BIOPOLYMER BASED ADDITIVES FOR PRINTING INKS

Sustainability and PFAS free waxes for printing inks

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CLARIANT

what is precious to you?

Planet – Setting out ambitious 2030 Sustainability Targets

SCIENCE-BASED CLIMATE TARGETS SET OUT ABSOLUTE REDUCTIONS IN GREENHOUSE GAS EMISSIONS*

- 54%

Scope 1, 2 &3 greenhouse gas emissions

SUSTAINABLE OPERATIONS TARGETS SET OUT INTENSITY REDUCTIONS FOR KEY ENVIRONMENTAL ASPECTS*

- 20

Water intake

- 25

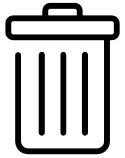
Waste water volume

100%

of sites in areas of high water stress with advanced water management

- 40%

Landfilled non-hazardous waste



- 25%

Hazardous waste

- 35%

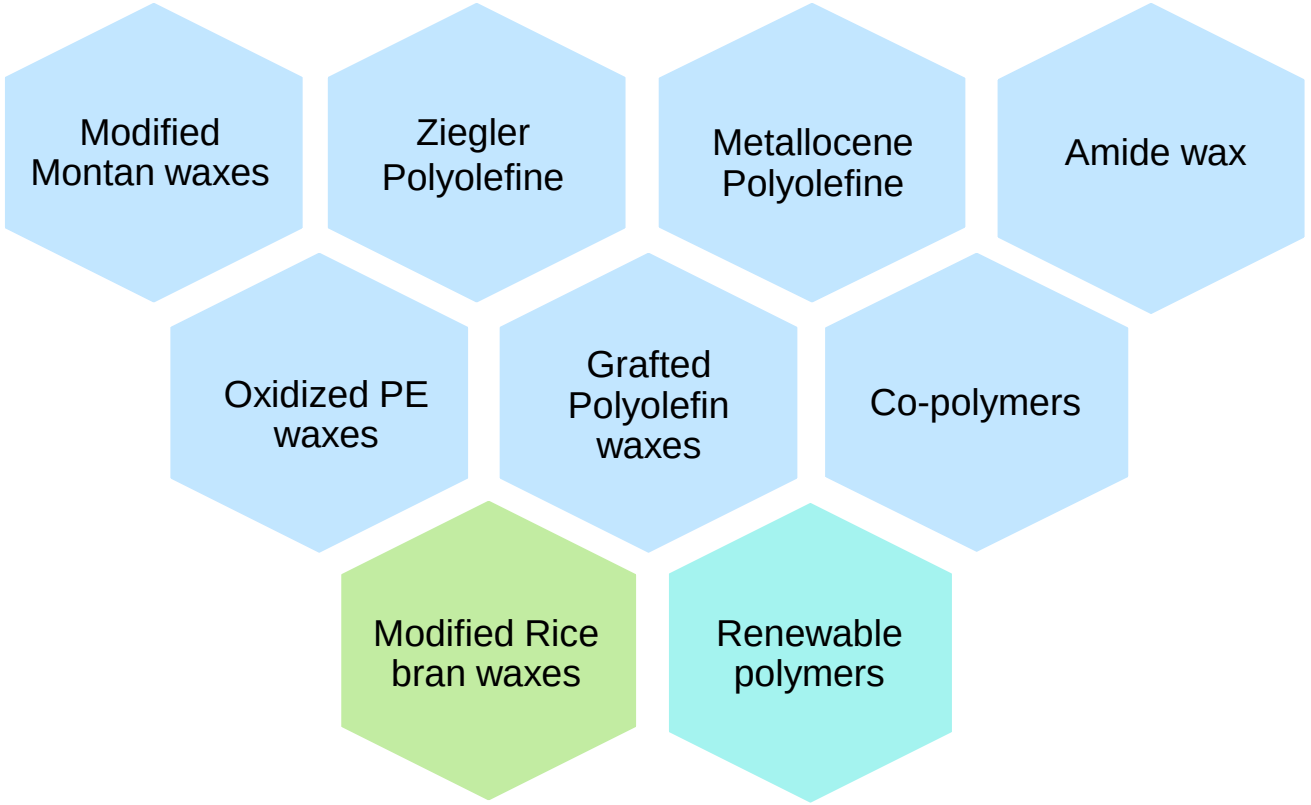
Nitrogen oxide (NOx) emissions

* From 2019 to 2030

Widely diversified wax portfolio

– Overview

Clariant offers a widely diversified portfolio of waxes



- Granules
- Flakes
- Coarse Powder

- Micronized waxes for direct application (5 - 30 µm)

What is Ceridust®?

- Micronized powder based on:
  - PE / oxidized PE wax, PP wax, AMIDE wax, FT wax, Montan wax, PTFE or specialty waxes including also renewable resources
- Mean particle sizes between 5 and 30µm

Both chemical structure and particle size play decisive roles in their use and performance

Ceridust – performance in coatings & inks

Sustainable wax additives

– Strategic pillars

Sustainability designators help customers and value chains identify products and solutions with key sustainability benefits

Clariant sustainability designators give clear orientation by highlighting sustainability with trade name suffixes.
Additives' portfolio carrying sustainability designators:

Renewable Feedstock **TERRA**

Products with significant (**at least 50% RCI**) content based on renewable resources with a mass-balance certification or real renewable content:

Licocene PP 6102 Terra
Licocene PE 4201 Terra
Licocene PP 1602 Terra
Licocene PP 2502 Terra
Licocene PPA 330 Terra

Natural Ingredients **VITA**

Products from **natural origin** with real renewable content (**at least 98% RCI**):

Renewable based crude waxes

Licocare RBW 101 Vita
Licocare RBW 102 Vita
Licocare RBW 106 Vita
Licocare RBW 300 Vita
Licocare RBW 330 TP Vita
Licocare RBW 360 Vita

