

Is Inkjet Still a Challenge for Paper Recycling and Deinking?

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International Association of the Deinking Industry
(INGEDE)

IMI Europe Digital Printing Conference

INKJET Market and Technology Advances

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Barcelona, Spain



About INGEDE: Communication

Recyclability

Paper for Recycling

Deinking Process

- Communicating **sustainability of printed products** and how to preserve it
- **Cooperation** with printers and competent bodies in terms of ecolabels
- **Cooperation** with printer manufacturers, ink manufacturers, adhesive manufacturers etc.
- **Testing**, discussing results, and consulting

About Paper & Printing

Recyclability

Paper for Recycling

Deinking Process

- A printed product can be sustainable – if the recycling cycle keeps running
- Paper is an important renewable resource
- Print products are challenged by digital information
- LCA can be in favour of paper

Printers “Going Green”

GREEN YOUR PRINTING

What is Greenwash?

Greenwash is an environmental claim which is unsubstantiated or irrelevant.

It is often used by organisations to mislead consumers or distract them from the truth.

sheet of non-recycled or virgin paper comes from forests... [\(read more\)](#)

INKS

Until recently, the printing industry has used petroleum-based inks, which have two primary environmental drawbacks. First, they are made using a non-renewable resource... [\(read more\)](#)

2008 alone, we

all, as printers, we

otprint. Since every



RECYCLED PAPER GLOSSARY



SOY & VEGETABLE INK INFO



DE

Printers “Going Green”



- Everybody talks about **printing**, but **what about the prints?**

How paper recycling works

- **Paper is collected**
- **Sorted – automatically & by hand**
- **Paper for deinking has to be free of impurities such as undeinkable papers and board (deinking = removal of ink)**
- **Neither machines nor workers can separate different printing processes (flexo, inkjet from offset)**

Where does it all go?



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Paper Recycling Process: Sorting



Paper Recycling Process: Sorting



Sorted paper for deinking

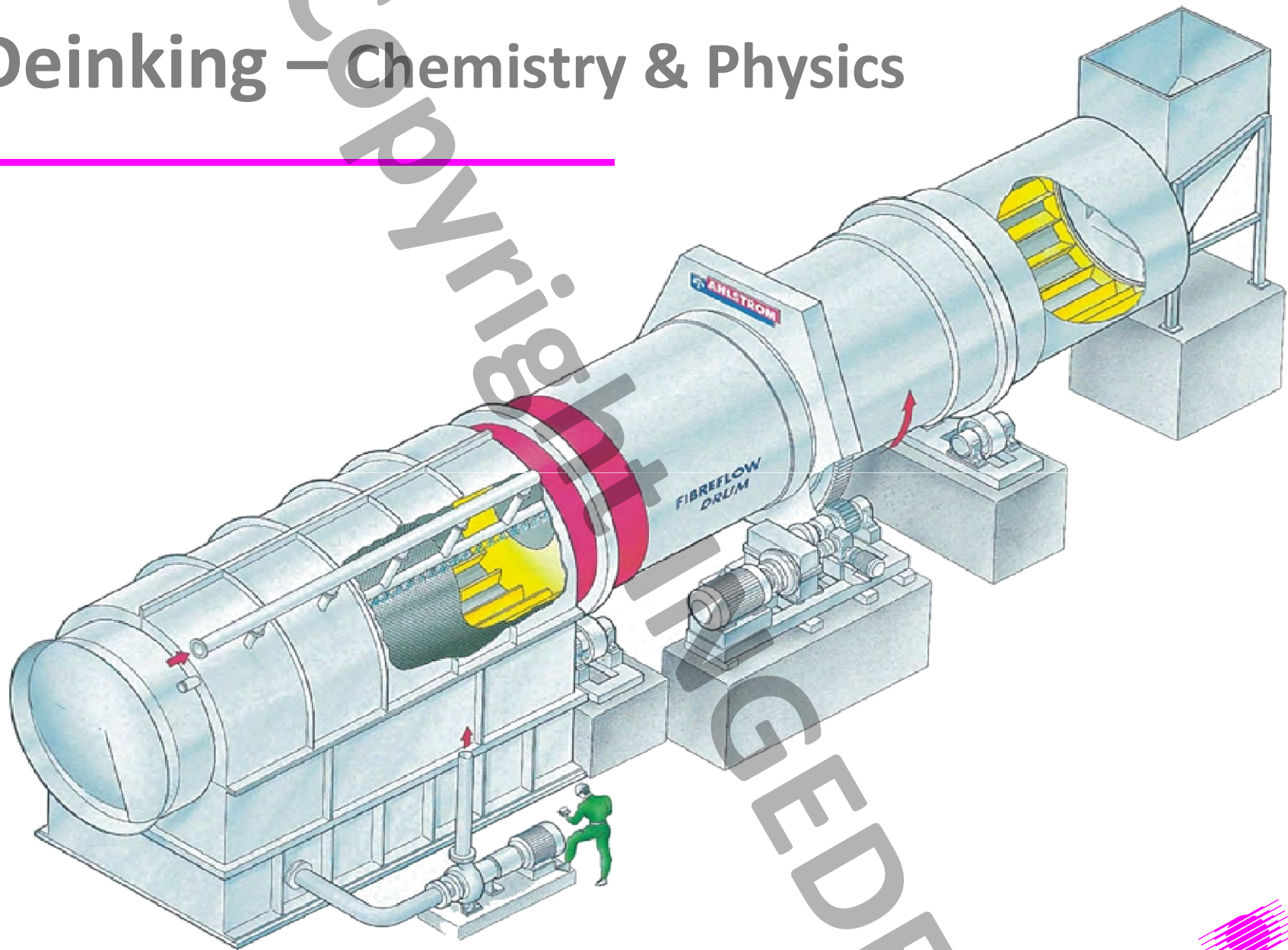




Paper Recycling Process: Paper Mill



Deinking – Chemistry & Physics

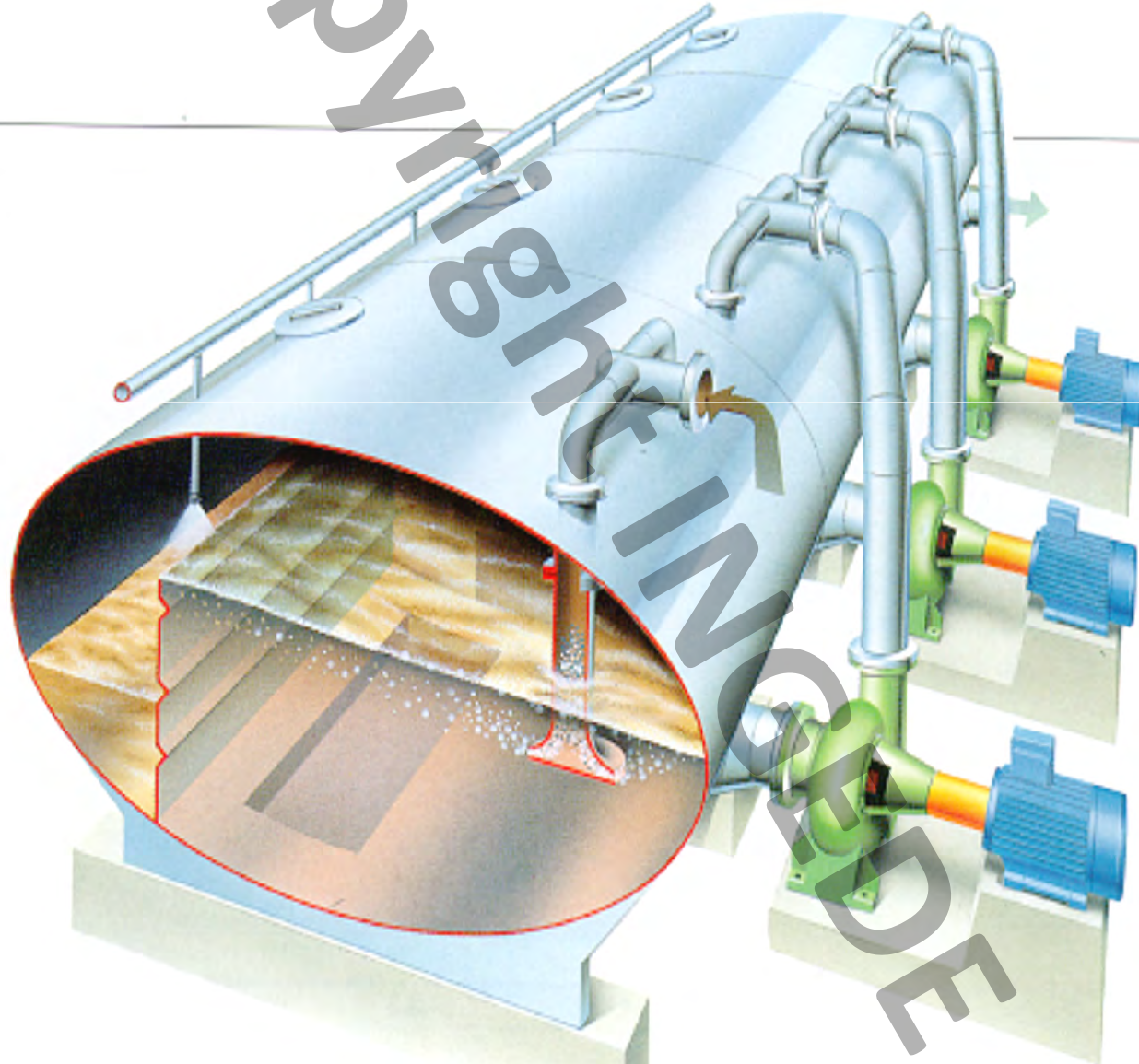


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Paper Recycling Process: Deinking

- **Deinking is the key step in paper recycling.**
- **Ink is separated from fibres in several consecutive steps.**

Paper Recycling Process: Deinking



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Paper Recycling Process: Deinking



~2,000 tons/day

Source: Voith





Undeinked Pulp – Deinked Pulp



Consequences for Printing Ink

Ink has to be

- hydrophobic
- particle $> 150\text{ }\mu\text{m}$ = screenable (stiff!)
- $30\text{ }\mu\text{m} < \text{particle} < 300\text{ }\mu\text{m}$ = cleanable
- $2\text{ }\mu\text{m} < \text{particle} < 100\text{ }\mu\text{m}$ = flatable
- particle $< 2\text{ }\mu\text{m}$ = problem

Problems with water based inks!

