

FUNCTIONAL COATINGS AS ENABLER FOR CIRCULAR PACKAGING

Dr. Ralph Detsch

Chief Technology Officer SIEGWERK



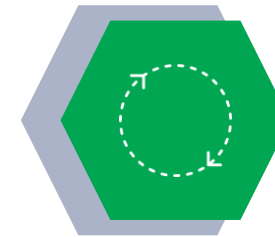
Inks & coatings – way more than what just meets the eye



**Communication
& decoration**



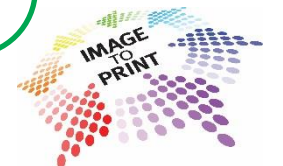
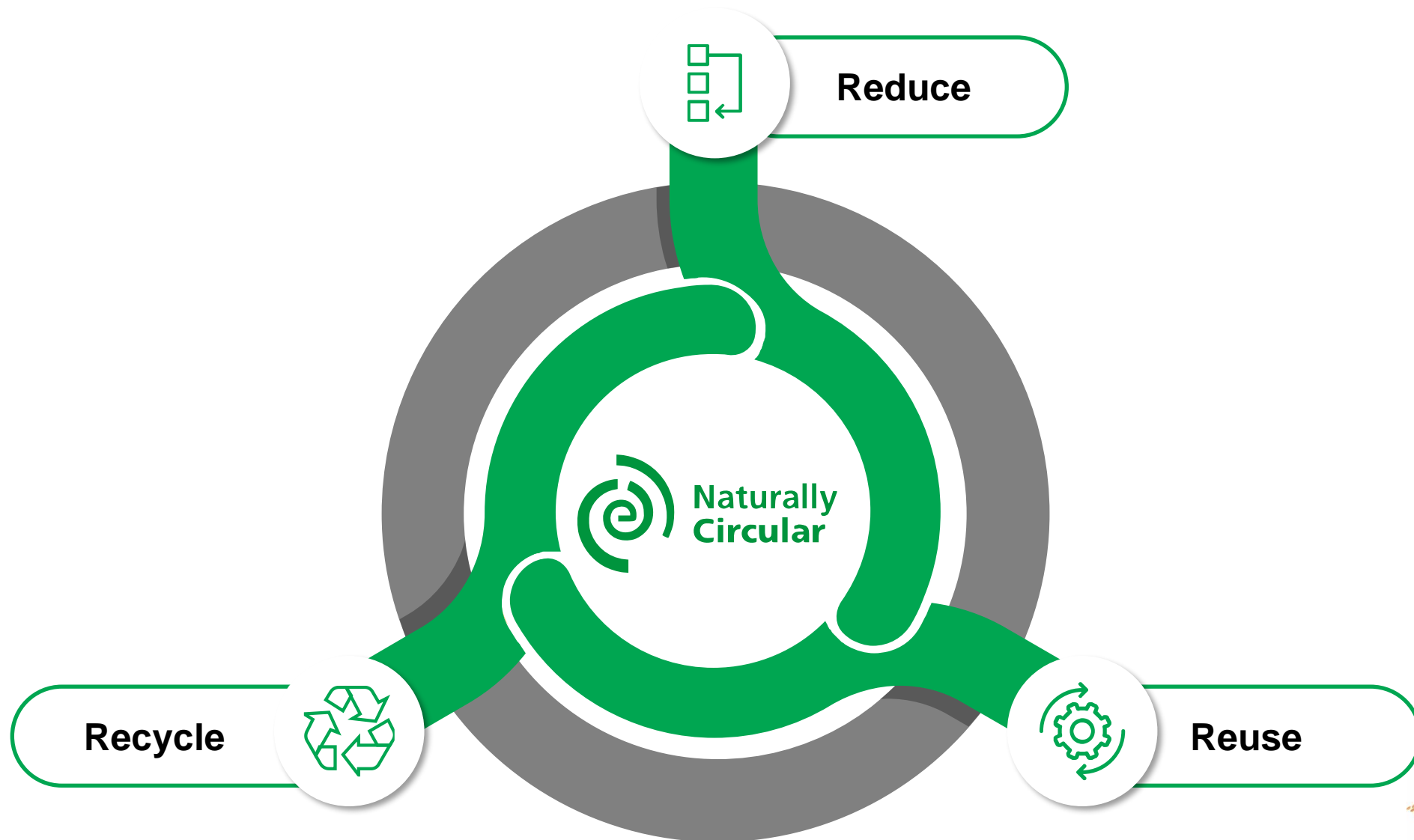
Functionality



