HP Digital Print Recycleability –
LEP and Inkjet Deinking
Flotation Process for Deinking

De-Inking Schematic

Source: “Paper Recycling and Inkjet Printing“, Don Burns, Kodak

Flotation Cell -- Video filmed by CTP Lab, France, 2009
Current HP Indigo ElectroInk (v4.0)
**HP Indigo ElectroInk 4.0**

Single-Loop Deinkability on 5 out of 6 papers tested

<table>
<thead>
<tr>
<th>Speck contamination (mm²/m²)</th>
<th>170 g/m²</th>
<th>135 g/m²</th>
<th>115 g/m²</th>
<th>140 g/m²</th>
<th>148 g/m²</th>
<th>130 g/m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>COATED</td>
<td>#1</td>
<td>#2</td>
<td>#3</td>
<td>#5</td>
<td>#6</td>
<td>#4</td>
</tr>
<tr>
<td>UNCOATED</td>
<td></td>
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</tbody>
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INGEDE/ERPC goal

Data collected by CTP France, using CTP Single Loop Wood-Free Deinking Test

‘Specks’ on Coated #3:

‘Specks’ on Coated #1:
HP Indigo Print Deinkability and Recyclability

- HP Indigo prints are deinkable and recyclable
  - Electroink 4.0 (launched in 2004) shows significant improvement in deinkability compared to previous ink generation
  - In 2009 single-loop tests at CTP with HP Electroink 4.0, HP concluded 5 out of 6 papers met general guidelines for deinkability
  - Oct 2009 NewPage paper company Pilot Trial at Western Michigan University successfully deinked mix of HP Indigo prints / standard Officepak furnish; 12 ton Indigo print Mill Trial planned for NewPage deinking mill
  - HP Indigo Israel facilities selling 60+ tons/month HP Indigo prints for recycling
  - HP Indigo presses support 800+ substrates with environmental credentials, many of which include recycled content (30% - 100% PCW)
HP IJ Print Recyclability Research
Promising Deinkability on Range of Papers

Data collected by PTS Germany using ‘MM1’ conditions (similar to Method 11 but lower pH, and lower shear; pH range before flotation is 8.6 to 8.9)
HP T300 Color Inkjet Web Press
Print Recyclability & Deinkability

• HP pigmented ink showing “promising floatation deinkability”¹
  – Promising independent test lab results (PTS, Munich) on 4 papers, even w/ nominal INGEDE Method 11 Oleic Acid ‘collector’ chemistry
  – Industry trends (low shear pulping, lower pH) enhance inkjet pigment deinkability

• Collaboration w/ deinking paper companies will provide robust proof of deinkability at mill-scale
  – Simple lab-scale tests (e.g. INGEDE Method 11): limited assessment value
  – HP Labs ‘HPES’ flotation chemistry: significant promise for digital & analog prints

• Paper design & additives can further enhance inkjet deinkability
  – ColorLok results: “enhanced deinkability (compared to non-ColorLok office papers)” ¹
  – Bonding Agent effects being confirmed using revised test methods

¹ Dr. Elisabeth Hanecker, PTS Deinking Lab, Germany

Bottom line: Put HP Inkjet prints in normal recycling collection bins. HP will ensure ongoing compatibility with recycling industry as volumes increase.