(Unless they form insoluble aggregates.)

Dry Toner is good deinkable



Deinking of dry toner



Deinking of inkjet



Water based = Eco Ink?

Prints with **water based inks**
in the recycling process
are like a **red sock**
in the washing machine

They turn fibers grey like your underwear
turns pink

Dye-based inks are not deinkable:

(Video)

Problems with soluble inkjet inks

Closed water loops
in the paper mill

→ **Soluble inks accumulate**
in the circulation water

2 % waterbased inkjet prints
(unless on special paper) in a
load of recovered paper can **make**
the whole load unrecyclable for
new graphic paper



January 23-26, 2009 3

bn

The value of syndicated loans written in Australia over the past two years. About 60 per cent of this was provided by 170 foreign banks.

China gloom grows

ort David Crowe
Mathew Duncley

... it is doubly critical for Australia," Mr Rudd said, speaking before the latest Chinese figures were released. "China's growth projections for 2009 have fallen by \$US200 billion (\$307 billion) - about one-third the entire size of the Australian economy. And that means a massive \$5 billion fall immediately in Australian exports ... and a \$5 billion consequential impact on Australian jobs."

Mr Tanner said the government was ready to take action to lift the economy when needed. Similar vows from senior government figures over the past week have raised expectations of a fiscal stimulus such as a tax cut, one-off welfare payment to the unemployed or an investment incentive for business.

The worse than expected Chinese growth figures were bad news for jobs and economic growth.

"They confirm that the Chinese boom that has supercharged the Australian economy over the past five to seven years is receding rapidly," Mr Tanner said.

"That's a big problem for Australia (and) it is part of a wider picture that is coming to bear around the world and is having a very powerful negative impact on Australia's short-term

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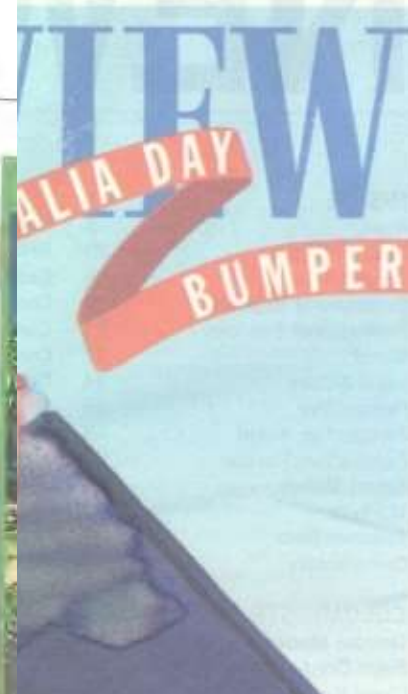
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26, 2009

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Editor: Glenn Burge, glenn.burge@afm.com.au • Weekend AFR Editor: Roger Johnson, rj@afm.com.au
Sharemarket Table
Responsibility for election comment in



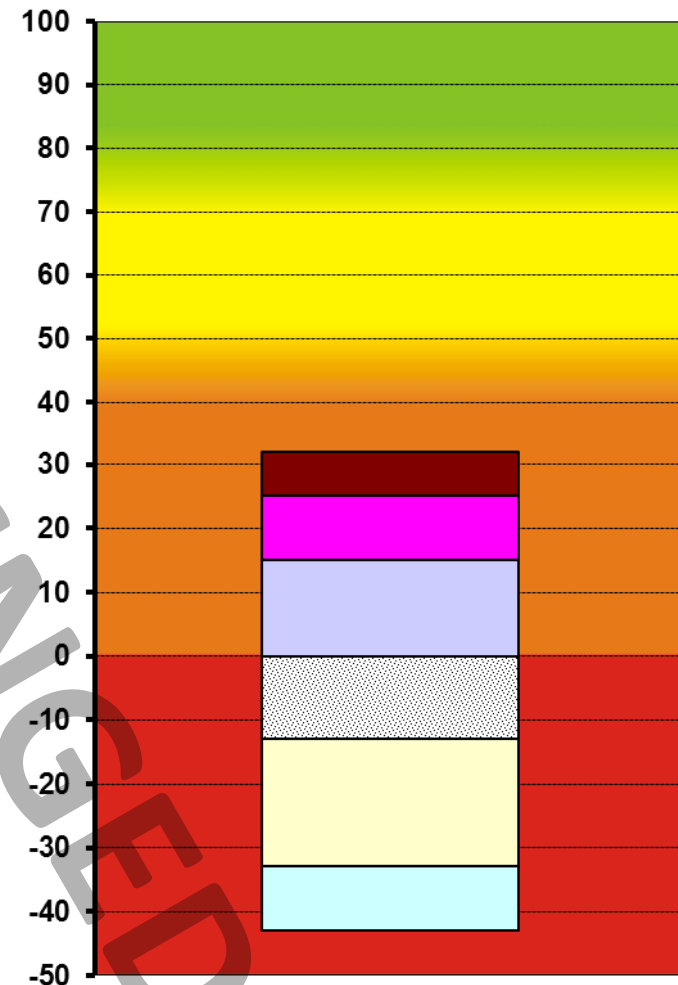
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Dye-based Ink

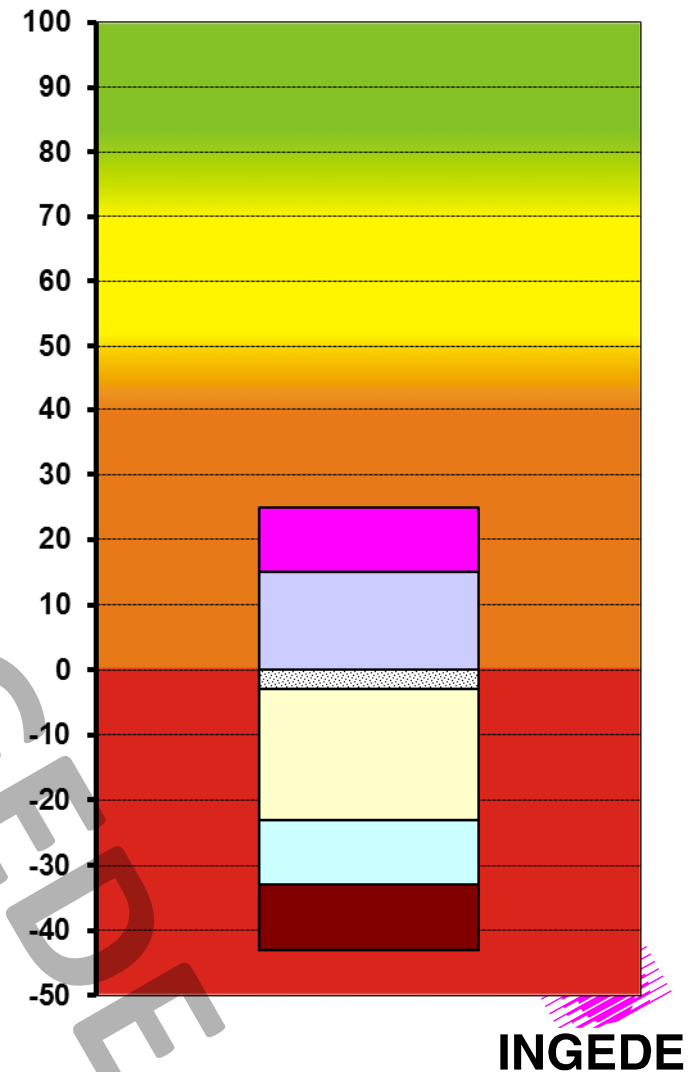
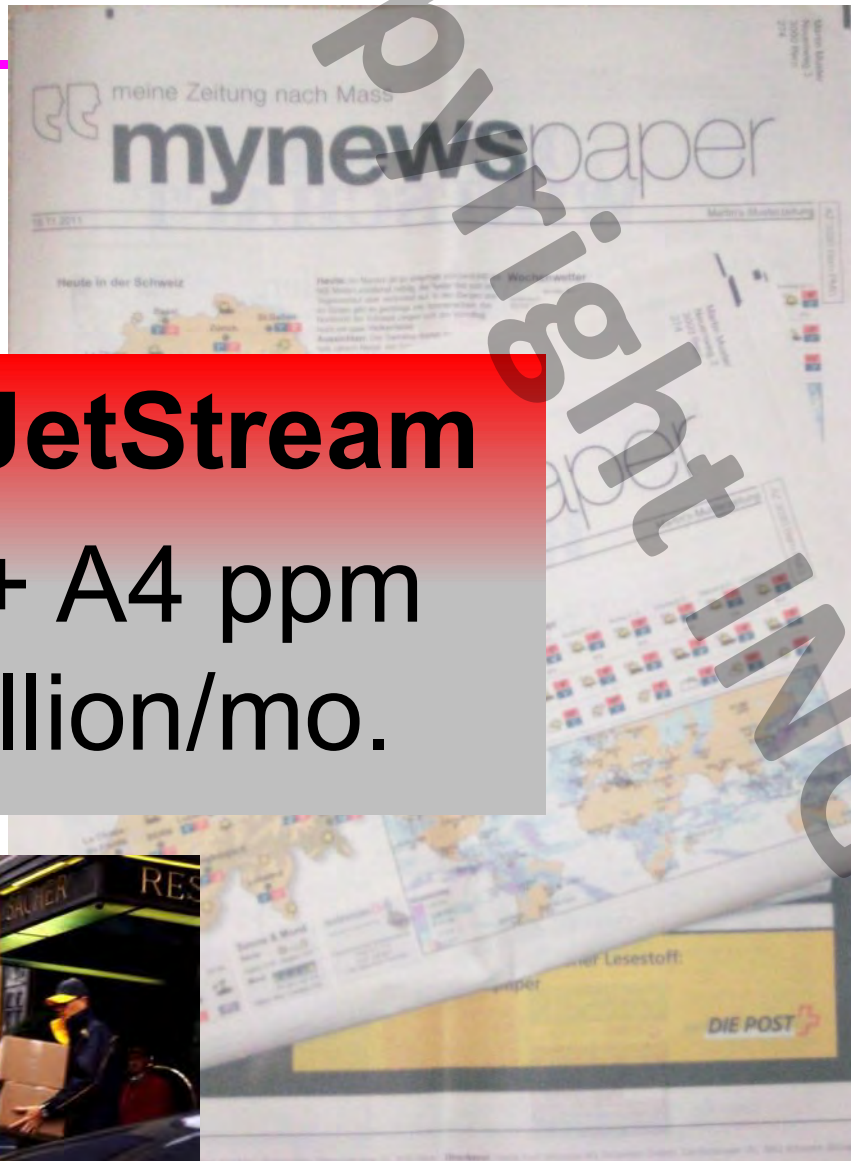
**Kodak
Versamark VL
4200**

1,684 A4 ppm



Dye-based Ink

Océ JetStream
1000+ A4 ppm
4+ million/mo.



