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Strategies for Digital Grade Development

Paul Busche – LIBERTY HALL, KIMBERLY WI. • APRIL 30, 2009

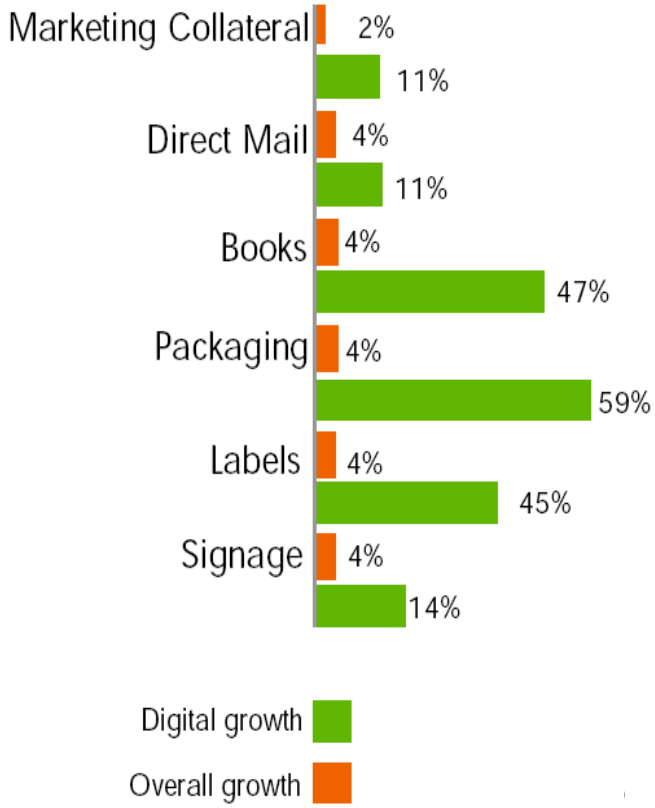
Presentation Outline

- LEP Digital Media
- Inkjet Digital Media
- Digital “Life Cycle”...Brand Strategy

Digital Grade Development

- What's driving the growth?
  - Break-even point
  - Creating new digital pages
  - Deconstruction/Reconstruction of the value chain
  - Environmental considerations

Source: HP internal estimates



Important Media Characteristics for "LEP" Digital Printing

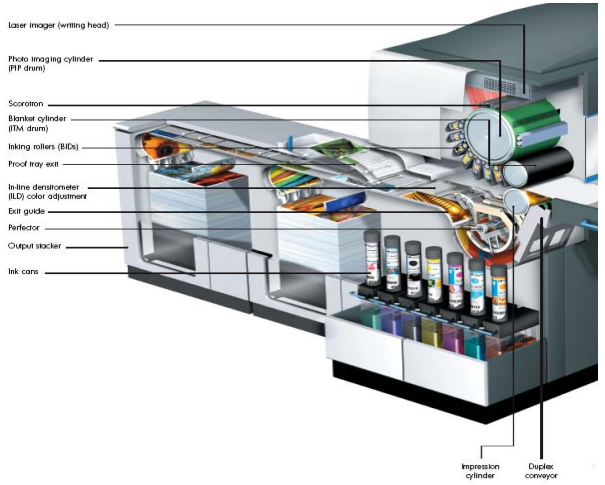
Evaluate key sheet properties built around conventional printing

Moisture level	
Macro scale electrical properties	
Smoothness	
Formation, evenness	
Thermal properties	
Surface chemistry	
Runnability, reliability in production and in post processing	

Source: OPPT Elvis Report 2005.

Conventional “LEP” Treatement

- Paper treatment during converting process
- Shelf-life limitation
- Sheet whiteness reduction
- Treatment logistics issue
- Costs of treatment



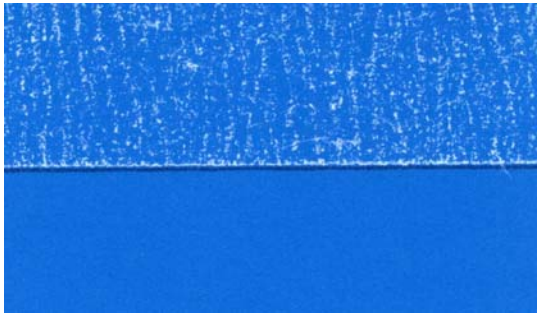
“LEP” Media Project

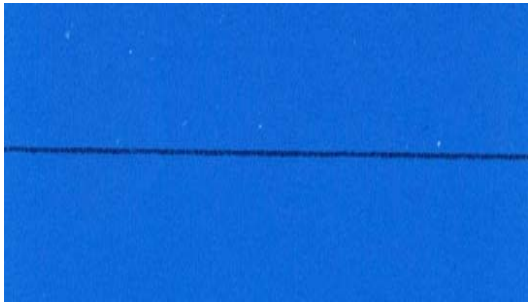
- **Scope:** Exceed performance targets certified by Rochester Institute of Technology.
- **Solutions:** Size Press & Coating Approach Based on Patented Technology & Proprietary Formulas.
- **Value Proposition:** Develop a premium digital technology to meet industry performance targets by removing the performance barriers of the current industry standard, “Sapphire Treatment”.