Circularity



Creating a Circular Economy for packaging



Circular Solutions: Siegwerk is your partner for creating circularity



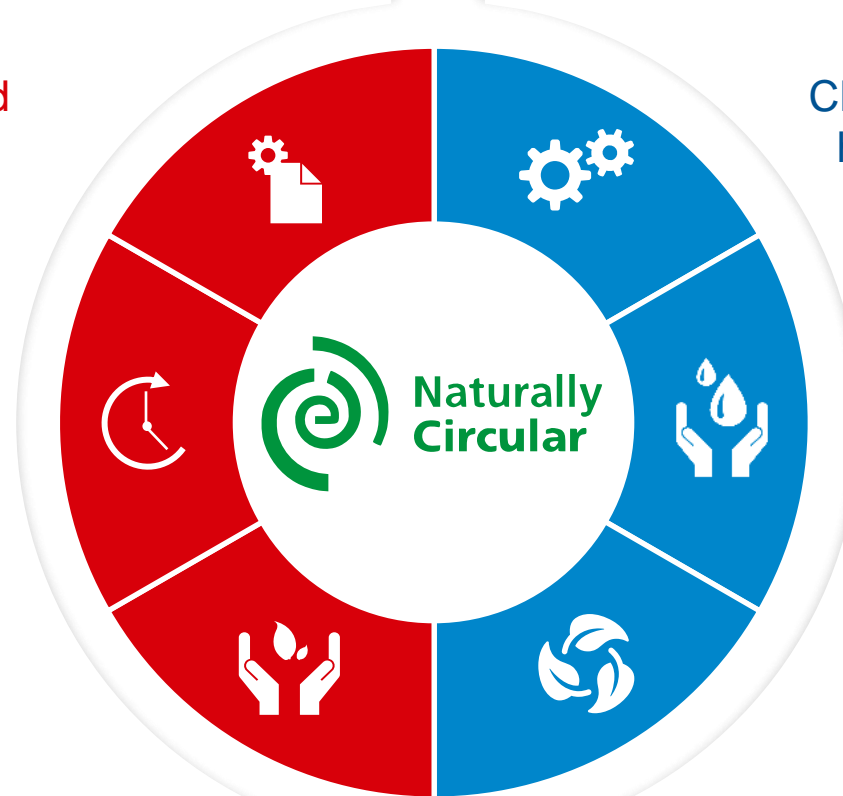
Design 4 Less <

Limiting the use of finite resources and exploring the re-use of packaging

Making paper into a recyclable high-function packaging option

Creating a future for re-use models

Supporting the ambition of bio-renewable packaging



Design 4 Recycling

Closing the loop for plastic waste through high quality recycle and its application

Making recyclable mono-plastic packaging a reality

Pushing for a system of de-inking for plastic packaging

Service compostable packaging – where sensible



Making recyclable mono-plastic packaging a reality

Solutions offered



Solutions for printed mono-material plastics

CE-ready ink systems for surface and reverse print



CIRKIT OxyBar

oxygen barrier properties comparable to extruded EVOH



CIRKIT ClearPrime

ensuring smooth deinking of laminated and difficult to deink surface printed structures



CIRKIT HeatGuard

protecting the film and print structure during sealing, filling and application



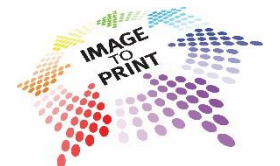
CIRKIT GreaseBar

grease barrier coating

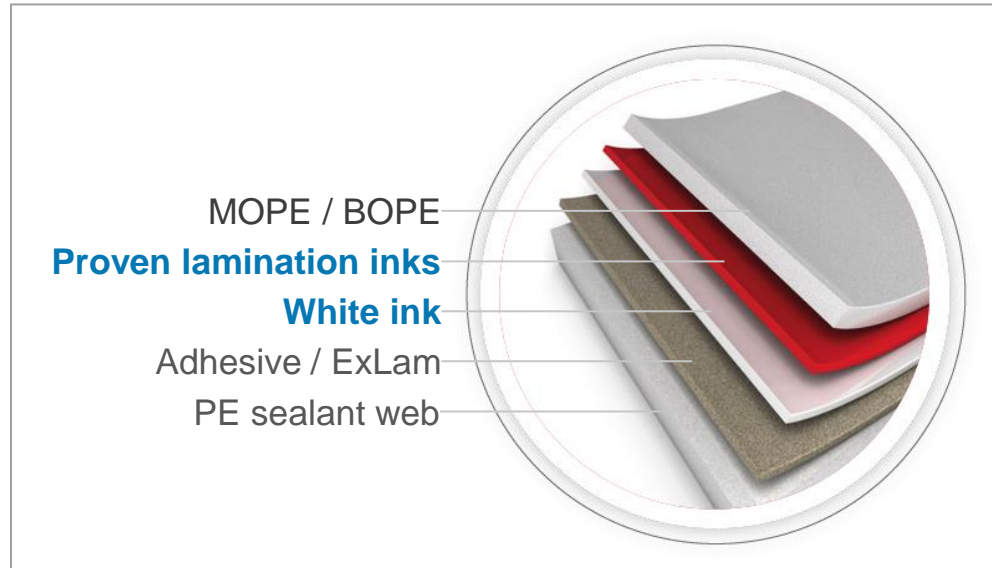


CIRKIT UVBar

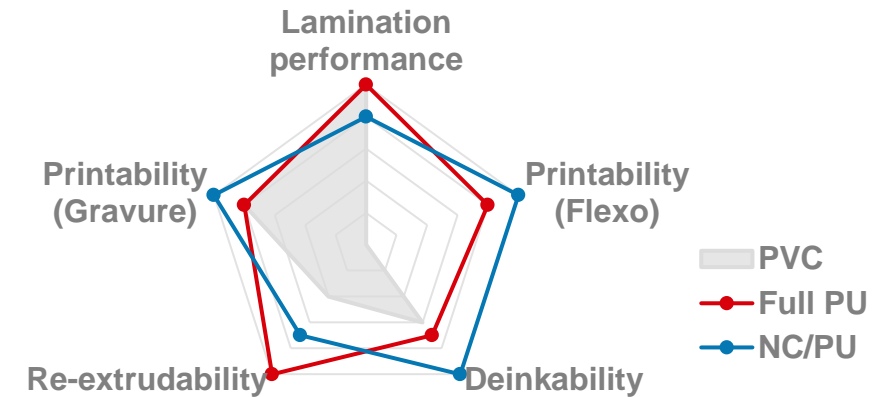
transparent lacquers protecting from UV-A and UV-B light



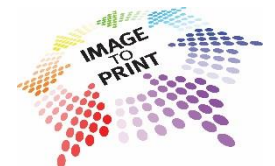
Siegwerk's next generation PVC-free inks ensure excellent printability, adhesion and bond strength with new mono-PE structures