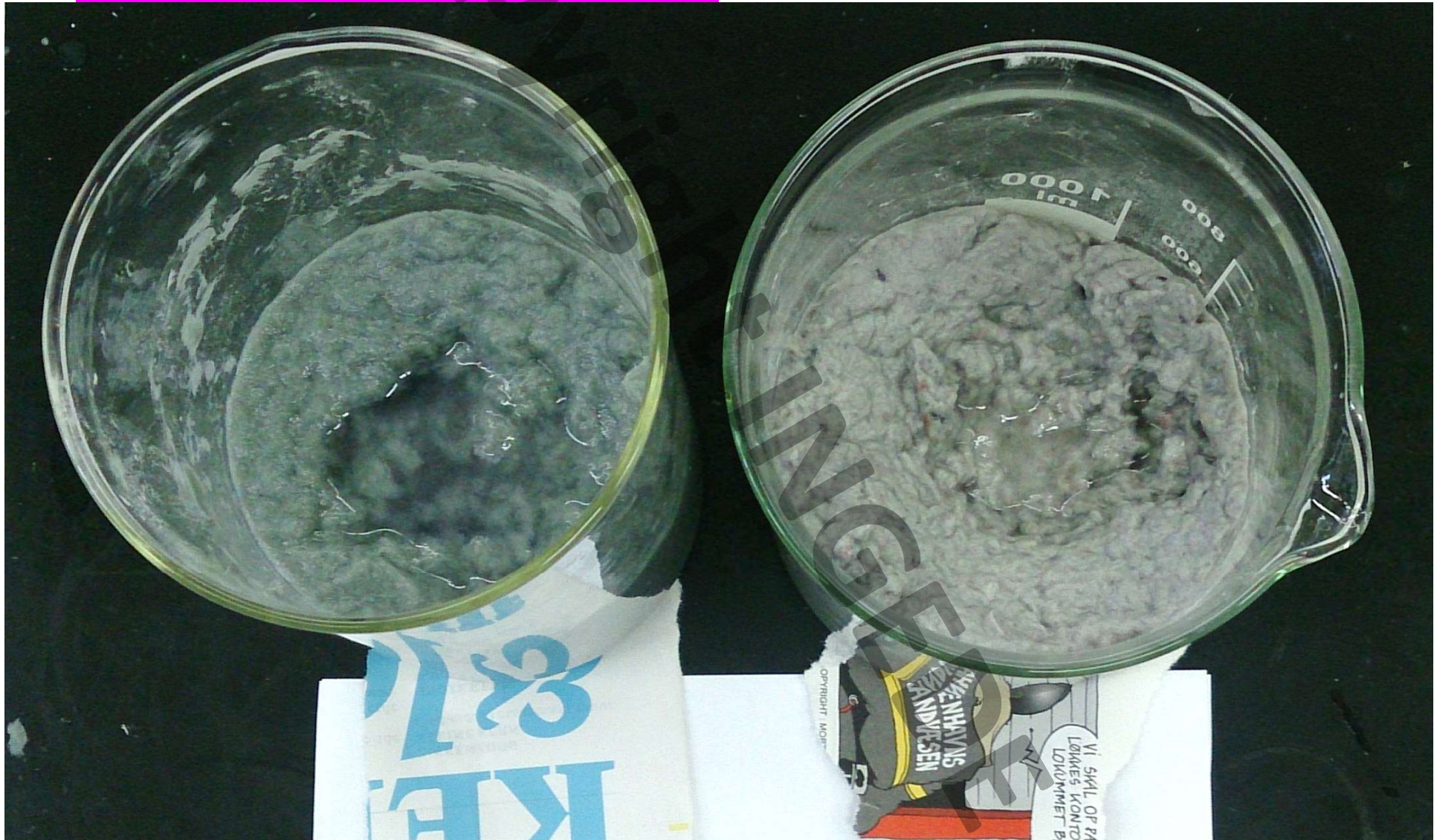
Dye-based Ink



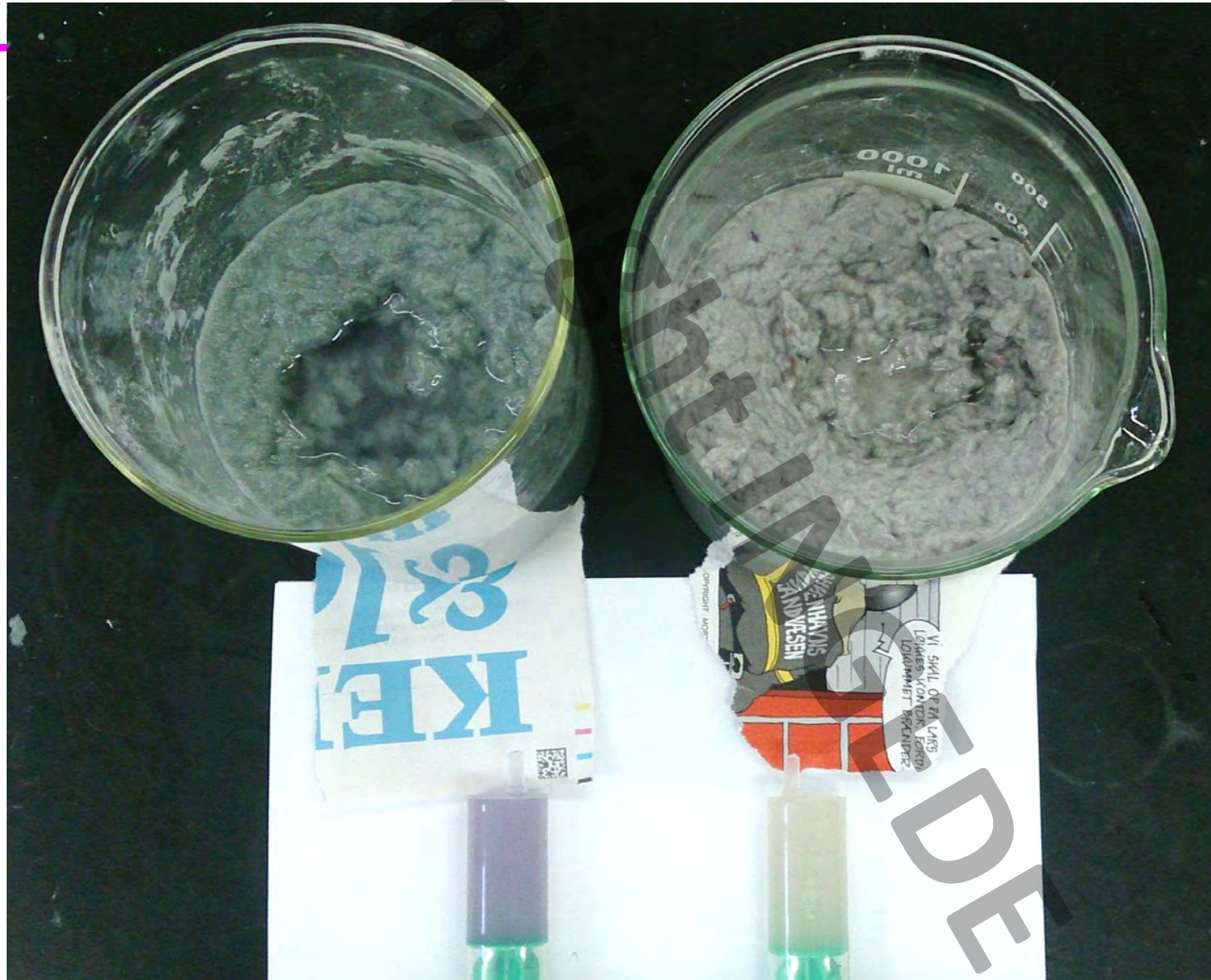
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Dye-based Ink



Dye-based Ink

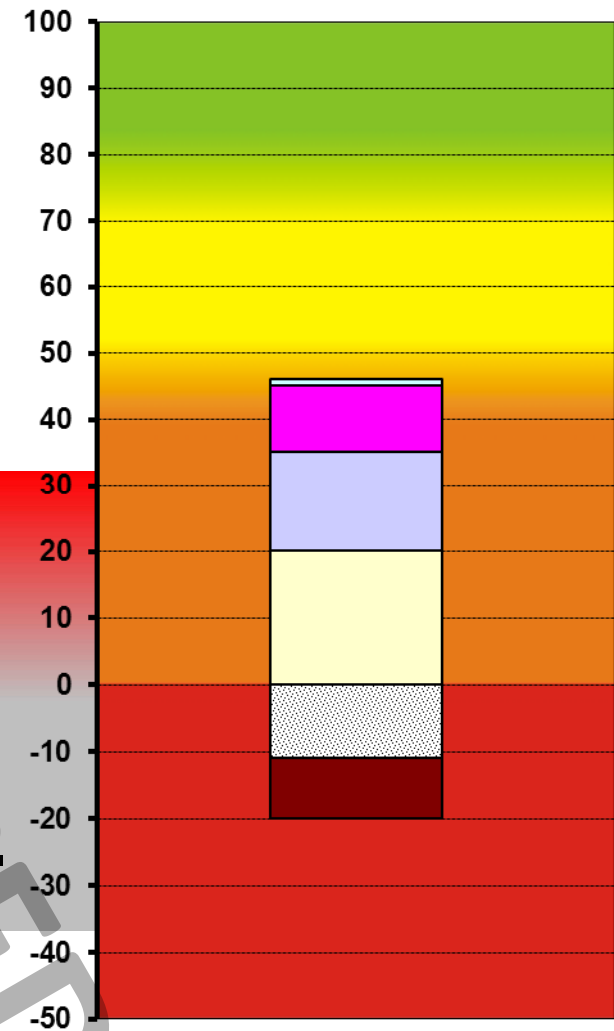


Pigmented Inkjet News



HP T300

400–600 fpm
75 million/mo.