Sapphire – is a trademark of Hewlett-Packard

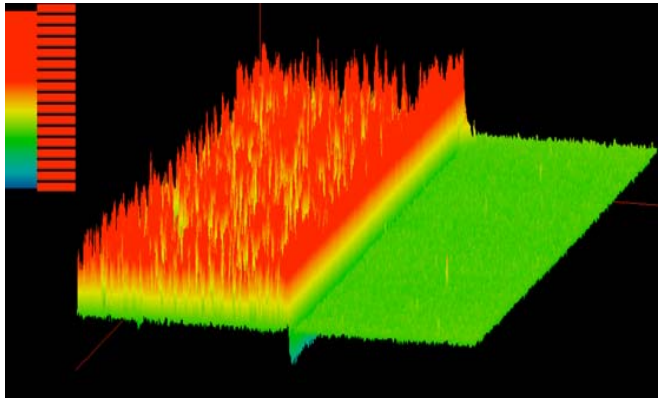
“LEP” Ink Adhesion

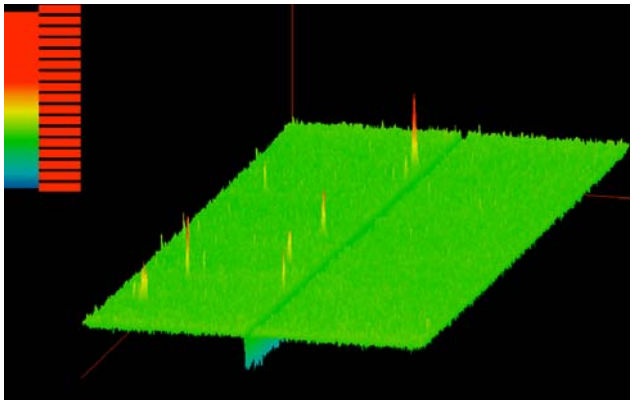
Pull Test





Digital Image

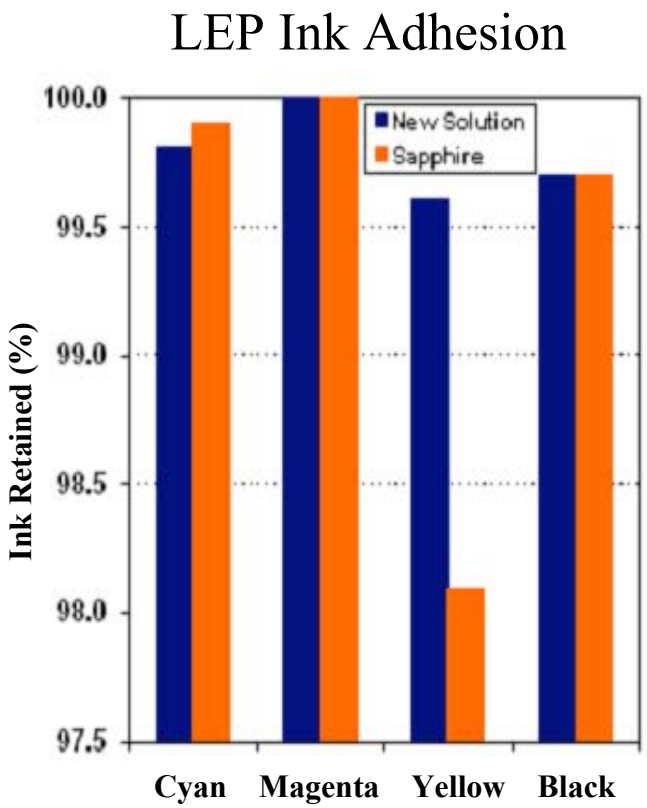


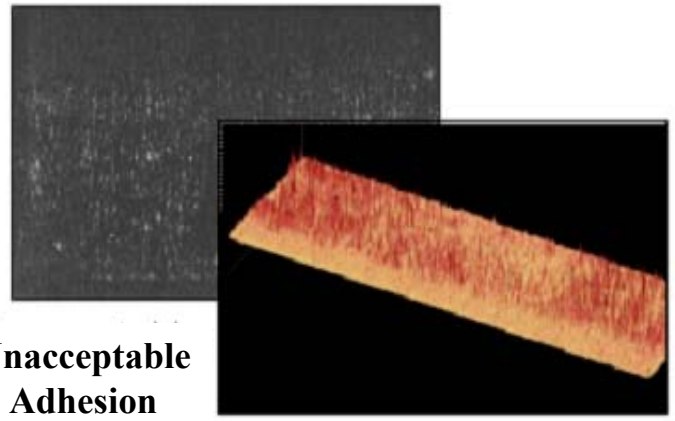


Surface Starch only

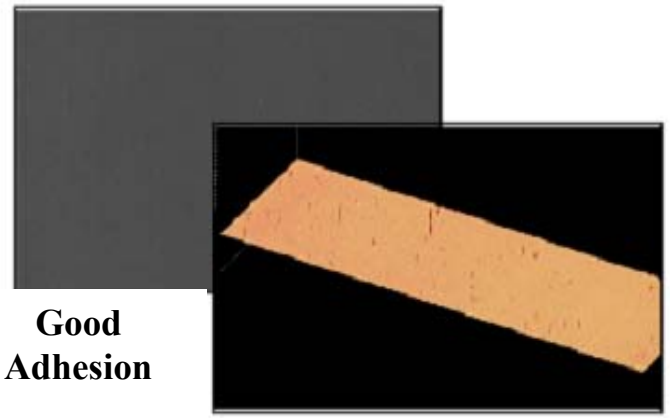
With Surface Treatment