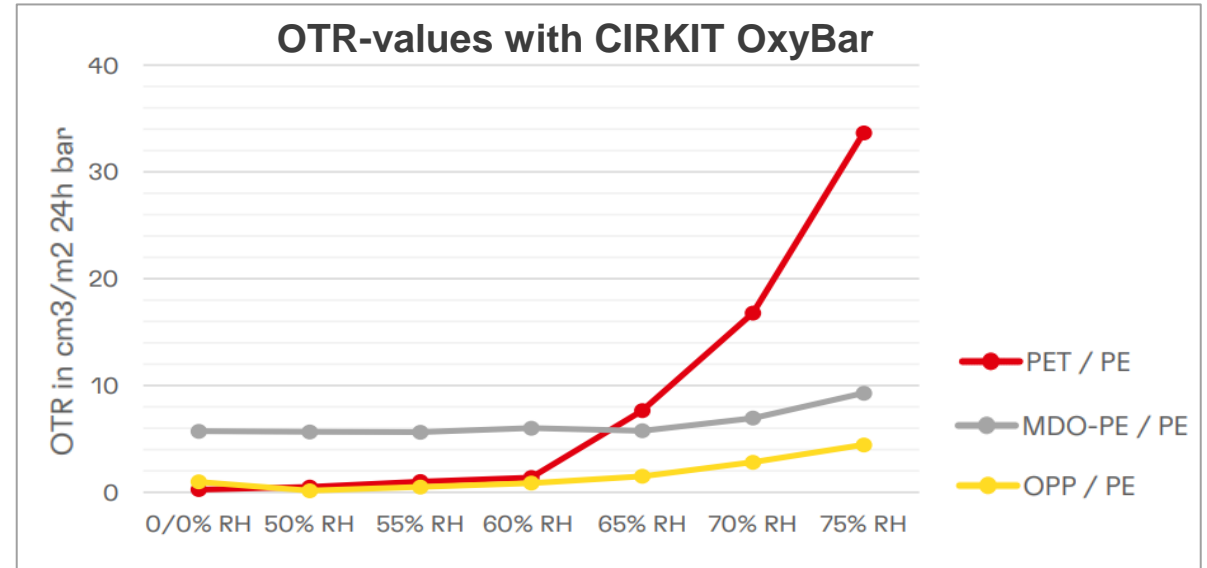
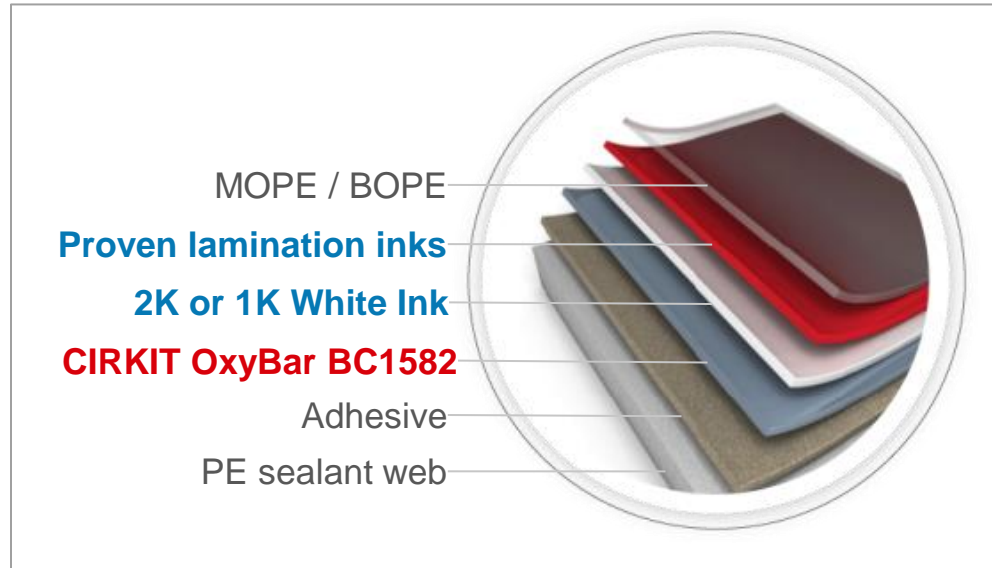
Qualitative comparison of PU- and NC/PU- vs PVC-based inks



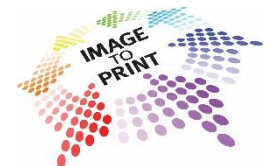
- High performance for HD printing in flexo and gravure
- High bond strength in lamination & retort
- Excellent adhesion to oriented PE substrate
- **CE-ready** (solutions for deinking and re-extrusion available)



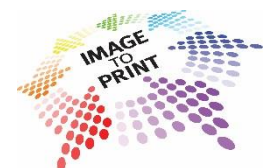
Siegwerk's CIRKIT OxyBar: Oxygen barrier coating ensuring prolonged shelf-life for dry food packaging applications



- Inline printability at speeds >150-200 m/min in Flexo and Gravure
- Comparable **OTR performance to market alternatives** (EVOH, PVDC) at lower coating weight
- Fully deinkable after delamination
- **Compatible with PE recycling** according APR Critical Guidance Protocol for PE Film & Flexible Packaging and Cyclos HTP



Target application CIRKIT OxyBar is dry food packaging



Even within mono-material streams PCR quality still insufficient due to contaminants like food residues, inks and other packaging components



Sorted input stream PCW



PCR

- 1) Washing
2) Extrusion
> 200°C

Quality impairment of PCR*
caused by contaminants like food residues, adhesives, barrier materials, inks, etc.