Totally digital ...



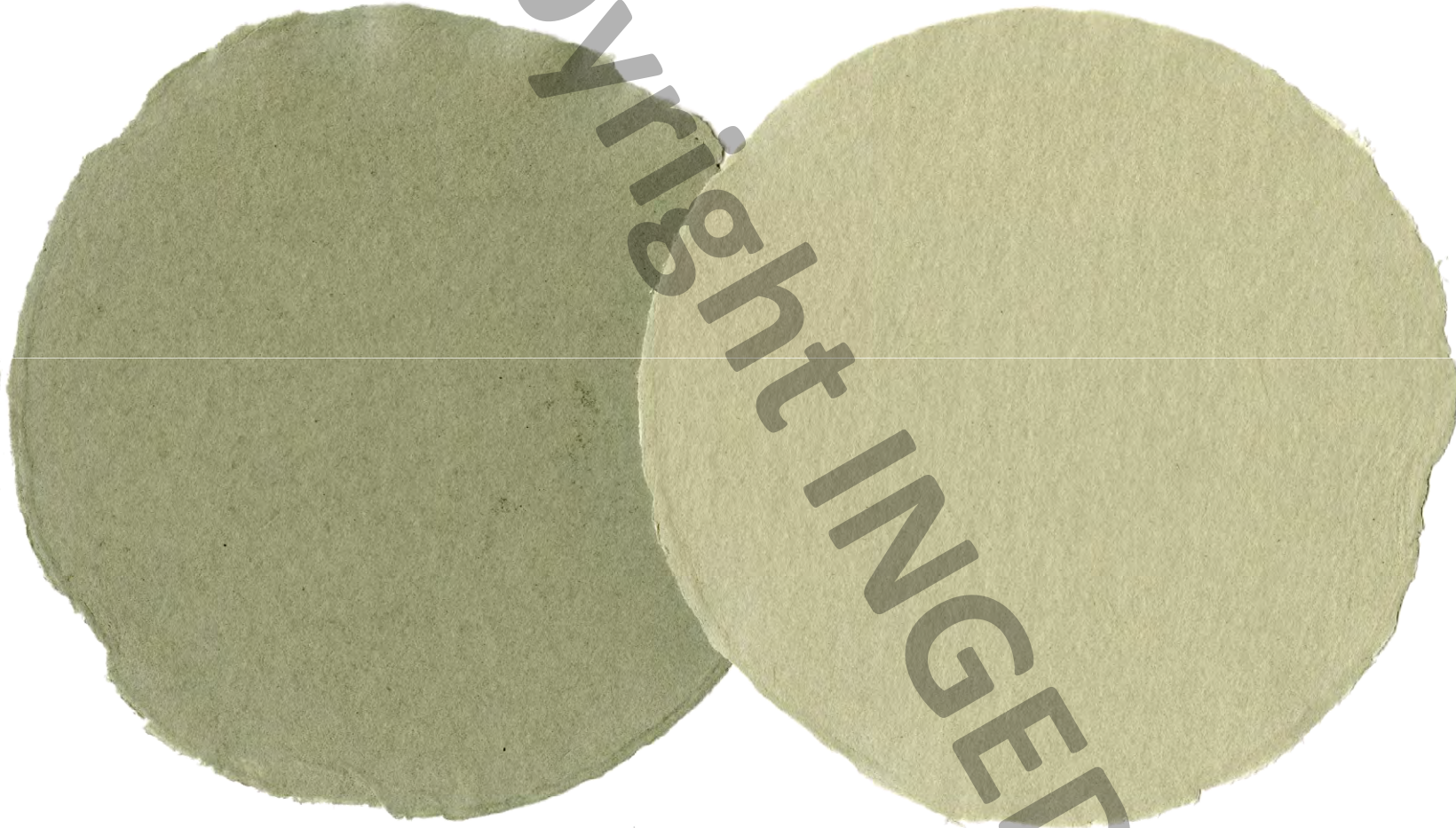
... after 175 analog years:

The Swiss “**Walliser Bote**”, produced by Mengis Druck AG in Visp, was the first daily newspaper to be printed digitally in total.



INGEDE

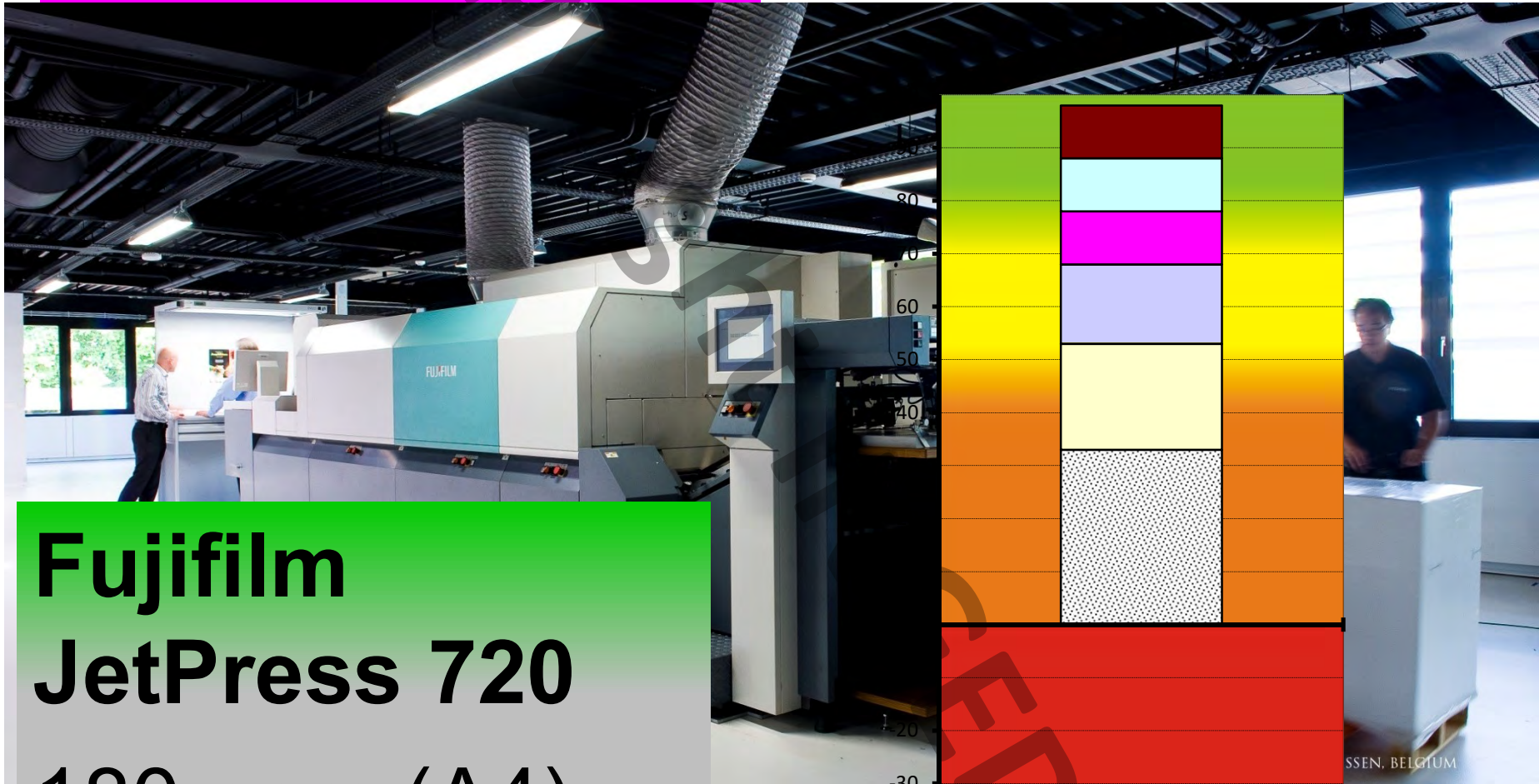
Deinking of inkjet



Inkjet can be deinkable:

(Video)

Inkjet with Pre-treatment



The image shows a large industrial inkjet printer, the Fujifilm JetPress 720, in a factory environment. The machine is white and blue, with the Fujifilm logo visible. It is processing a large sheet of paper. A worker is visible in the background. The machine is equipped with a pre-treatment system, which is highlighted by a color-coded bar on the right side of the image. The bar shows a gradient of colors from red at the bottom to green at the top, with a central section of yellow and blue. The text 'Fujifilm' is visible on the machine's side. The text 'INGEDE' is visible in the bottom right corner, along with a logo consisting of several parallel lines. The text 'SSSEN, BELGIUM' is visible in the bottom right corner of the image area.