Ink Adhesion Evaluation at RIT Printing Application Laboratory





Unacceptable Adhesion



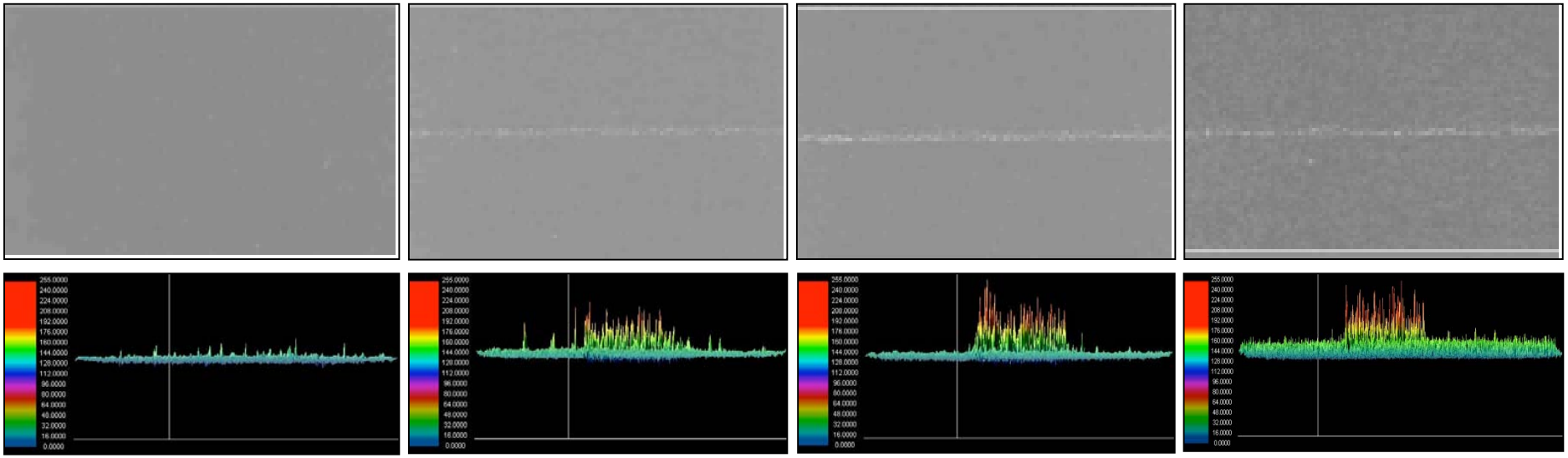
Good Adhesion

New Technology ≥ Sapphire Treatment

Sapphire – is a trademark of Hewlett-Packard

Adhesion Evaluation for Black Targets

Good → Bad



It is **important** to determine ink loss along the crease because:

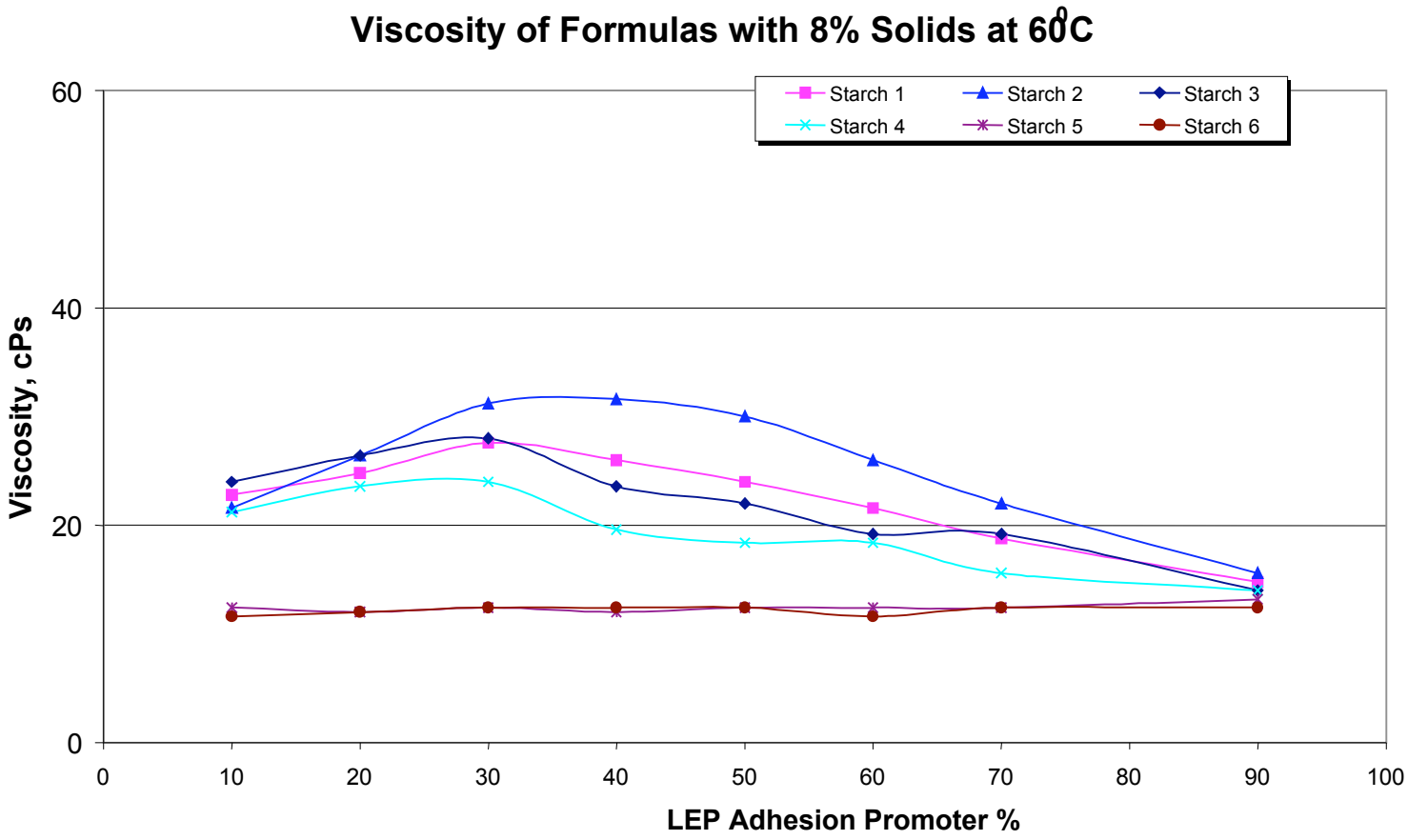
- It is related to finished quality and functional performance
- Fracture can result in ink loss

“LEP” Experimental Process

- Solution Makedown
  - Adhesion Promoter
- Handsheet Preparation
- Ink Adhesion Tape Pull Test
  - “LEP” digital press
  - Test patterns
- Machine Trials
- RIT Print Certification
  - Screen Test
  - Full Test