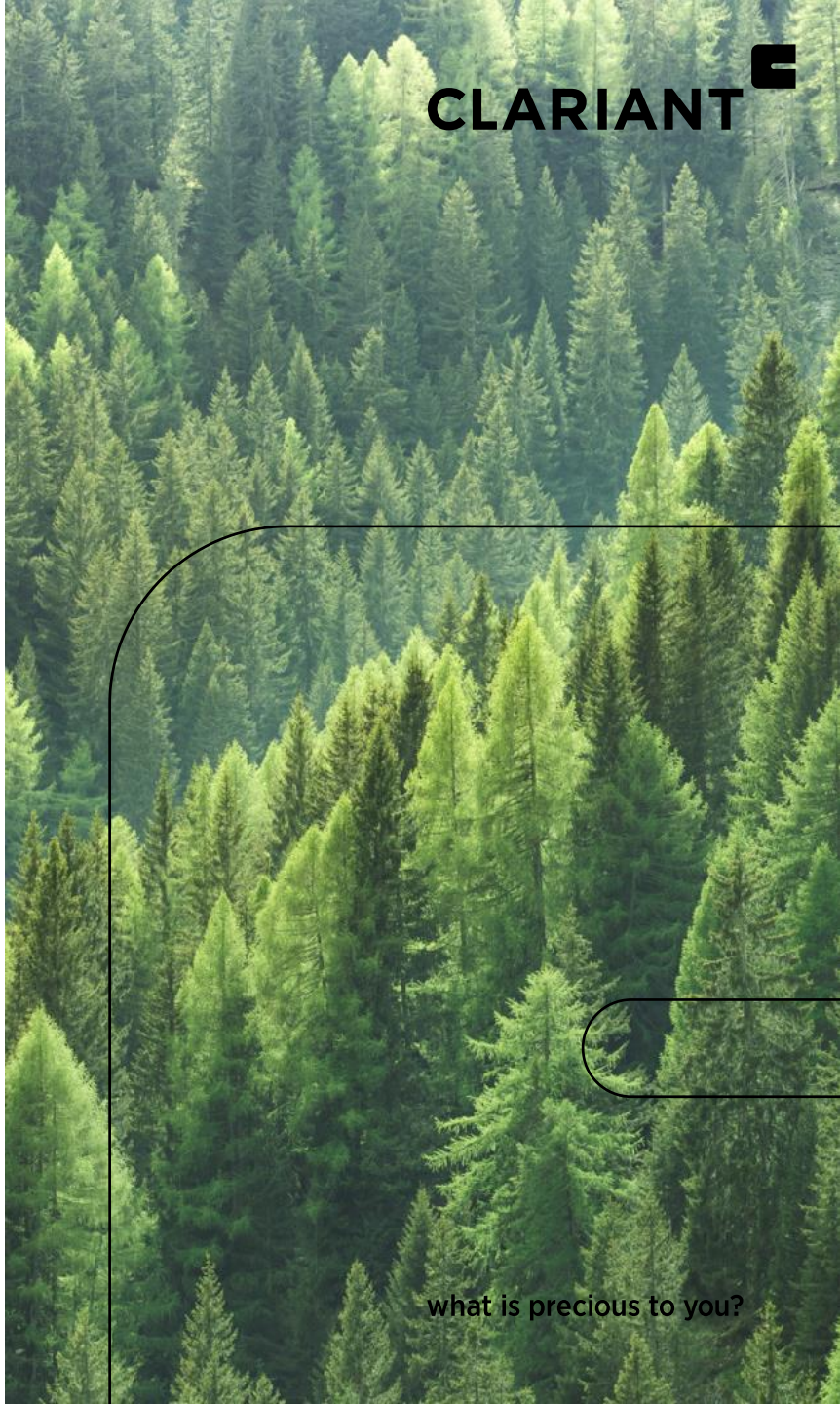
Renewable based micronized grades

Ceridust 1041 TP Vita
Ceridust 1060 Vita
Ceridust 8090 Vita
Ceridust 8091 Vita

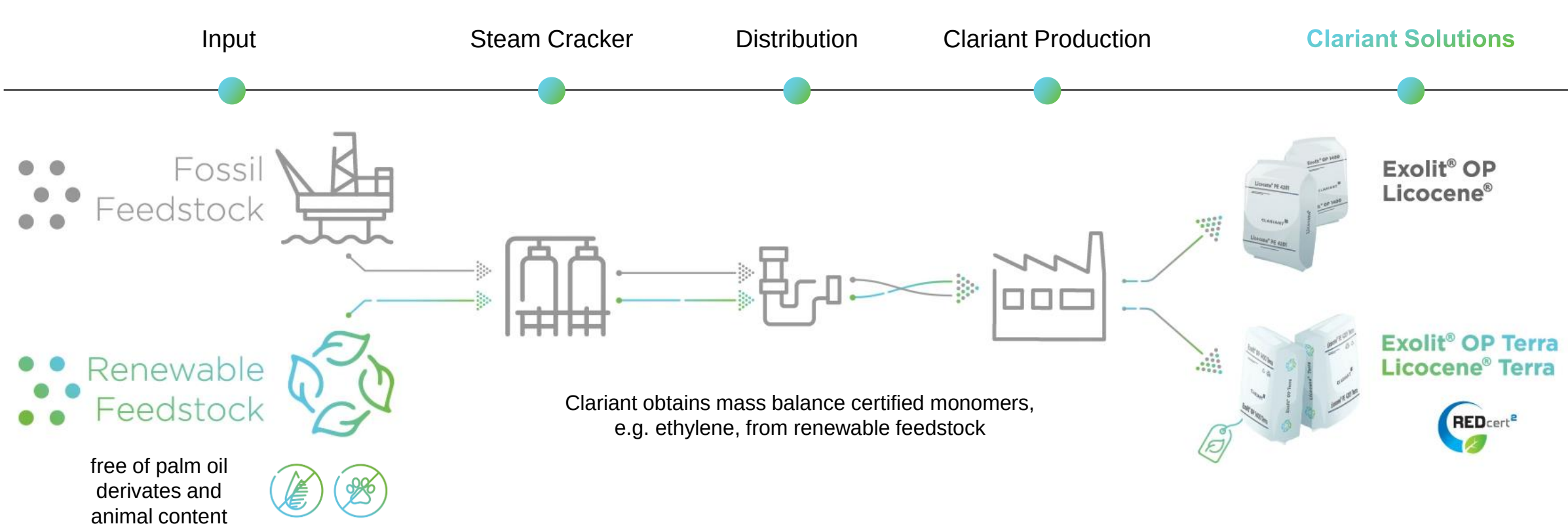
Minimum requirement for all designators: undergo a Portfolio Value Program screening with a sustainable or EcoTain outcome.