Fujifilm
JetPress 720
180 ppm (A4)

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SSSEN, BELGIUM

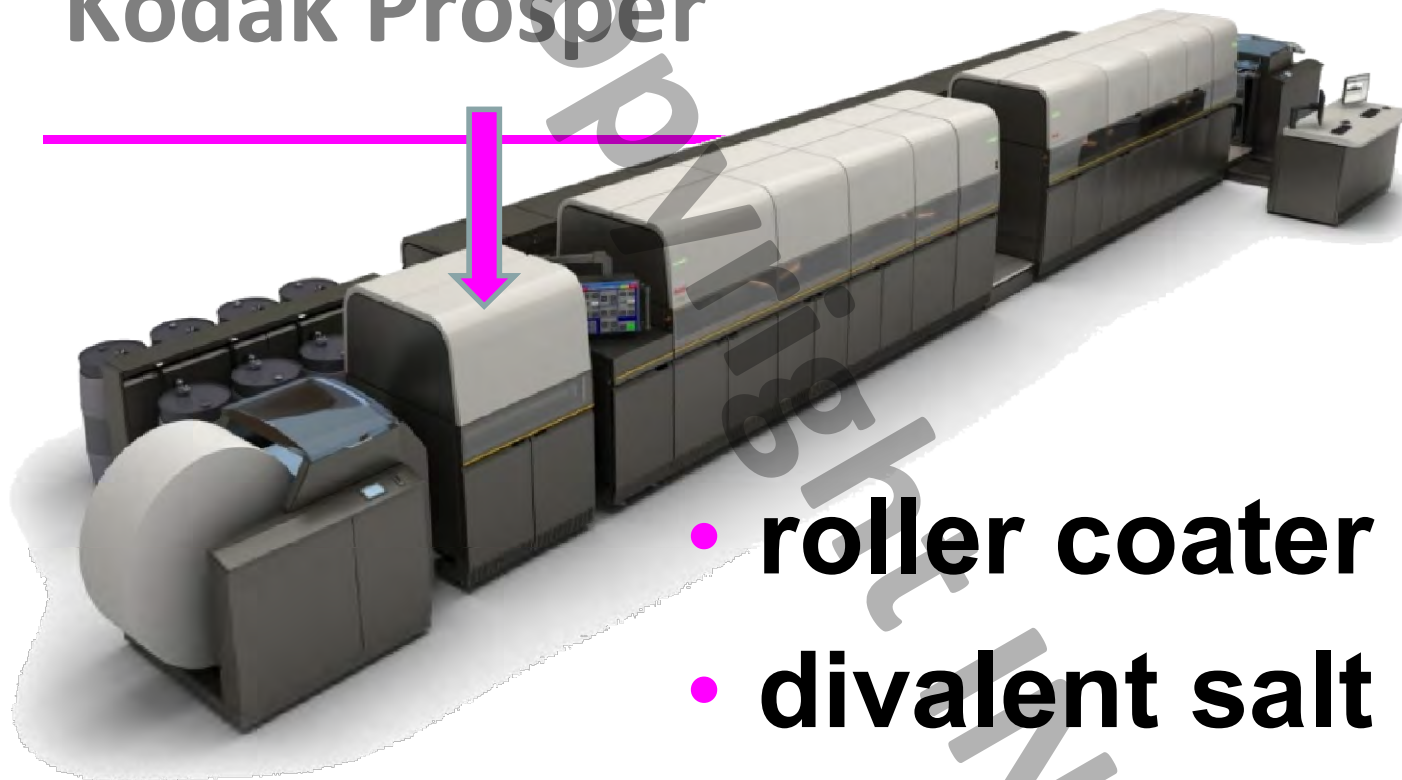
Kodak Prosper Press Image Optimizer Station (IOS):



- Roll Coating pre-treatment for inkjet printing on standard paper:
 - Applies uniform surface treatment to enable any untreated paper
 - Up to 300 mpm, 2 side coating in single pass and in-line
 - IOS treated coated gloss paper INGEDE Method 11 score of 95 for deinking

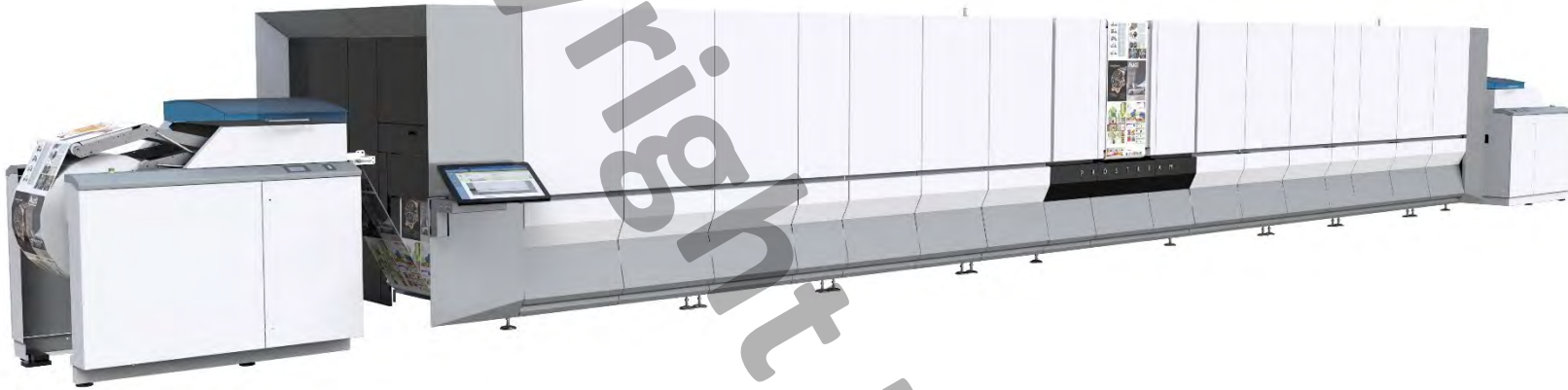
(Source: Kodak)

Kodak Prosper



- roller coater
- divalent salt (Ca^{2+})
- polymer
- pre-dried
- enhanced durability

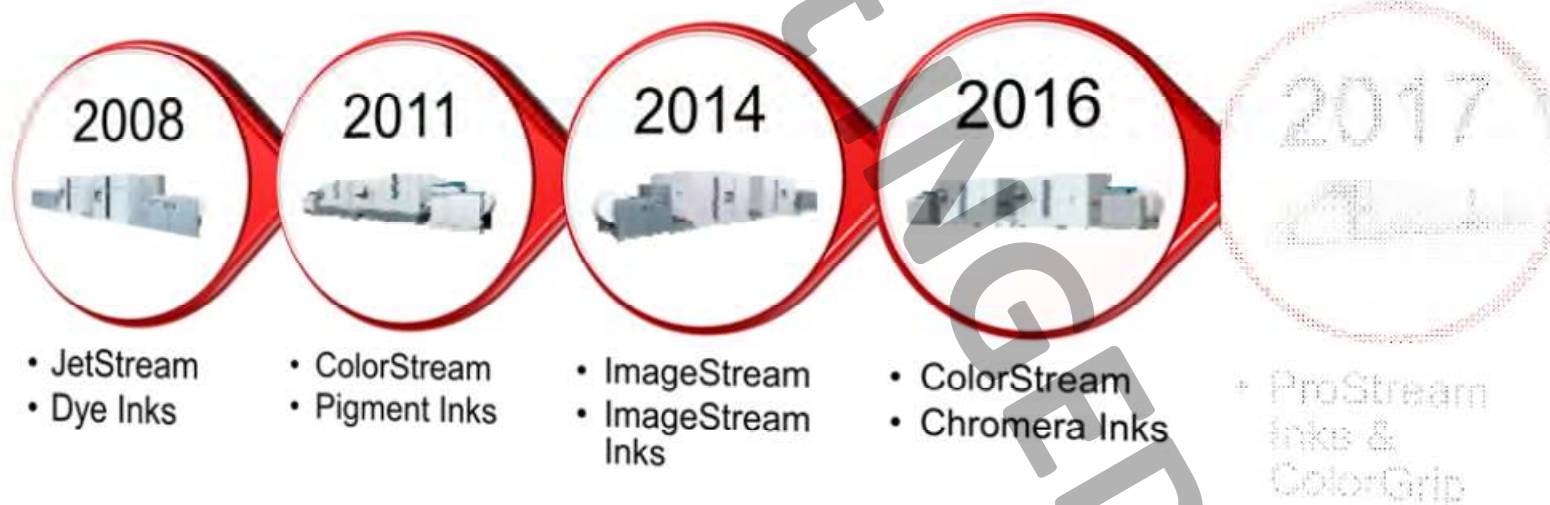
Canon Océ i300, ProStream



- **Polymer ink**
- **Pre-coating “ColorGrip”:**
*High quality output on
non inkjet treated papers*

Integrating Ink Study Results Into Next Generation Océ Inks

- Knowledge from the joint INGEDE-DPDA model ink study was integrated into the recipe design for Océ's next generation pigment inks
- Recipe strategies to improve deinkability where combined with recipe strategies to improve color gamut and reduce ink show-through



Result: Océ Chromera Inks

The Only Question Remaining Was... «Can We Get Even Better?»

- Ink design strategies for improved deinkability are now known
- Reports from some inkjet machine vendors claim improved deinkability with a paper pretreatment / inkjet primer
- What if we combine both strategies in one printing system?



Result: Océ ProStream with ColorGrip

So Our Work is Finally Done, Right?

No, because...

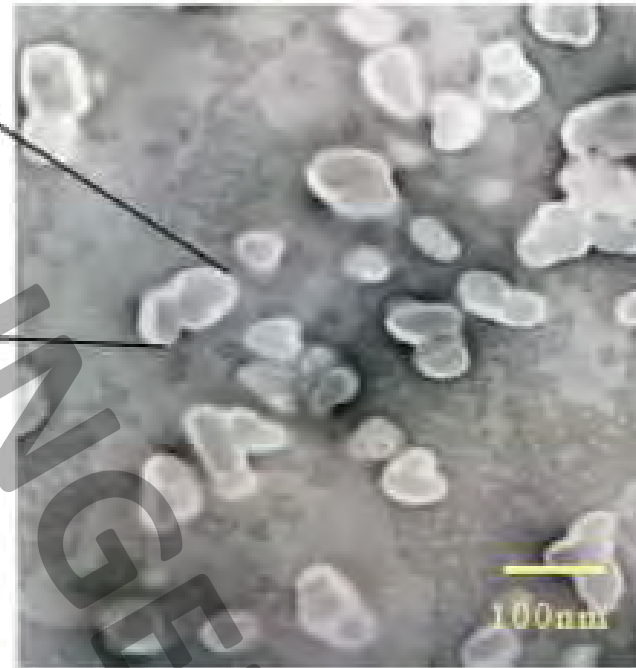
- An installed base of inkjet systems with lower deinkability performance will still be in the market for years to come
- A large paper dependence on deinking performance in most printing technologies still exists – we need to cooperate to understand these dependencies and work to improve the total recovered paper loop
- Paper manufacturers still want/need to improve the deinkability of their papers for inkjet technologies

So we will continue our journey...and we need your continued cooperation and support!