HP Indigo – is trademark of Hewlett-Packard

Starch Compatibility



"LEP" Ink Adhesion Pull Test Results

Sample Description	10 min pull test	2 hr. pull test
Starch Control	50% mono; 4 color delamination	50% mono; 4 color delamination
Formula 1 : 65% LEP Promoter		
at 10.2 gsm	99% mono and 4 color	99% mono and 4 color
at 16.5 gsm	99+% mono and 4 color	100% mono; 99%+4 color
at 21.5 gsm	100% mono and 4 color	100% mono and 4 color
Formula 2 : 50% LEP Promoter		
at 10.7 gsm	98%mono; 100% 4 color	98% mono; 100% 4 color
at 16.5 gsm	100% mono and 4 color	100% mono and 4 color
Formula 3 : 50% LEP Promoter+10% V. C.		
at 10.2 gsm	98%mono and 4 color	98% mono and 4 color
Sapphire treatment	99% mono and 4 color	99% mono and 4 color

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“LEP” Project Results

- Pull test improvement from 50% standard paper to 99+% LEP adhesion - Exceed RIT certification requirements (3 Star >90%)
- Pick-up weight as a tool for different surface condition
- Ink adhesion comparable to Sapphire treatment level
- No performence limitations or “shelf-life”
- No sheet whiteness reduction
- Paper treatment is improved – on-line process
- Competitive cost...”Insurance Policy”

Cost Vs Performance

Developments Process

On machine treatment

- 70% cost reduction

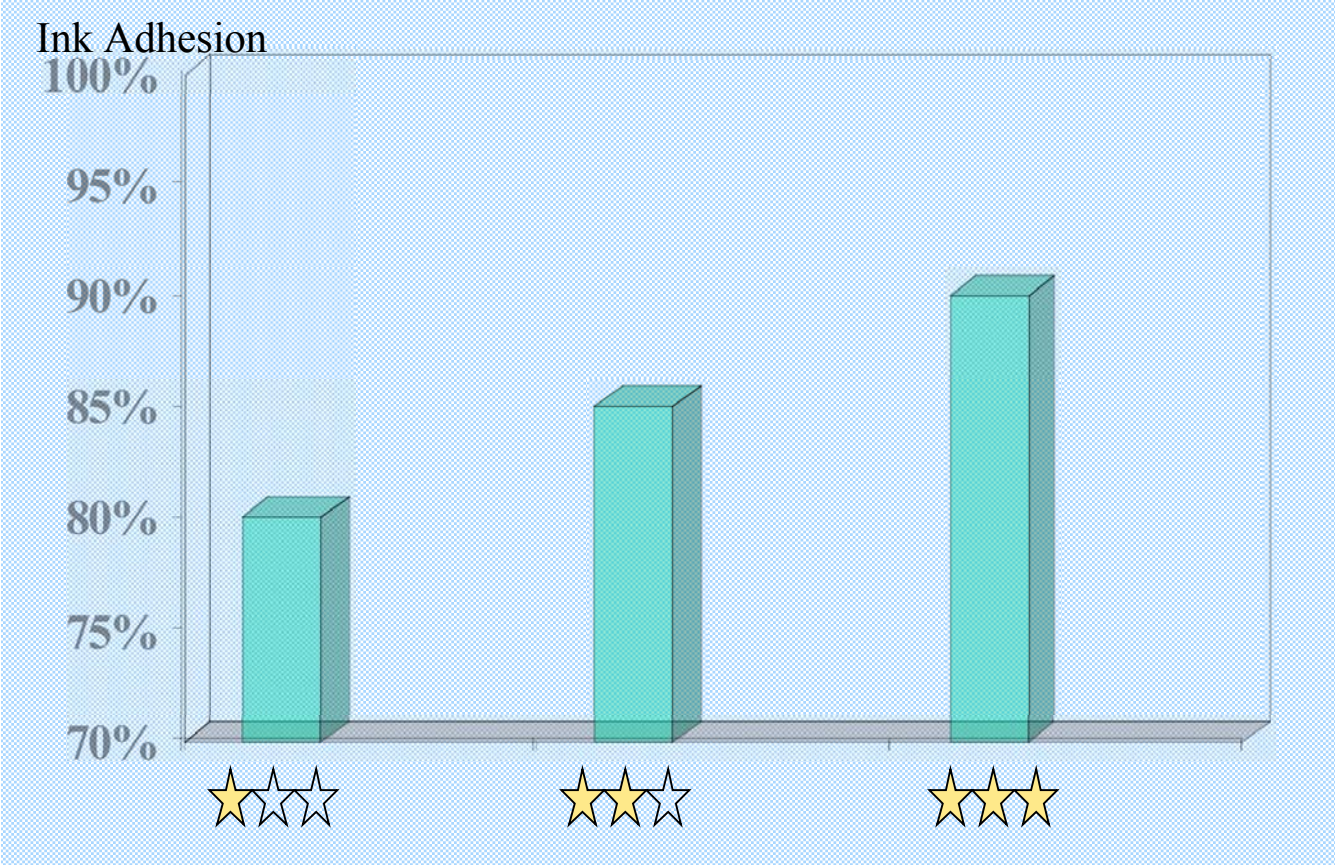
Optimized Size Press Coating Formulations

