Is Inkjet Still a Challenge for the Paper Recycling Process?

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About INGEDE: Research & Communication

- 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
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”

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.

(TWO SIDES)
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?
Paper Recycling Process: Sorting
Paper Recycling Process: Sorting
Deinking – Chemistry & Physics
Paper Recycling Process: Deinking

- Deinking is the key step in paper recycling.
- Ink is separated from the fibres in several consecutive steps.
Paper Recycling Process: Deinking

- water
- a little bit of NaOH
- some Na₄SiO₄
- soap
- air
- does not work with hydrophilic particles!
Consequences for Printing Ink

Ink has to be

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

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
can be 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
China gloom grows

Report: David Craig and Matthew Dunckley

Australian jobs are at risk and the budget is under pressure from the latest sharp fall in China’s growth, the Rudd government has warned, in another alert over the deteriorating economic outlook for the year ahead.

Finance Minister Lindsay Tanner prepared the ground for another major spending initiative to shore up domestic growth after noting that China’s slowdown would do “very powerful” harm to Australia.

The comments came after the Chinese government announced that national growth had fallen to 6.8 per cent in the year to December 31, well below market estimates of about 8 per cent.

Growth had been 9 per cent in the year in September 30.

The Rudd government expects the slowdown to weaken demand for Australian exports significantly and deepen the cut in commodity tax revenue from the resources sector, as it did when the federal budget was already tilted to saving to a deficit.

Prime Minister Kevin Rudd made it clear he expected more job losses, by using a speech in Melbourne to emphasise the damage already done to Australian interests.

“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 $US20 billion ($207 billion) — about one-third the entire size of the Australian economy.

And that means a massive $5 billion fall in intermediates 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 voices from similar 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 no investment incentives 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: “It’s a big problem for Australia (and) it is part of a wider picture of coming to bear around the world and is having a very powerful negative impact on Australia’s story.”

Inkjet News
Inkjet News Cyprus, Malta
Inkjet can be deinkable:

- Video
Inkjet with Pre-treatment

Fujifilm
JetPress 720
180 ppm (A4)

71st Annual Technical Conference · Minneapolis, MN · 2019
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*
KBA RotaJet 76: “Polymer Ink”

First tests in 2014, also at Drupa 2016

Polymer ink coagulates after jetting
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
Indigo
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)
But: Only on coated paper, uncoated:

Uncoated paper according to KM not used for high quality images
... on uncoated:
UV curable inkjet I
UV curable inkjet II
Landa, Drupa 2016
Landa
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 (Citeo, F)**
INGEDE ...

- Discussion and joint testing with ink manufacturers in Germany, Europe, US and Japan
- Discussion with all OEMs
- Discussion with printers and associations
- to be continued ...
INGEDE. We are the Deinkers.

Thank you.

www.ingedecom