Polyolefine solutions derived from renewable hydrocarbons

– Licocene® Terra
– Ceridust® 3610 Terra, Ceridust® 3030 Terra



Traditional fossil infrastructure is used to produce Clariant's new mass balance certified Terra solutions



With the mass balance approach renewable based feedstock is allocated to specific end products using a third party verified certification method to ensure that input and output quantities along the value chain match. Clariant uses the RedCert2 mass balance certification scheme.

Very fine PE wax to replace PE/PTFE blends

Key feature: very fine ground PE wax based on Metallocene platform technology
Mean particle sizes 4,5µm to 6µm
Finer versions are possible
Higher dosage of PE wax can fulfill requirements like very low CoF of PTFE containing materials
Equal rub resistance achievable
Possible solution also for OPV (over print varnishes)

Food Contact Declaration:

- ✓ GB 9685- 2016
- ✓ NL-0647
- ✓ 21 CFR §175.300 & 21 CFR §175.320

Boosted rub resistance and slip effect with metallocene based polyethylene wax CERIDUST® 3030 AND CERIDUST® 3610

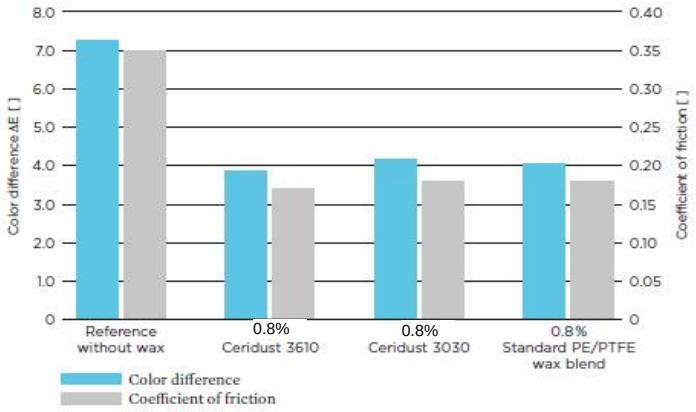
Ceridust 3030 and Ceridust 3610 are micronized additives made from metallocene based high density polyethylene wax. Both products generate excellent rub resistance in various kinds of printing inks and lower the coefficient of friction for high slip effect. With a medium particle size of 5 µm for Ceridust 3610 and 6 µm for Ceridust 3030, the very fine particles keep a high gloss level of the printed sheet and prevent pilling on rubber blankets.

Used in coatings like for packaging applications, both additives create excellent scratch resistance, slip effect and protection of the finished good. In several ink systems Ceridust 3030 and Ceridust 3610 can even be a PTFE free alternative to PE/PTFE wax blends and reach an equal performance at similar or slightly higher dosage level.

KEY PRODUCT FEATURES / YOUR BENEFITS

- Excellent rub resistance while keeping high gloss in printing inks
- Excellent slip properties
- Suitable for fast drying times
- Reduced pilling on rubber blankets
- Excellent scratch resistance properties in coatings
- Effective anti-blocking agent
- Easy dispersibility

SOLVENT BASED FLEXOGRAPHIC INK ON PAPER



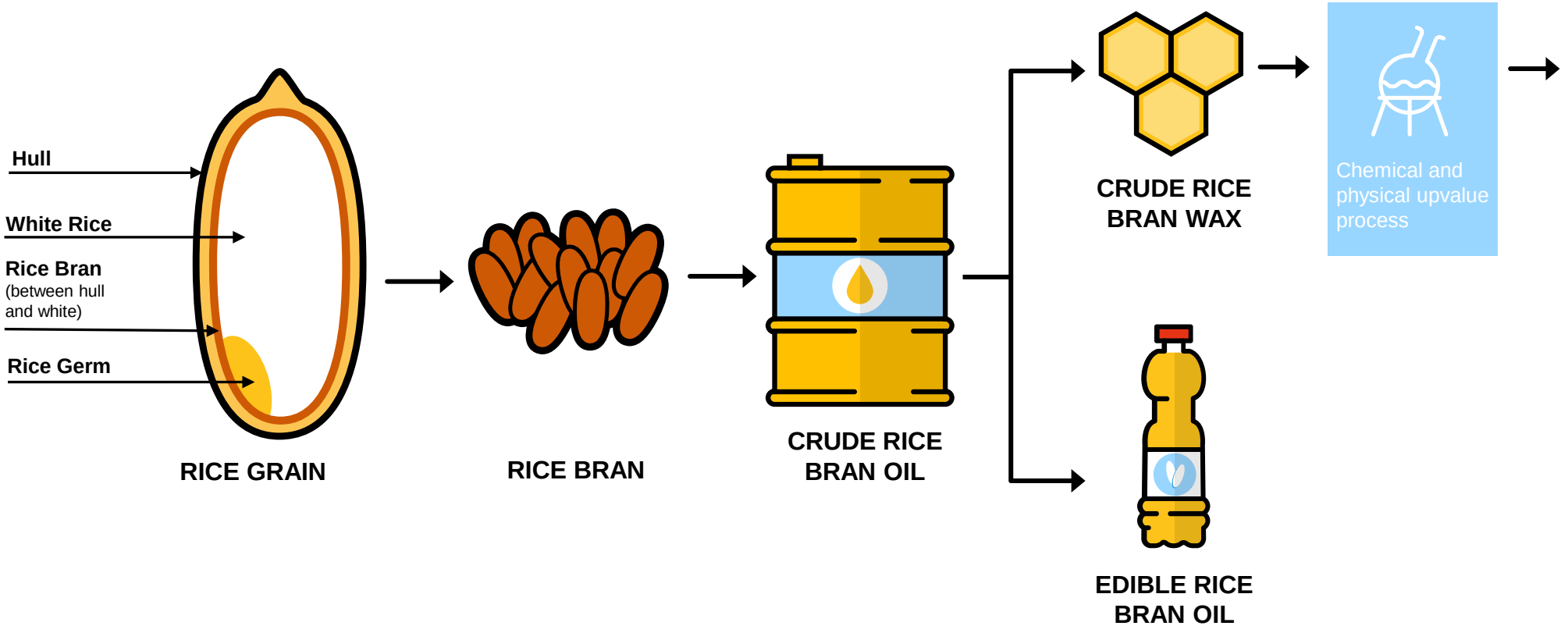
Example of solvent based flexographic ink on paper substrate, where Ceridust 3610 and Ceridust 3030 can even compete with a standard PE/PTFE wax blend. Tested after 24h; Reduced color transfer in rub test and lowered coefficient of friction.