- Formulation knowledge & modifiers developed to optimize solids and viscosity control.
- Manage sheet surface strength & blanket compatibility
- $ 30 – 150 per ton

* (< 3/10ths cent per page)

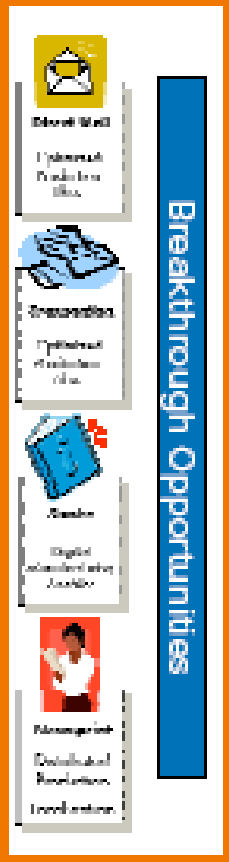
Optimized Latex Coating Formulations

- $ 10 – 50 per ton



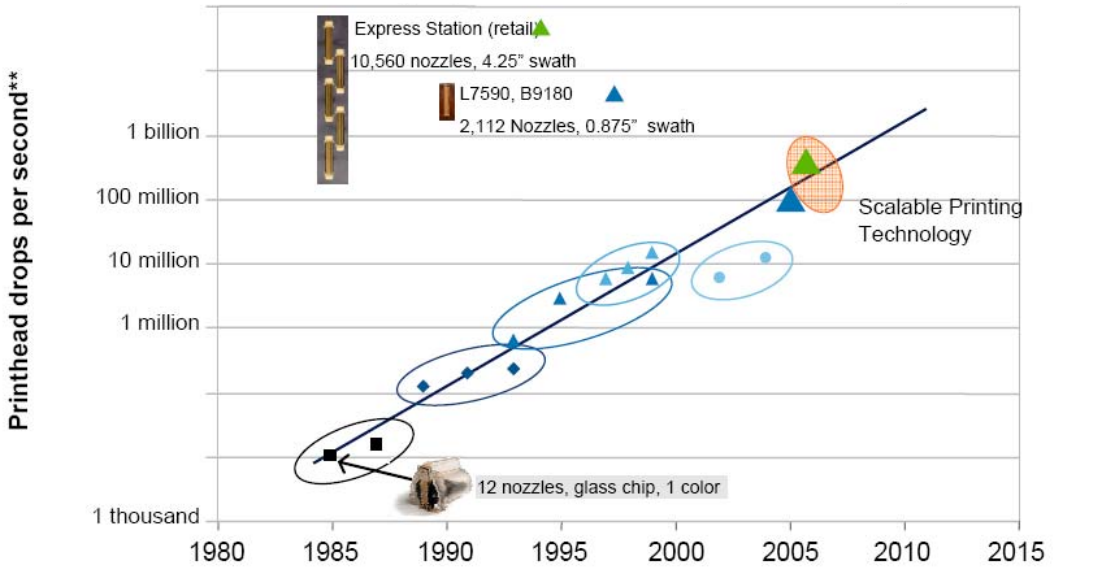
Inkjet Media

Inkjet Is Breaking Boundaries



Faster Inkjet Print Speeds

Enabling Small Business Customers to be more productive



* Based on per printhead comparison

** Product of (drop rate) X (number of nozzles) on a single silicon chip
Used for comparison purposes, not necessarily achieved in practical print modes