Before IPEX 2010 Birmingham: Encapsulated Pigment (KAO)

Water insoluble
Dispersant

Pigment



New Pigments: “Polymer Ink”



Under
Development:

Polymer coating
induces
orientation, film
allows removal

KBA RotaJet 76: “Polymer Ink”



First tests in 2014,
also at Drupa 2016

**Polymer ink coagulates
after
jetting**



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Deinking Politics

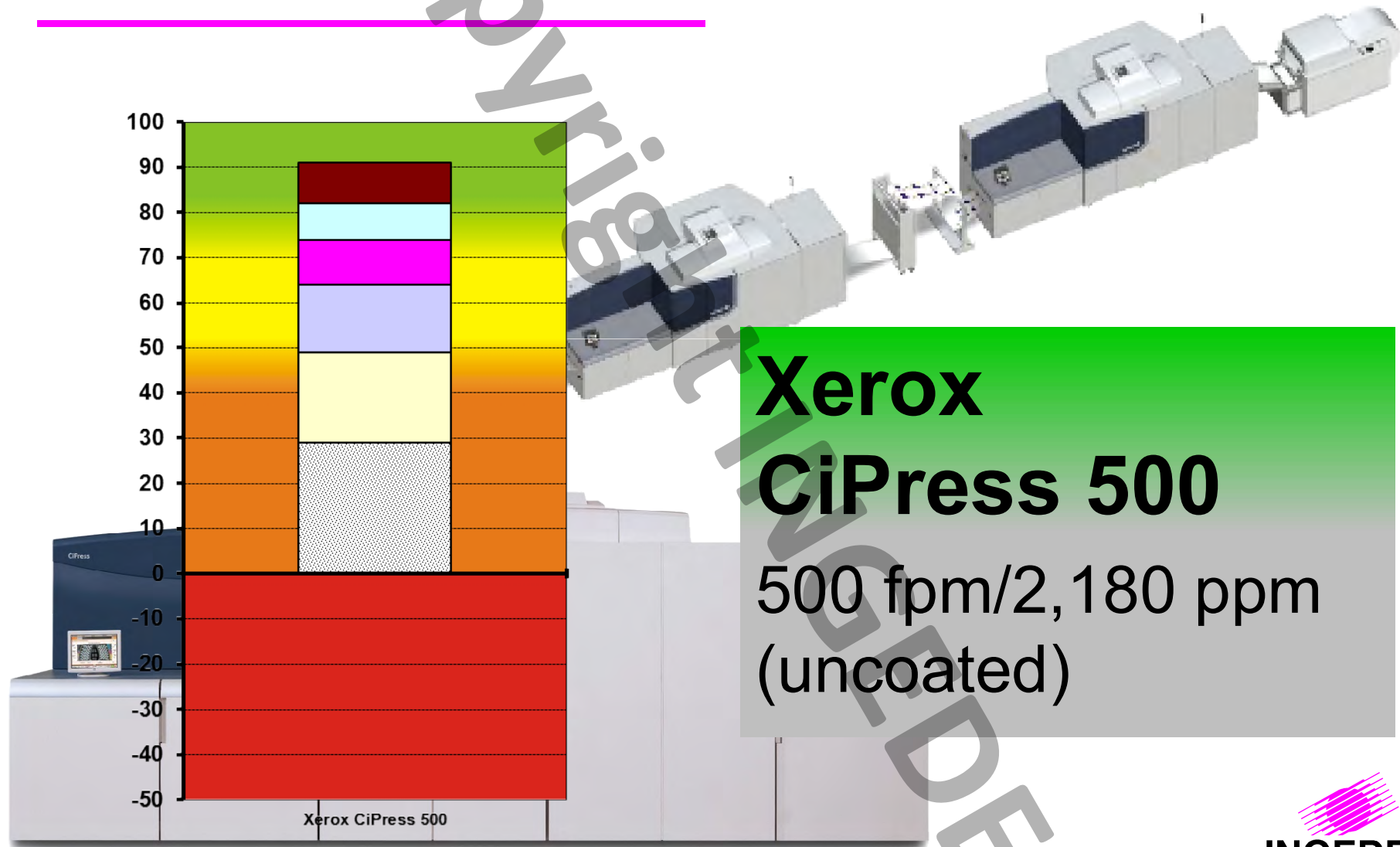
- Reality is not all pigment inks on specially coated paper, but high volume, dyes on uncoated (price!)
- More steps into the right direction.

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Non-aqueous Inkjet



Deinking of crosslinked inks

- **UV curable inks, varnishes:** polyacrylates; photoinitiator induces polymerisation
- **Mineral-oil free inks:** plantseed oils crosslink due to oxidative drying
- **HP Indigo toner:** polyethylene film, flexible, high cohesion
- **Landa ink:** also polymer film, transferred from blanket to paper