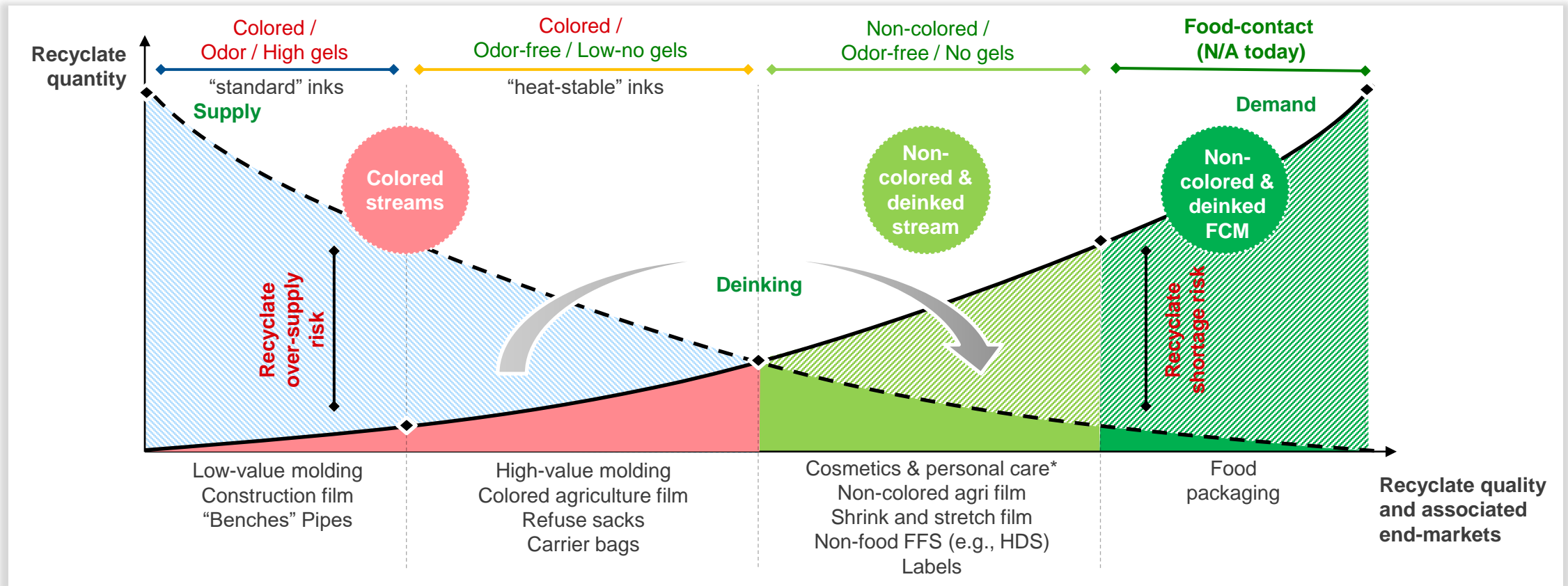
- Odor
- Gel particles, black spots
- Mechanical properties
- Discoloration
- Color fluctuations
- Optical uniformity
- Haze



* Qualitative assessment, depending on the target application

Supply is growing mostly for lower quality PCR from colored streams but many applications require transparent or white high-quality PCR

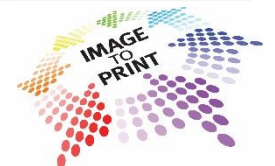
Deinking increases value of colored PCW and opens road to closed-loop recycling of printed packaging



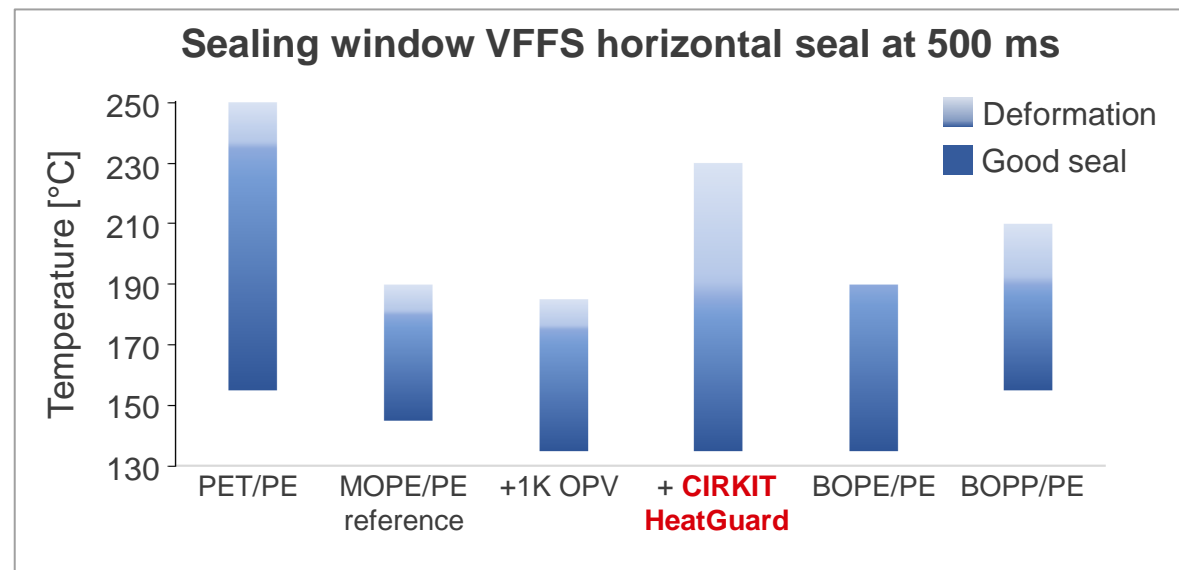
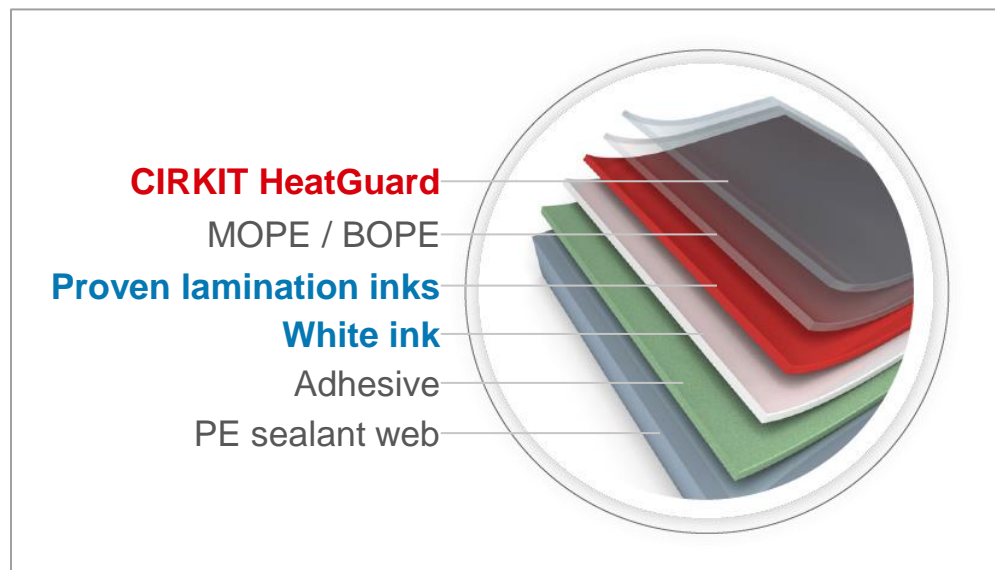
Siegwerk's CIRKIT ClearPrime: Delamination and deinking primer technology to get colorless recyclates