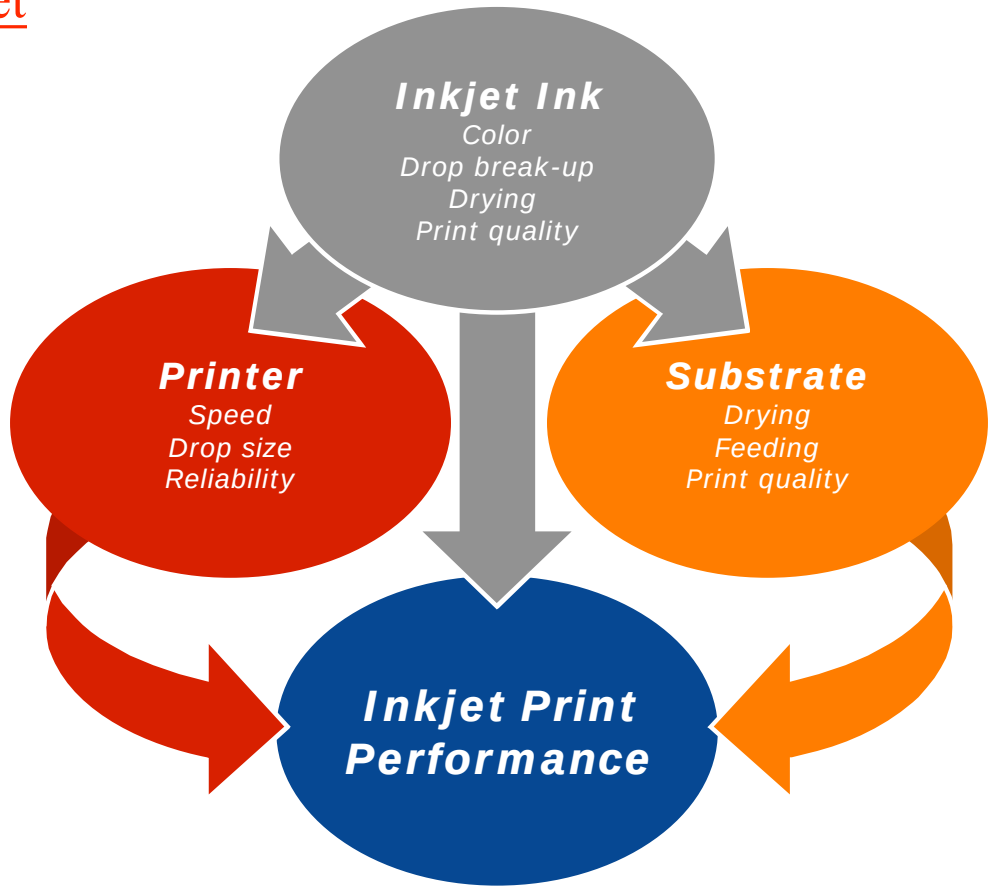
14 4 February 2009

Inkjet Media Requirements

Performance Targets Set By the Market

- Pigment Inks achieve a step change in optical density
- High print quality/color gamut
- High waterfast/good wet-rub resistance with color inks

- Industry standards being set for cut sheet, i.e.. ColorLok
- Commercial Media...TBD



Inkjet Media Challenge & Opportunity

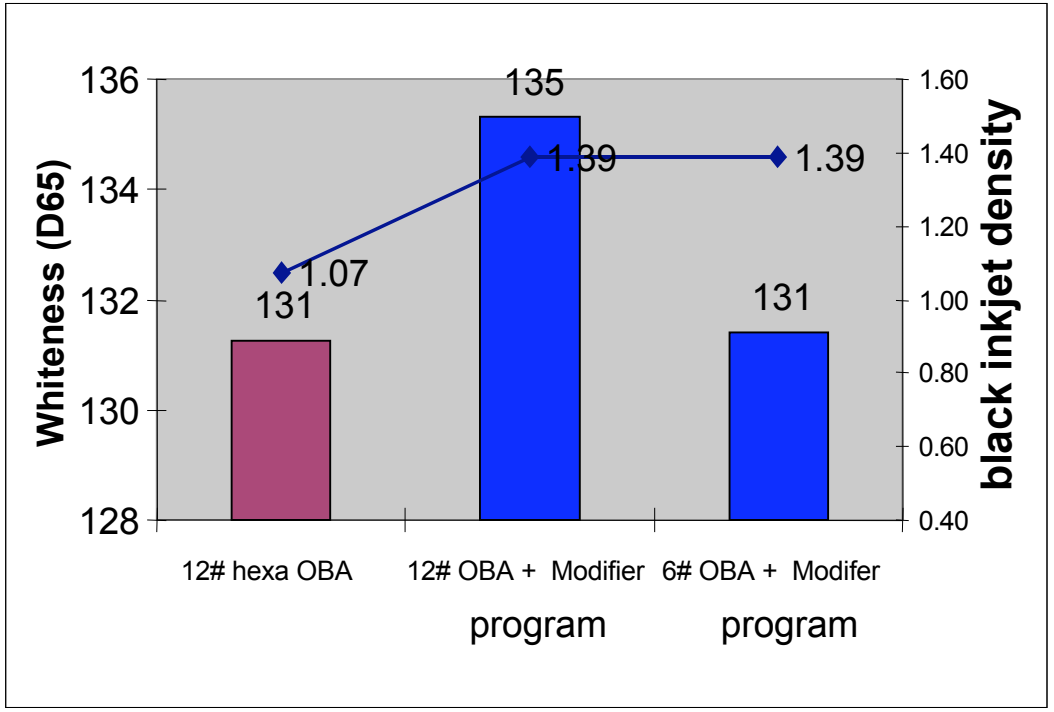
Need to define what the commercial printers are asking for by market?