Modified Rice Bran Wax
Combining sustainability and performance

– Ceridust® 1041 VITA

CLARIANT

We convert non-food-competing residues of rice bran oil production into high performing waxes



The **non-food-competing** crude rice bran wax is a by-product of the edible rice bran Oil production.

We **chemically & physically upvalue** crude rice bran wax into our high-performing **Licocare®** rice bran waxes to achieve the properties our customers need

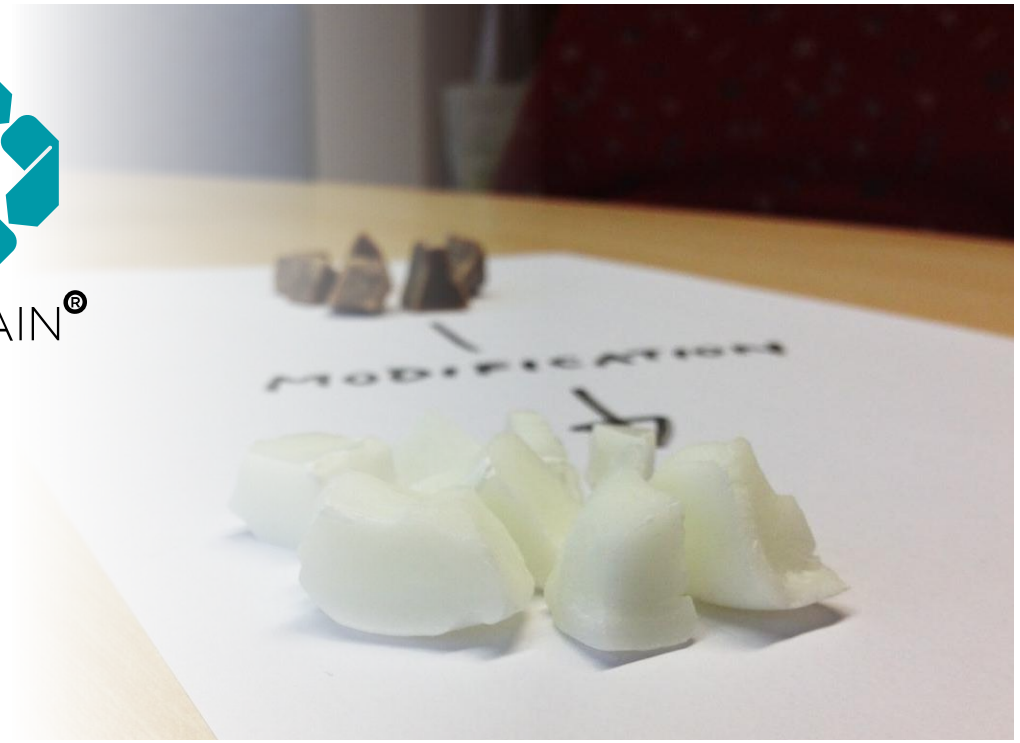
Addressing megatrends, anticipating legislation

CHALLENGE: MICROPLASTICS

SOLUTION: LICOCARE® RBW VITA & Ceridust 1041 VITA

Innovative multi-purpose wax additives

ECOTAIN®



Chemically and physically upgraded natural wax
Non-microplastic as it is not a polymer by definition

Excellent rub and scratch resistance as well as high slip effect both for water and solvent based coatings and inks

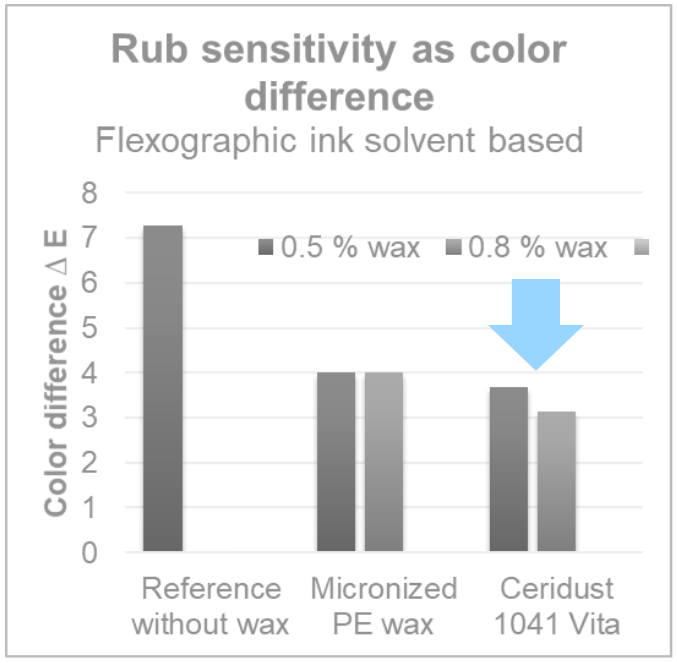
Externally recognized:

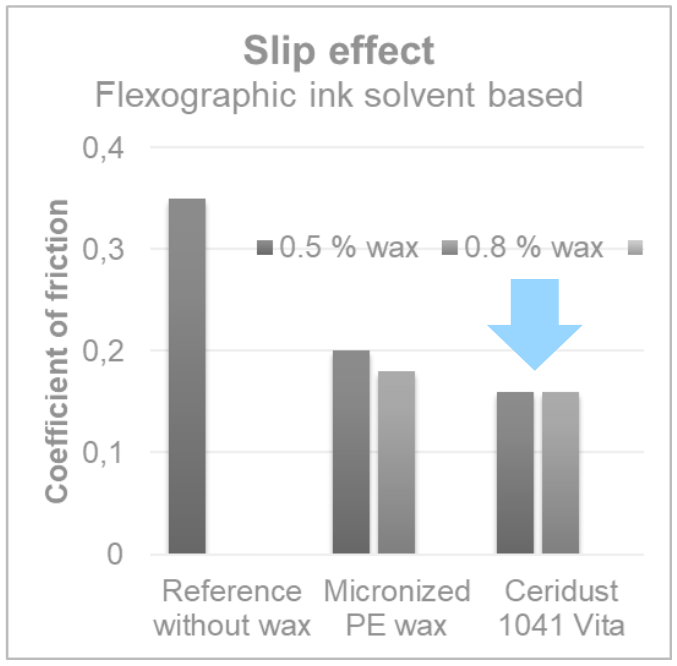
- »Best Sustainable Product« ICIS Innovation Award 2020 | Gold Level Material Health Certificate
- OK compost INDUSTRIAL / OK biodegradable SOIL label

Microplastic refers to polymers within the meaning of Article 3(5) of Regulation (EC) No. 1907/2006): Polymer means a substance consisting of molecules characterized by the sequence of one or more types of monomer units.

Ceridust® 1041 VITA
Sustainable wax for high rub resistance and slip effect

- is used in a dosage level of 0.2 – 1 %
- can be used in water / solvent based, pasty or solid printing ink systems
- Drop point 78°C, D50 ~ 8 µm





KEY PRODUCT FEATURES

- Excellent rub resistance in printing inks
- Excellent slip effect (low coefficient of friction)
- Easy dispersibility in aqueous & solvent based systems

Also available: Ceridust 1060 VITA (D50 ~ 12µm)

Easy dispersibility in water based systems

All renewable based Ceridust®
are suitable for water based systems

WAX CHEMISTRY

- Polarity
- Wettability in water

DENSITY

- Ceridust® 1060 Vita and Ceridust® 1041 Vita density very close to water

Wax compound with renewable biopolymer for outstanding rub resistance without PTFE

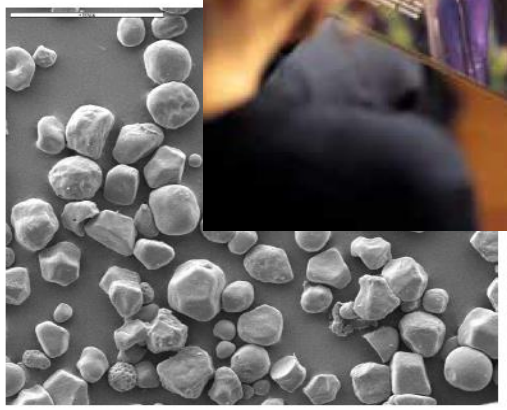
– Ceridust® 8330

Ceridust® 8330 – wax compound with biopolymer
Outstanding rub resistance

X	Water based
X	Solvent based
X	UV curing

Predominantly bio-based, micronized wax compound
d50 ~ 5.5µm, no drop point

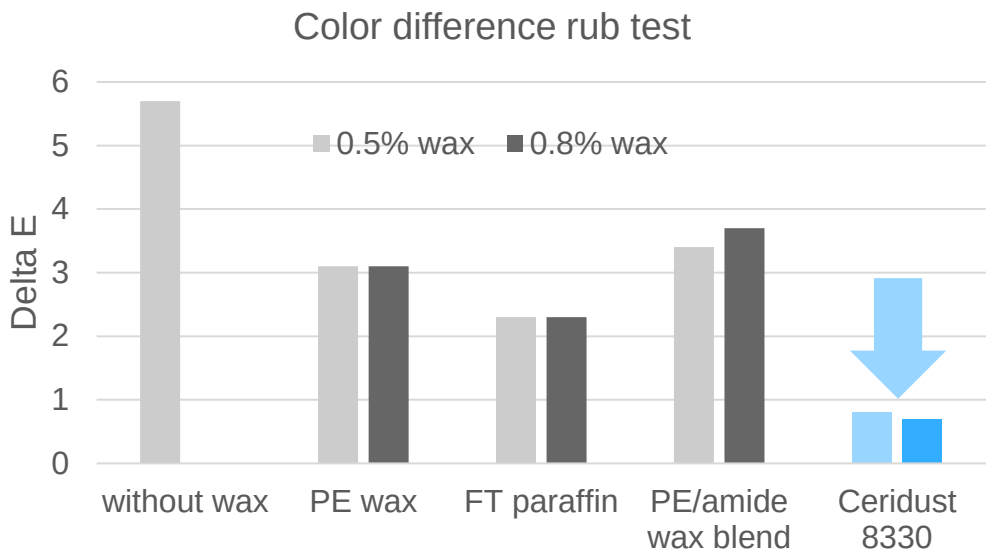
ECOTAIN®

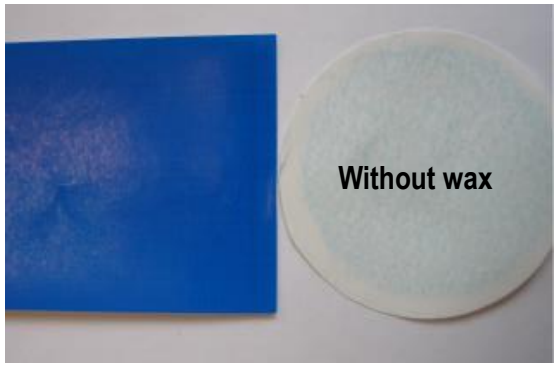


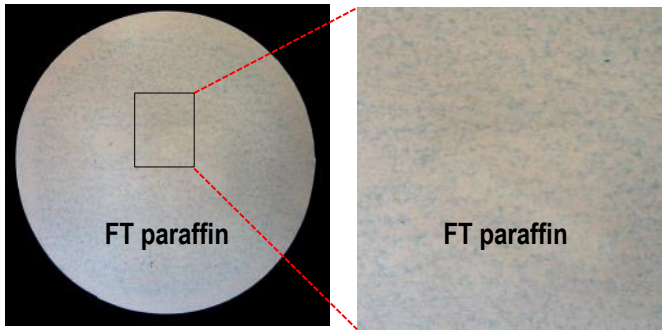
- Outstanding rub resistance for all kinds of inks even at low dosage levels
- Outperforming conventional waxes, can substitute PTFE
- Sustainable additive partly based on renewable resources
- Fine and narrow particle size distribution
- Possibility of dosage reduction compared to standard waxes
  E.g. 30-50% wax reduction in gravure or flexographic ink