Problems with Indigo: Dirt Specks

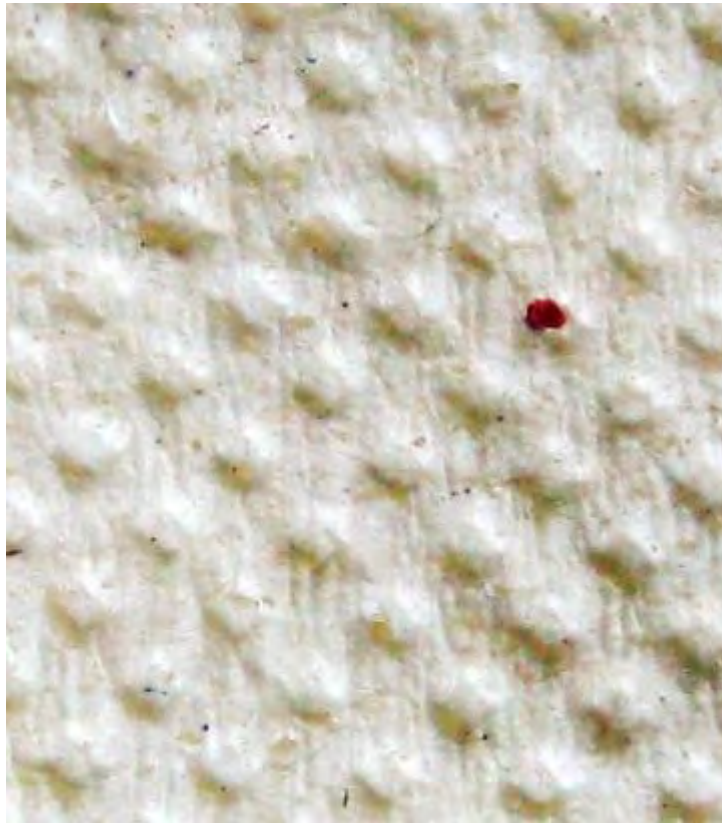


Indigo

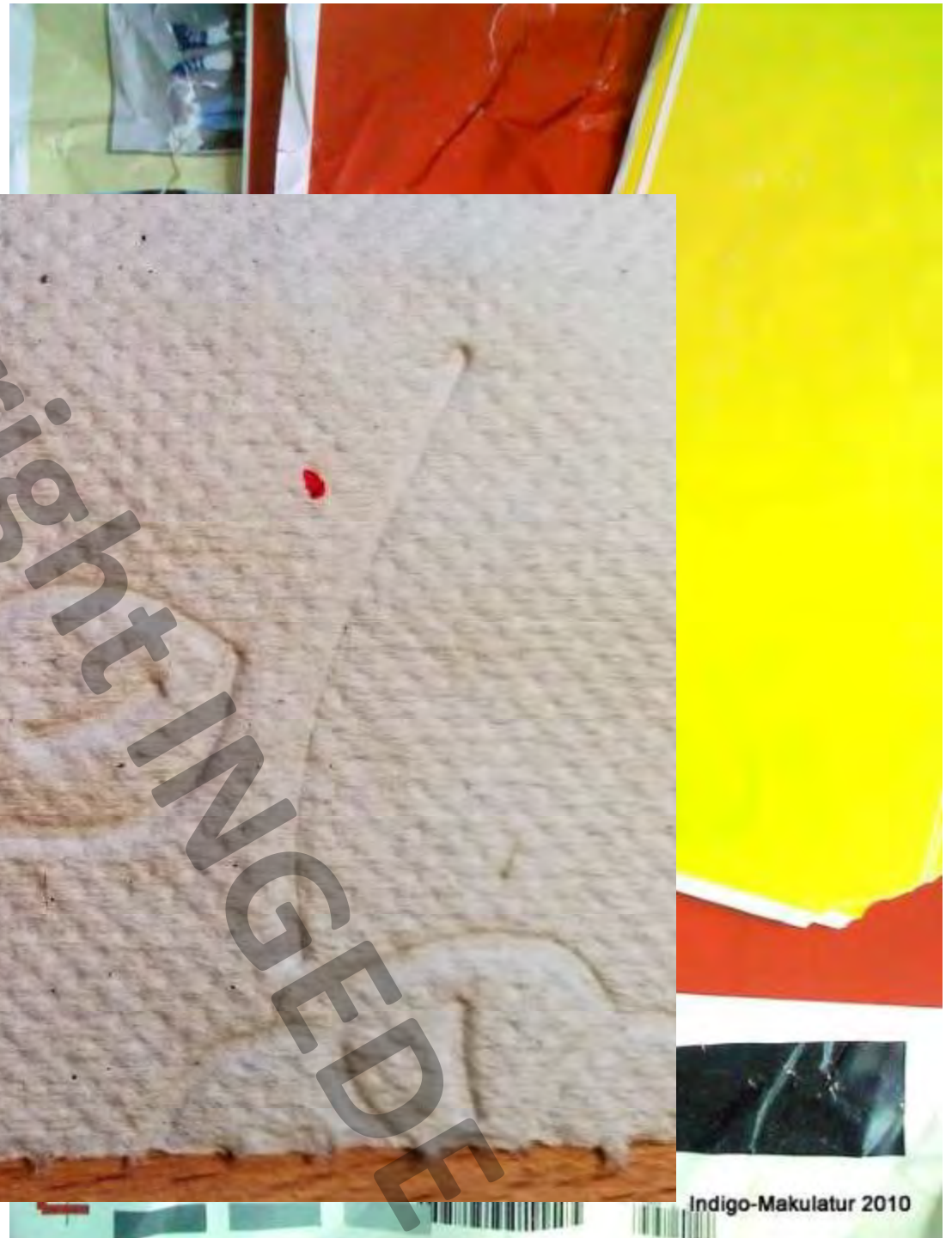


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Indigo



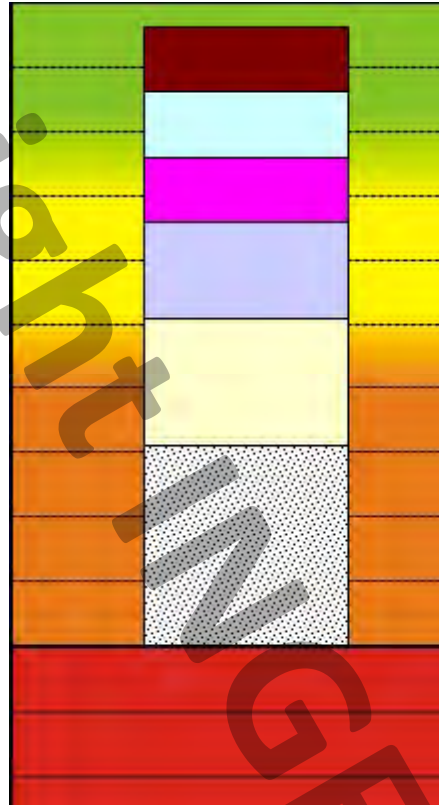
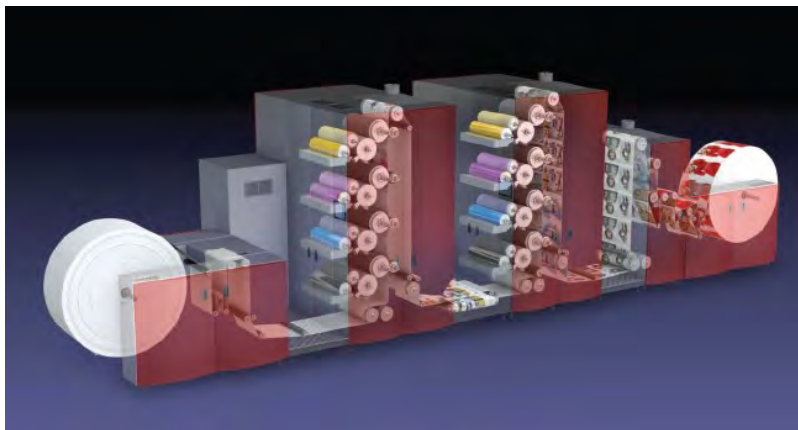
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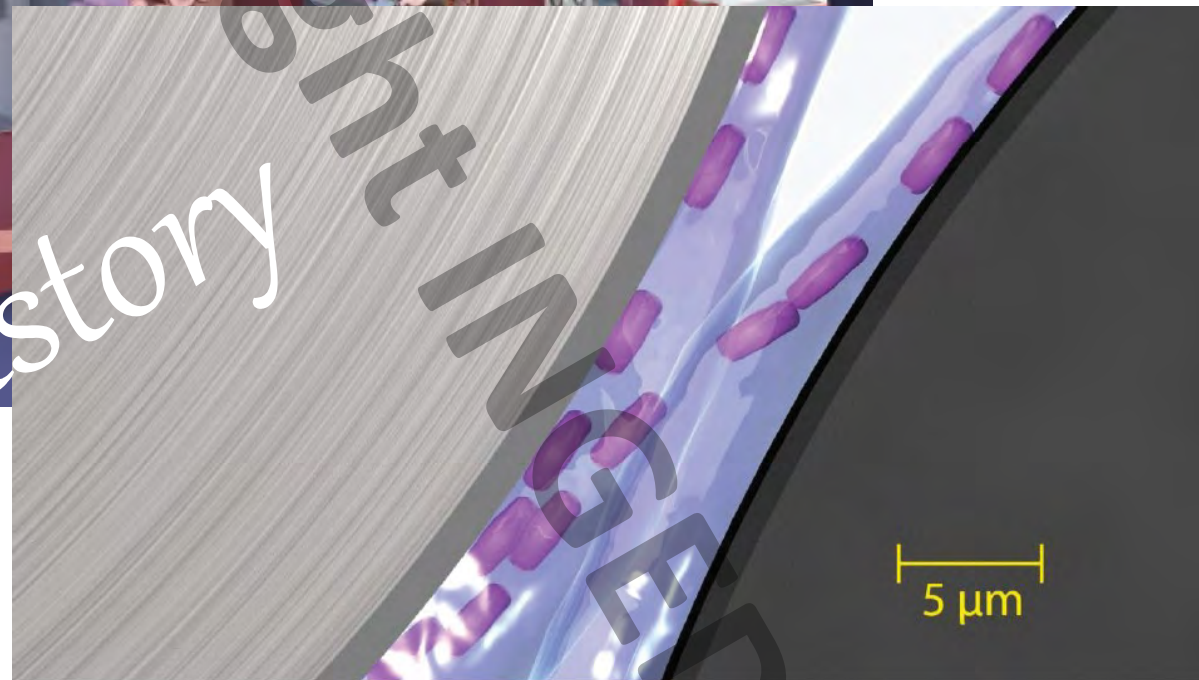
Indigo-Makulatur 2010

Deinkable liquid toner

- Xeikon Trillium: Polyester (brittle)



Deinkable liquid toner



Deinking of crosslinked inks

- **Problem:**
large particles (too heavy for flotation)
not or little hydrophobic
- Also: **Dispersion varnishes**
and **UV-curable offset inks (LE-, LED-UV)**

Konica Minolta KM-1 (UV Inkjet)



Konica Minolta KM-1 (UV Inkjet)



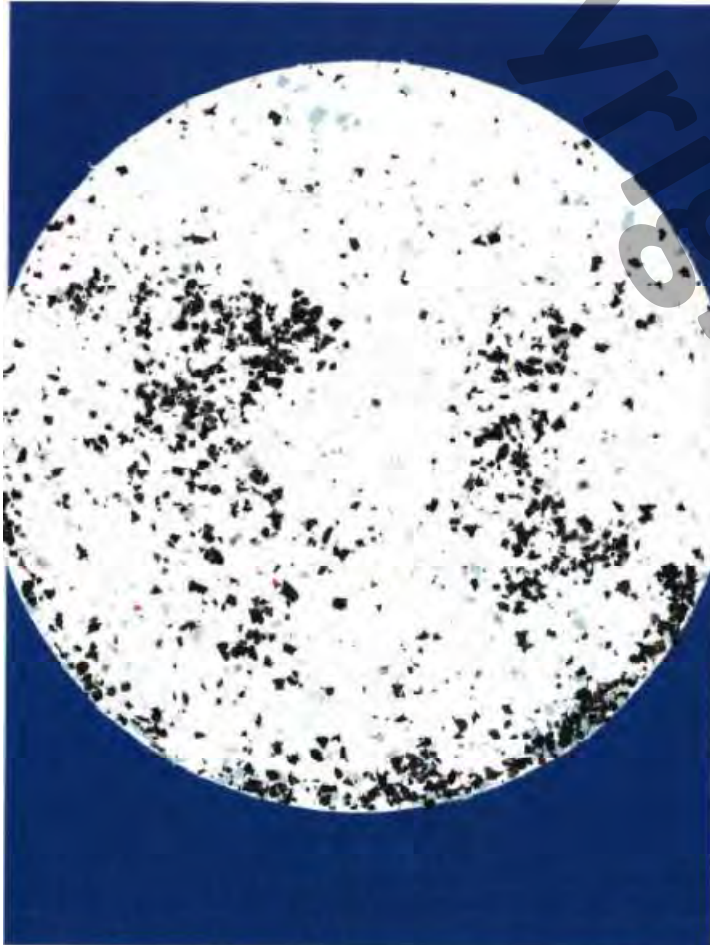
Konica Minolta KM-1 (UV Inkjet)



Konica Minolta KM-1 (UV Inkjet)



