An Alternative Thermal Printing Media
Koehler Paper Group – Key Figures

- The Koehler Group was founded in 1807
- Eight generation family owned German company
- More than 1,800 employees
Products Koehler Paper Group
Direct Thermal Printing (DTP) - basic terms

Imaging system based on:

- **thermal media** (e.g. thermal paper) with a heat sensitive coating – contains all components necessary for forming an image

- **thermal printer** - provides the thermal energy for triggering the image generating process

- Technical simplicity & robustness of the DTP technology – no waste apart from the imaged paper
State-of-the-art media for DTP

- Image forming mechanism → chemical reaction between a (colorless) dye precursor („color former“) and a „color developer“ which react when heated to form a colored (usually) black dye complex.
Pros & cons – conventional DTP thermal media

Pros

- The image forming chemistry is highly developed, a wide range of technical requirements (printing sensitivity/speed, optical print density, image stability, contrast etc) can be met with existing chemicals

- A wide range of applications (POS, label, ticket, tags....) can be covered by DTP media

- Cost optimized media (both in terms of imaging chemistry and coating technology)
Cons

- Rel. high chemical load of the heat sensitive layer - approx 50% w/w of the heat sensitive coating consists of low molecular-weight chemicals

- Human-/ecotoxicological profile of some functional chemicals might be of some concern

- High-end thermal media tend to be less cost-attractive
Ways to mitigate the points of concern

- Identifying new functional chemicals with:
  - technical performance profile not worse than the state-of-the-art chemistries
  - availability and economically competitive
  - good tox/ecotox profile

→ „chemicals are only safe as long as the presently available (toxicological) data don’t suggest the opposite”

Motivation for disruptive innovative approaches for alternative DTP media!
New generation DTP media

- Image forming mechanism: heat responsive layer which can switch between an opaque (high hiding power) and transparent state (functional layer, FL) applied over a colored layer (physical process).

- Before printing the color of the colored layer is hidden and the material appears (ideally) white. During the thermal printing process the opaque layer becomes (locally) transparent exposing the color of the colored layer.
Blue4est Technology

- Blue4est technology uses specially designed thermo-responsive polymeric hollow-sphere pigments (HSP) as light scattering centers to generate the necessary hiding power/opacity of the functional layer.
Pros & cons – Blu4est DTP media technology

Pros

- Significantly reduced chemical load of low molecular-weight chemicals in the Fl
- No color-forming functional chemicals present in the coating
- Works with conventional thermal printers and standard printer settings
- Good long-term printing test results - no printhead deposit build-up, no printhead abrasion
- Non-fading image
- Approved for direct food contact
- Good printability of the Blue4est paper with different print technologies (offset, flexo), similar to conventional thermal papers
- Can be manufactured with standard paper coating technologies/equipment
Pros & cons – Blu4est DTP media technology

Cons

▪ A compromise between surface brightness (high hiding power) and thermal sensitivity (optical print density, contrast) is necessary

▪ Somewhat higher scratch/pressure sensitivity compared to conventional thermal paper
Ways to mitigate the points of concern

- Identifying new materials/systems for improving the specific hiding power (hiding power/μ FL thickness, scattering efficiency) of the FL

- Applying a protecting overcoat layer (top coat) above the FL
Conclusion

- The Blue4est paper constitutes a successful product implementation of an idea from the field of imaging technology.

- In times of increasing public awareness regarding health, safety and environmental quality, disruptive innovations like Blue4est offer the possibility to meet future product requirements.
## Thermal paper placed on the EU market, 2014-2018 (tonnes); [ETPA + NON-ETPA contacted directly by ECHA, without Hansol]

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## Developers used in thermal paper placed on the EU market, 2014-2018 (tonnes); [ETPA + NON-ETPA contacted directly by ECHA, without Hansol]

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Data incomplete for 2018*  
Source ECHA/ETPA
Thank you for your attention