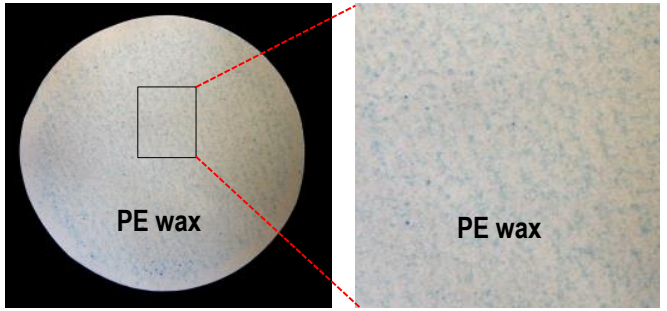
Ceridust® 8330 – Outstanding rub resistance

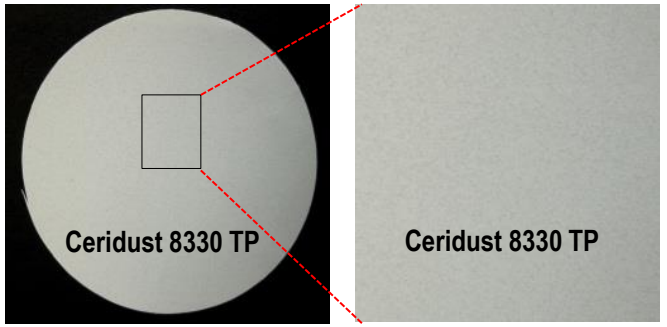
Example water based flexographic ink











Conditions: wax content 0.5 / 0,8%; 50 cycles after 24h; 6µm wet film; loading 48 g/cm^2

Ceridust® 8330 – Outstanding rub test for high mechanical resistance against PTFE containing materials

Main challenges

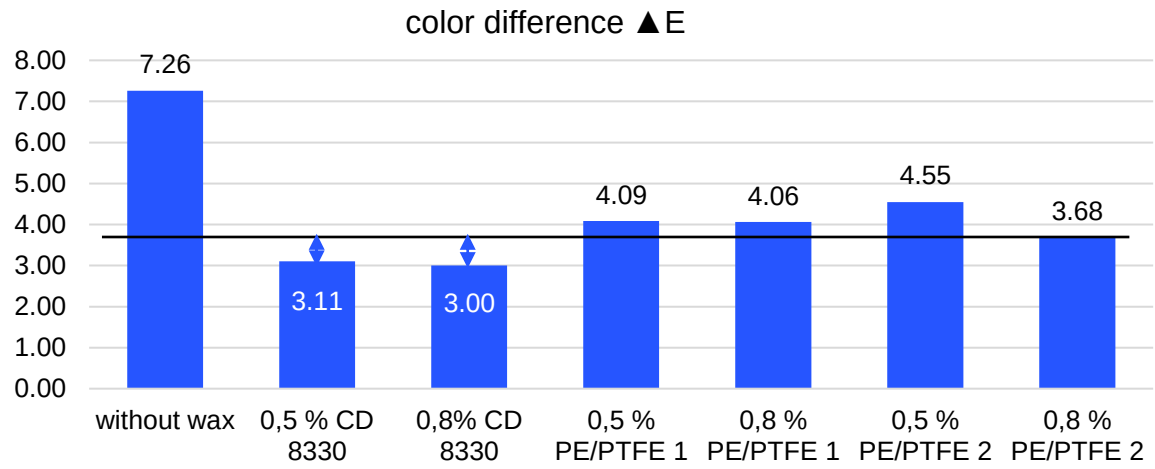
High mechanical resistance for longer lifetime circle:

– High mechanical resistance
– Keep color on paper or other substrates like PE films
– No color loss after mechanical stress
– Low E values

Benefits using Ceridust 8330

– Achieve high mechanical resistance – lowest color loss in comparison to PTFE containing additives
– Keep print image beautiful even at harsh conditions during production or in use phase

