total} according to ASTM D6866: **48 % ± 3**

Storage and handling

Suggested storage condition for ESACOTE® BIO 5024 is between +5°C and +35°C. Keep the product away from frost and direct light. If stored under these conditions, ESACOTE® BIO 5024 is stable for 12 months after production date.

Packaging

ESACOTE® BIO 5024 is available in 120 kg drums or 1000 kg intermediate bulk containers.

Material safety

Please consult the safety data sheet of ESACOTE® BIO 5024 before its use.

Regulatory information

In case compliance with specific regulations is required please contact our sales representatives.

Highly sustainable solutions

ESACOTE BIO 5024 has been already tested on paper machine and it showed following results:

- Excellent runnability on paper machine
- Very good double folds
- Very good water hold out
- Excellent wet strenght
- Excellent crumpling porosity

Thank you



www.lamberti.com