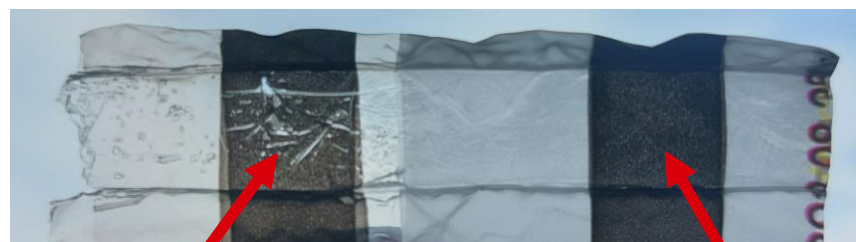
- **Deinking of laminates and difficult to deink surface printed structures** without affecting application properties
- CirKit ClearPrime (**solvent-based or water based**) for inline gravure- or flexo-printing at industrial speed available
- Delamination and deinking applying **aqueous, alkaline hot washing** process



Siegwerk's CIRKIT HeatGuard: Heat-resistant lacquer to ensure packaging line performance with mono-PE structures



Sealing at 200°C:



Without lacquer

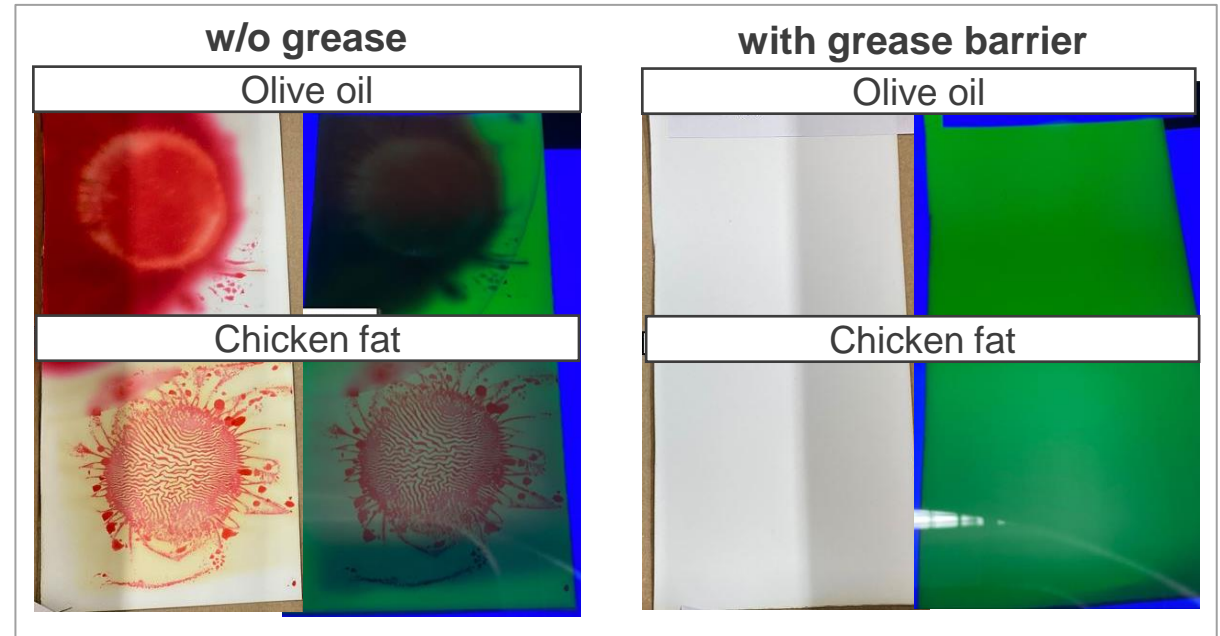
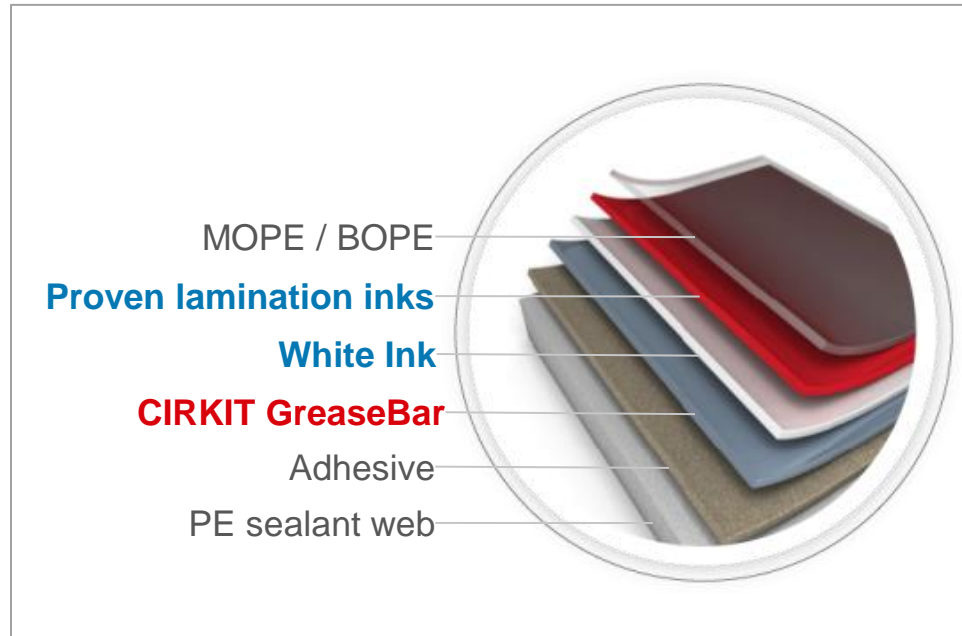
With lacquer