Color difference after 50 rub cycles

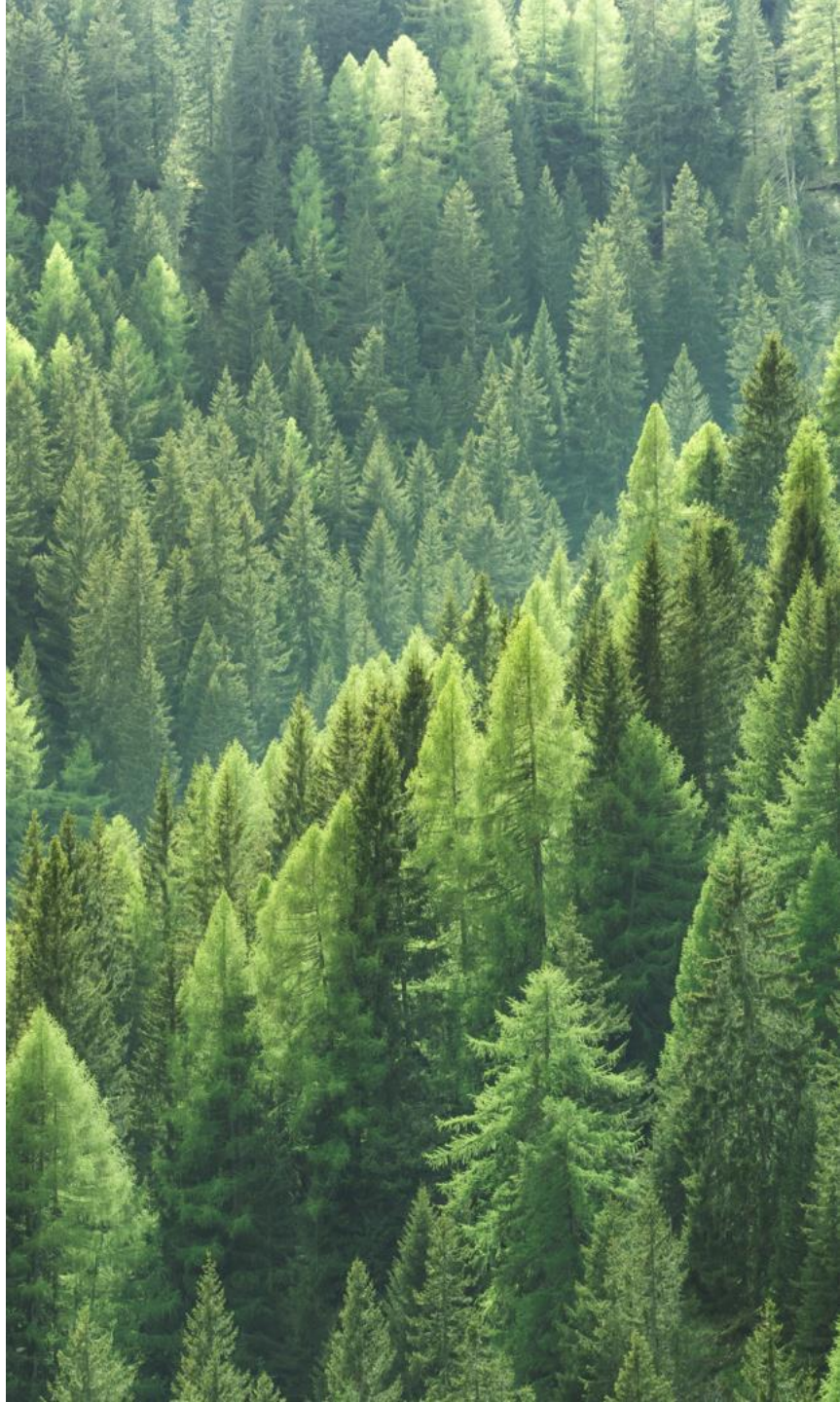


Lowest ▲E values

20% higher mechanical resistance to PTFE containing blend

Micronized renewable polymers for easy incorporation in water based inks

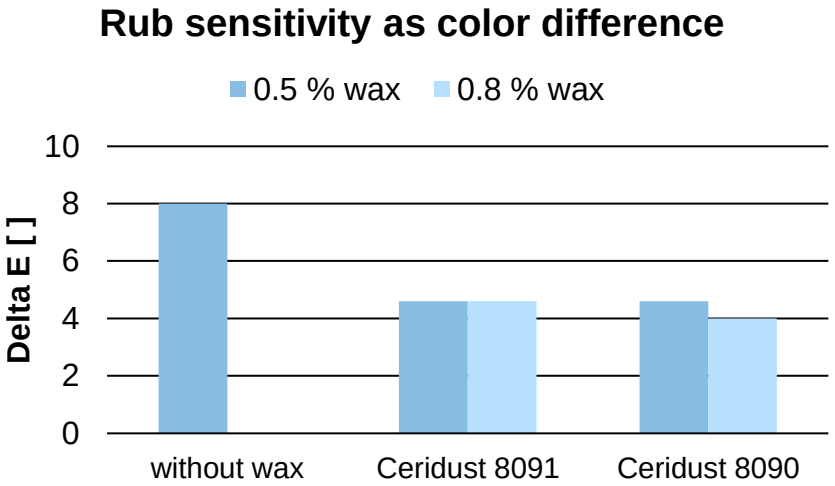
– Ceridust® 8090 VITA
– Ceridust® 8091 VITA

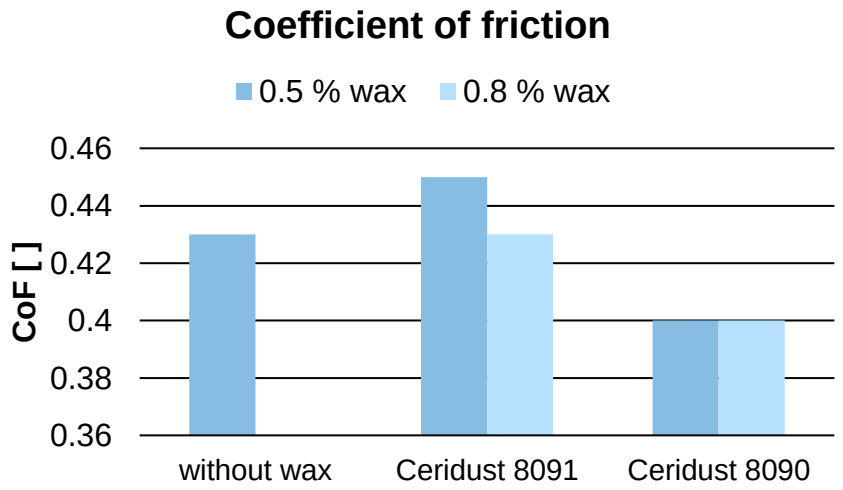


Ceridust® 8090 & 8091 VITA – renewable based additives for easy incorporation and improved rub resistance