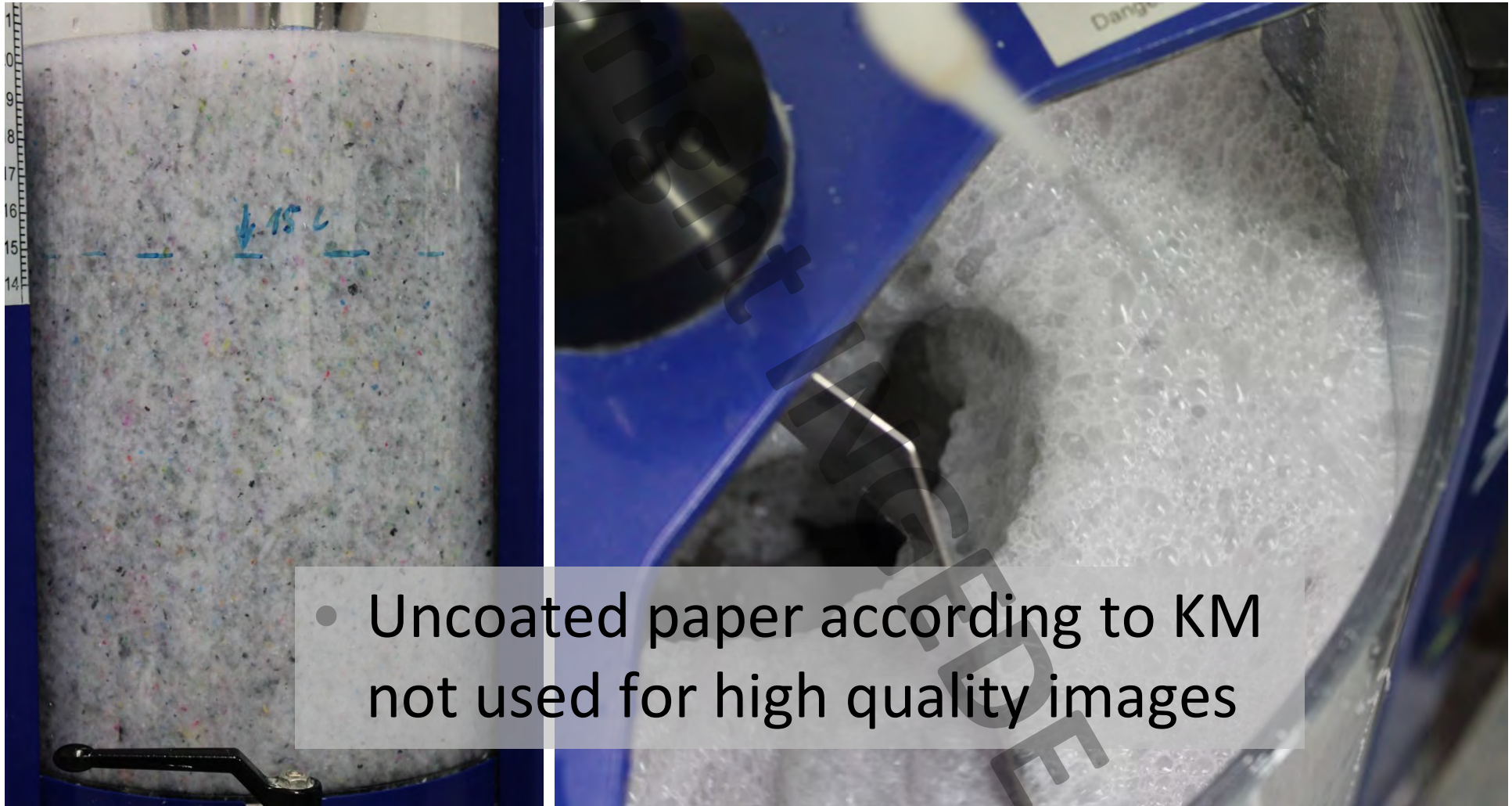
Konica Minolta KM-1 (UV Inkjet)



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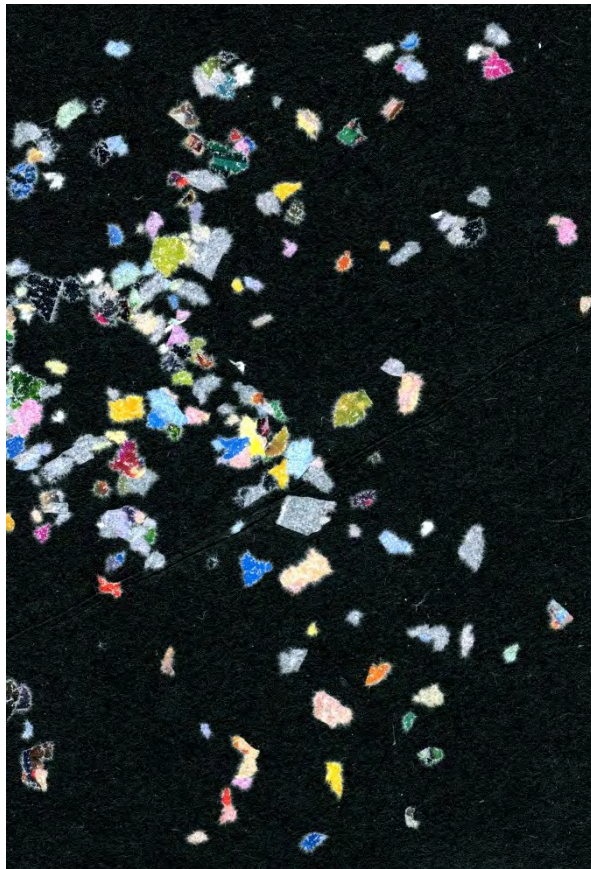


But: Only on coated paper, uncoated:

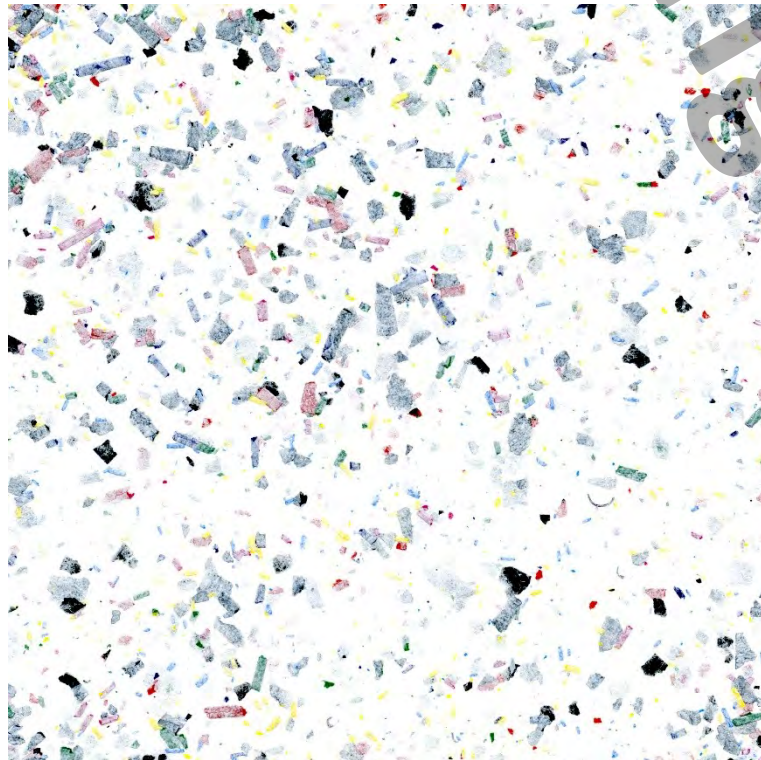


- Uncoated paper according to KM not used for high quality images

... on uncoated:

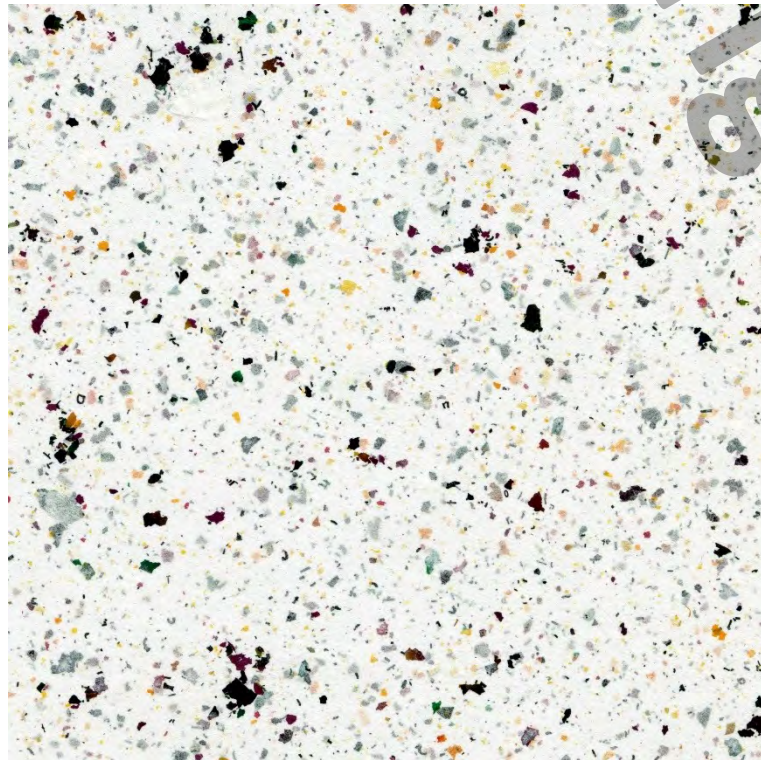


UV curable inkjet I



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UV curable inkjet II



Landa, Drupa 2016



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Pictures: landanano.com, wikimedia commons RaBoe


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Landa



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Caring For the Planet - Ned & Nelly's Nano

1.031 Aufrufe



Technology is recyclable

paper


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Landa



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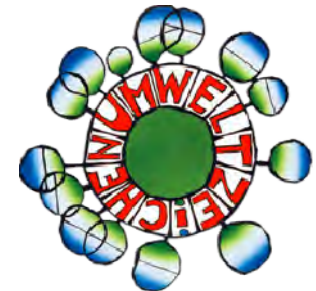
Printed on a Landa S10 Nanographic Printing® Press





Testing and Certification

- **INGEDE Deinkability Test:**
 - Reproducible and well-documented procedure
 - Cooperation with manufacturers, partly under NDA
- **Certification:**
 - Increasing presence & importance in marketing for digital printers
 - **Required for Austrian Ecolabel, EU flower, Blue Angel (UZ 14, UZ 195), Ecofolio (France)**



Tous les papiers
ont droit à plusieurs vies.



- **Discussion and joint testing with ink manufacturers in Germany, Europe and Japan**
- **Discussion with all OEMs**
- **Discussion with printers and associations**
- **to be continued ...**



INGEDE. We are the Deinkers.

Thank you!

www.ingede.com