- **60% gain in sealing window** vs MOPE ref
- Available in matte and high-gloss versions
- Excellent adhesion to oriented PE substrate*
- Excellent rub and scratch resistance enabling **transition from laminate to surface-print** structures

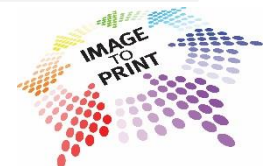
* Reverse-printed laminates require treatment from both sides



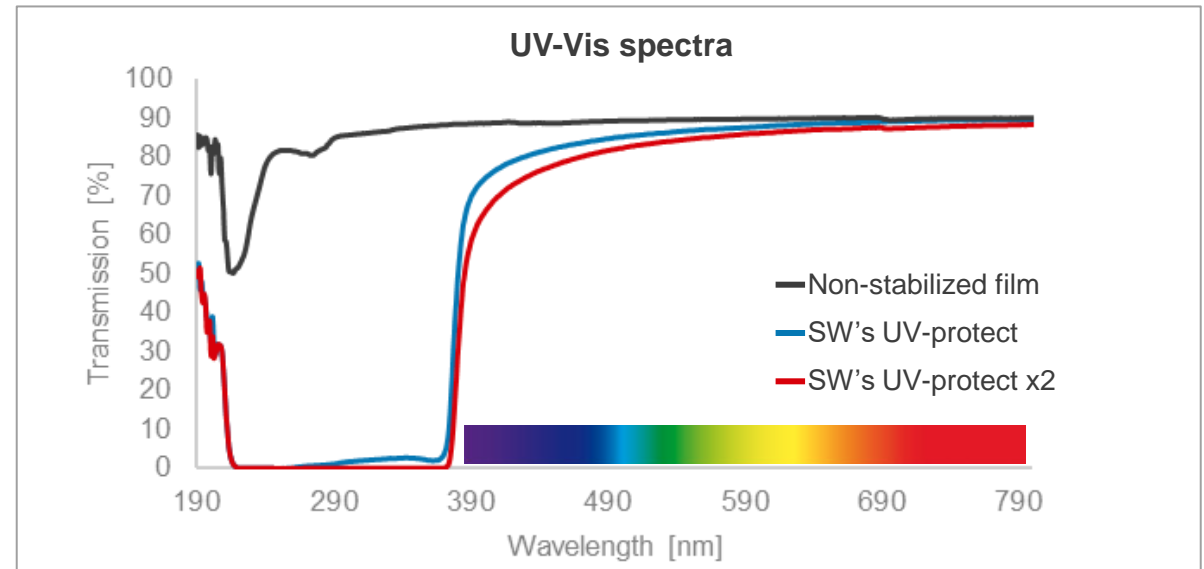
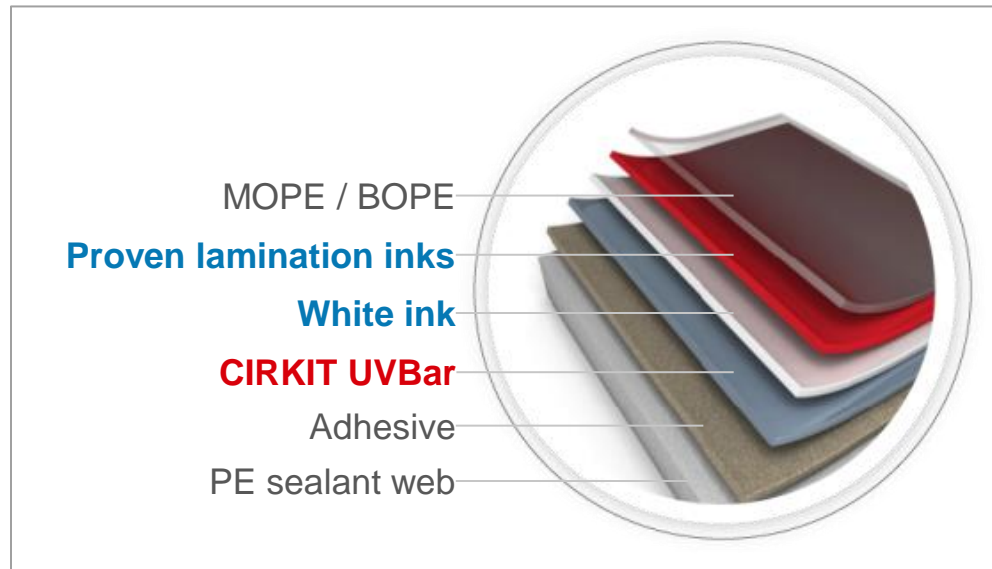
Siegwerk's CIRKIT GreaseBar: Enabling usage of mono-PO packaging for greasy or oily filling goods