ECOTAIN®

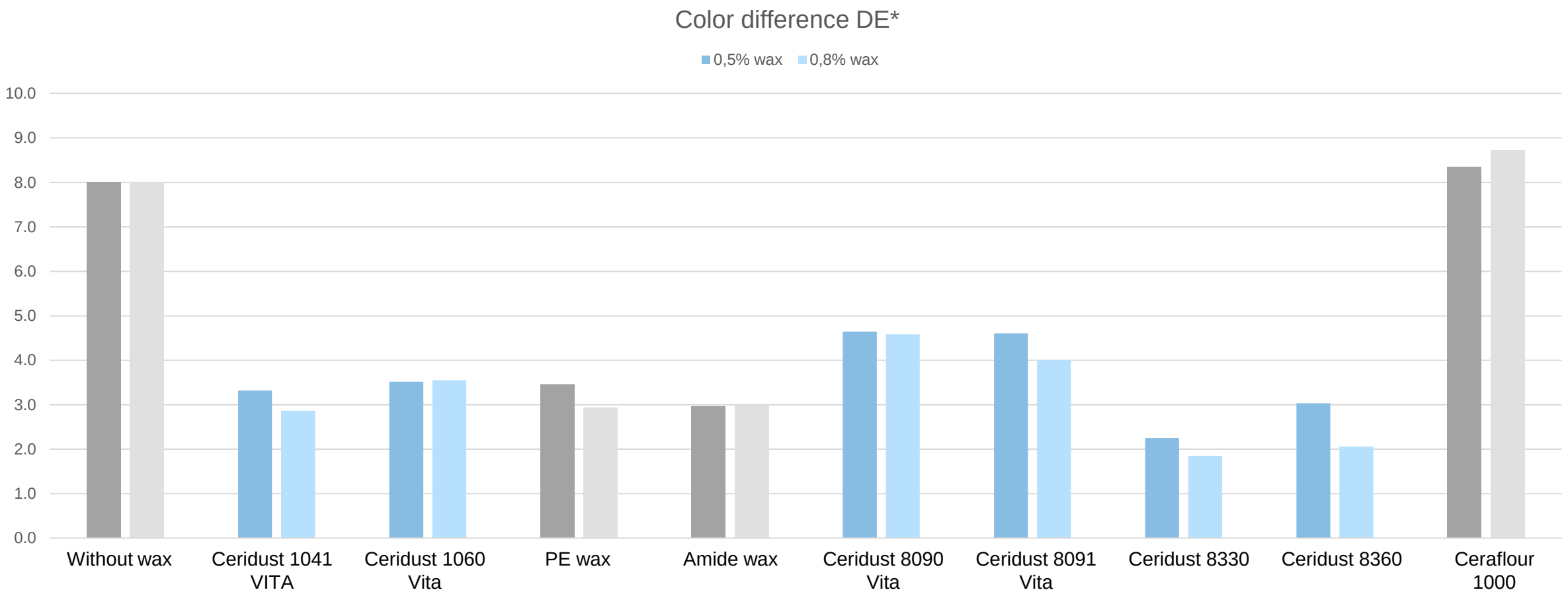
- 100 % renewable-based additive
- Very easy incorporation to water based systems
- Improved rub resistance performance
- Keeping high coefficient of friction
- D50 ~ 30 µm for Ceridust 8090 VITA
- D50 ~ 8 µm for Ceridust 8091 VITA
- Suitable for water based formulations





Performance in water based flexographic ink

Overview – performance of sustainable additives in water based flexographic ink



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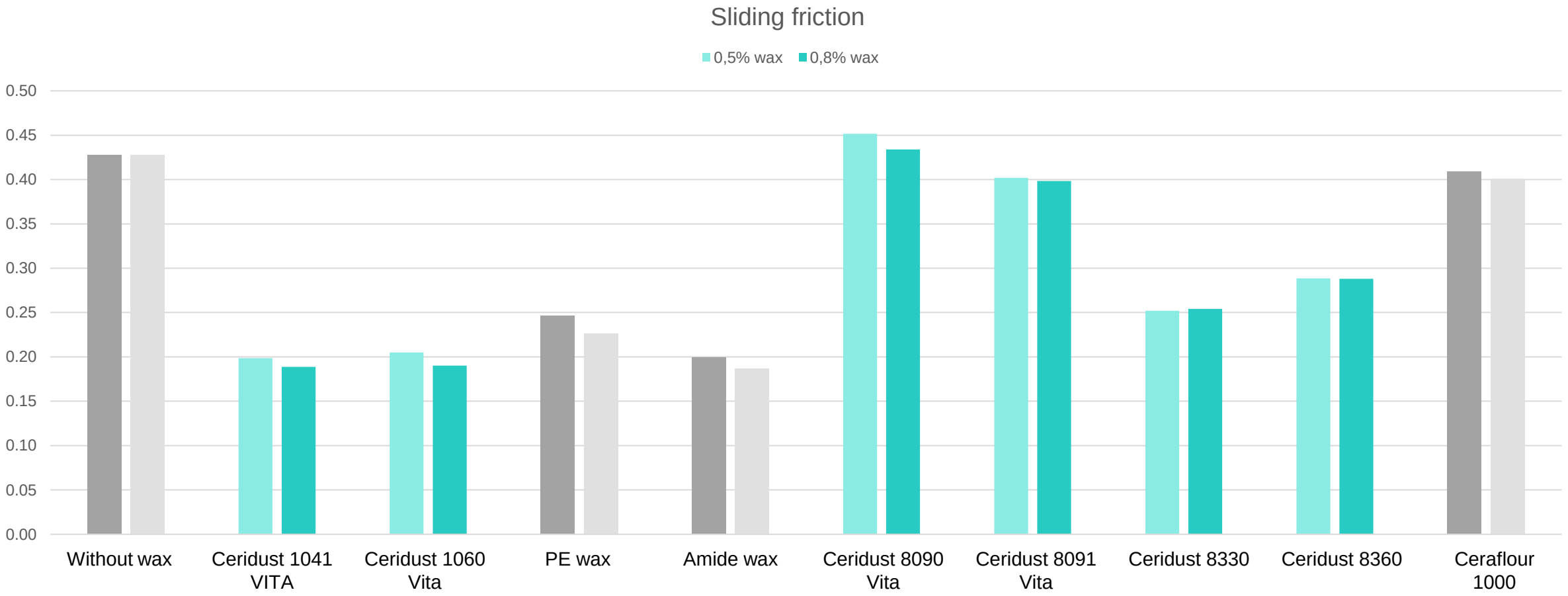

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