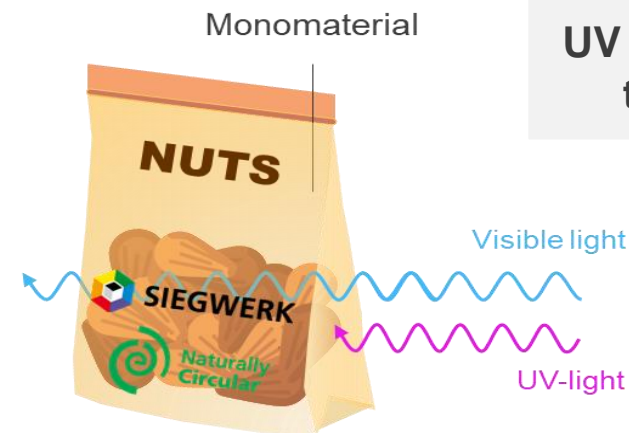
- Typical application e.g. pet food packaging
- High grease and oil barrier also after 20 gelbo flex crack cycles
- **Available as SB-coating or integrated into white ink**
- Fully deinkable after delamination



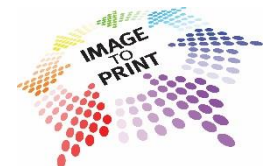
Siegwerk's CIRKIT UVBar: UV light barrier ensures protection of vegetable oils and vitamins while keeping the filling good visible



- **Transparent lacquer with full UV-A (315-400 nm) and UV-B (280-315nm) protection**
- Suitable for PO films and cPET shrink sleeves
- Solvent-based and printable in Flexo and Gravure
- Fully deinkable after delamination



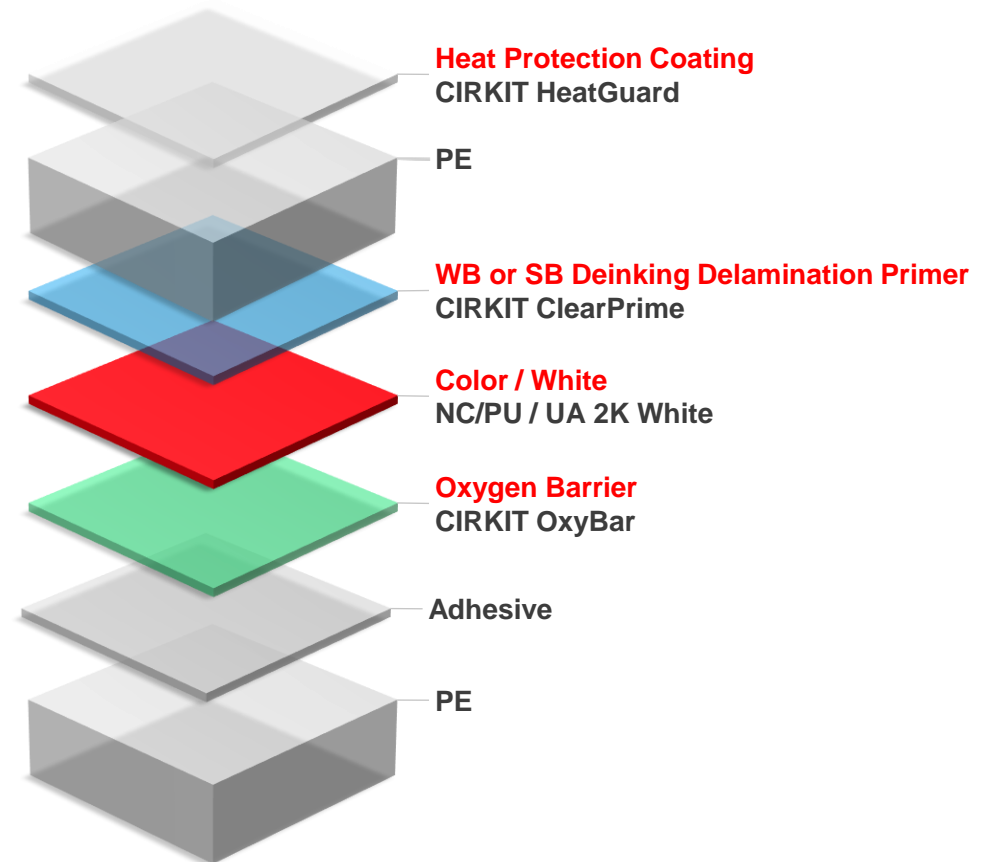
UV protection while keeping the filling good visible



Recyclable full PE barrier Pouch



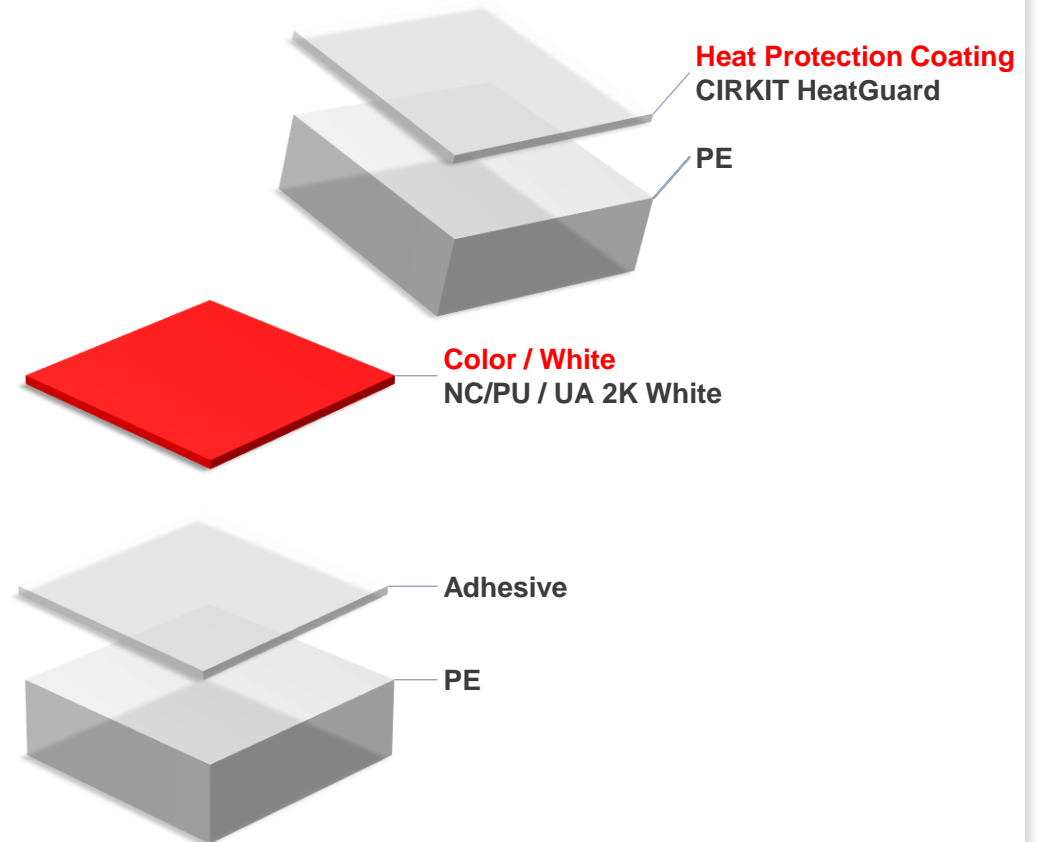
Enabled by Siegwerk's functional coatings



Recyclable full PE barrier Pouch



Enabled by Siegwerk's functional coatings

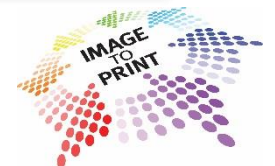
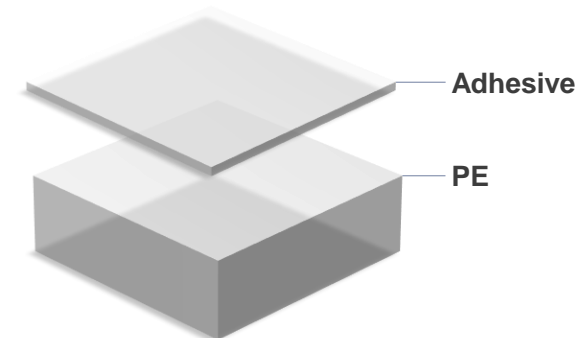
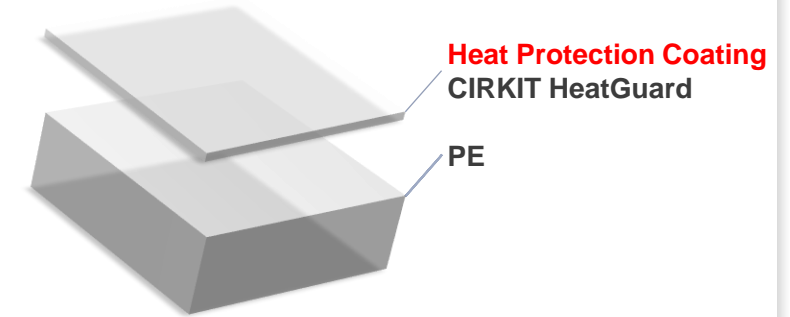


Recyclable full PE barrier Pouch

Printed material can be delaminated and de-inked



Enabled by Siegwerk's functional coatings



Deinkable and recyclable stand-up pouch* won German Packaging Award and the gold award in the category sustainability



ExxonMobil



* Factsheet with detailed information <https://www.exxonmobilchemical.com/en/resources/library/library-detail/107294/asset>

Products offered making recyclable mono-plastic packaging a reality

- **Ink solutions** - CE-ready
- **CIRKIT OxyBar** - oxygen barrier
- **CIRKIT ClearPrime** - delamination/deinking primer
- **CIRKIT HeatGuard** - protecting print structure and increasing sealing window
- **CIRKIT GreaseBar** - grease barrier
- **CIRKIT UVBar** - UV-A and UV-B protection