•What performance gap is acceptable?

- Overall quality and paper types
  - Commodity, Treated, Coated…Targets?
- Costs
  - Inkjet paper in the low price / high turn world, or premium low volume promotion media.
- Availability
  - New products, Initial volumes vs. demand potential. This is the “Chicken & Egg” dilemma.
- Sustainability
  - Offer a unique value proposition that the Advertisers & Consumers can accept.

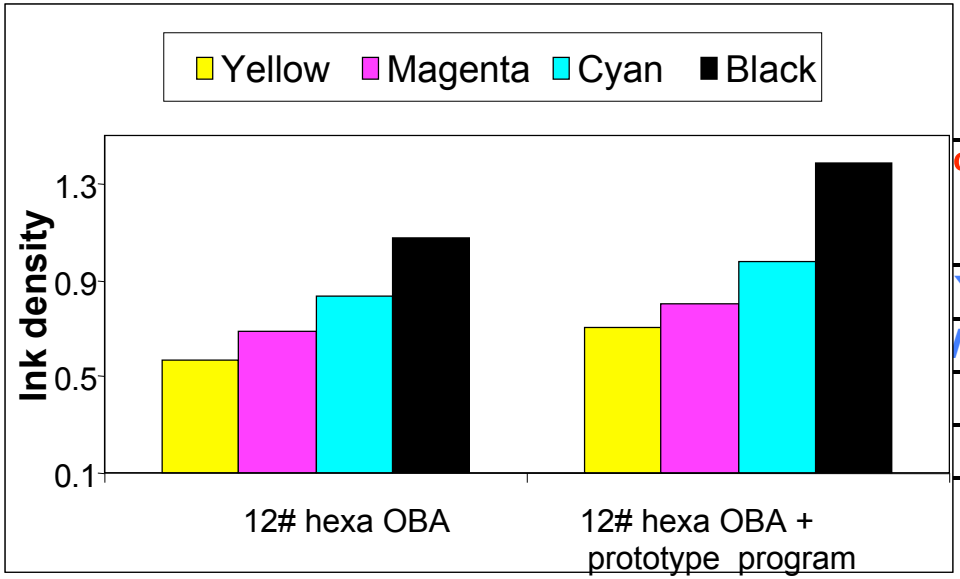
Future technology: Preliminary results

- Results for Pigmented black ink: whiteness values (bars) and print density (blue curve). was used.



Future technology: Preliminary results

- Results for color pigment ink sets



% Density Gain with Prototype	
Yellow	23
Magenta	17
Cyan	18
Black	29

Offense & Defense

Branding Sustainability

Marketing Strategy for Digital Print

- The paper or board used in the final product often is viewed as a necessary evil
- Increasingly, consumers are confused by the certifications & logos
- NGO's continue to attack "Print Media".

New Drivers Make Sustainability a Critical Issue

Expenses	Rising resource cost & availability plus waste treatment and disposal
Regulations	Emissions to Water, Air, Soil
Retailers	"Green Procurement": pressuring suppliers on sustainability
Consumers	Pressuring industry on sustainability: responsible fiber sourcing, recycle content, clean production, use of renewable resources

Fiber Has Been the Most Visible Target To Date

- The focus of the campaigns has been to ensure that the fibers used come from forests managed using sustainable forestry practices

- There can be real consequences to the campaigns…business has been won or lost based on how a company performs in the area of sustainability
  - APP, Verso, etc.

Evolution of Sustainability

Next…

- Carbon Foot Print
- "Life Cycle"

"Do You Know Where Your Fiber Came From ?"

Fiber Type ✓

"Are You Managing Your Production Resources ?"

- Energy Source & Efficiency
  - Wind & Biomass
  - Boiler Efficiency
- Increase mill closure
  - Dilution H_2O Technology
  - UF & RO

Carbon Footprint ✓

"How Does Print Compare to other media ?"

- Promote Fiber as a renewable resource
- Compare recycle recovery rates & fiber life cycle.
- Digital Print utilization & production efficiency
- Digital Print response rates

Print Life Cycle ✓

WWF

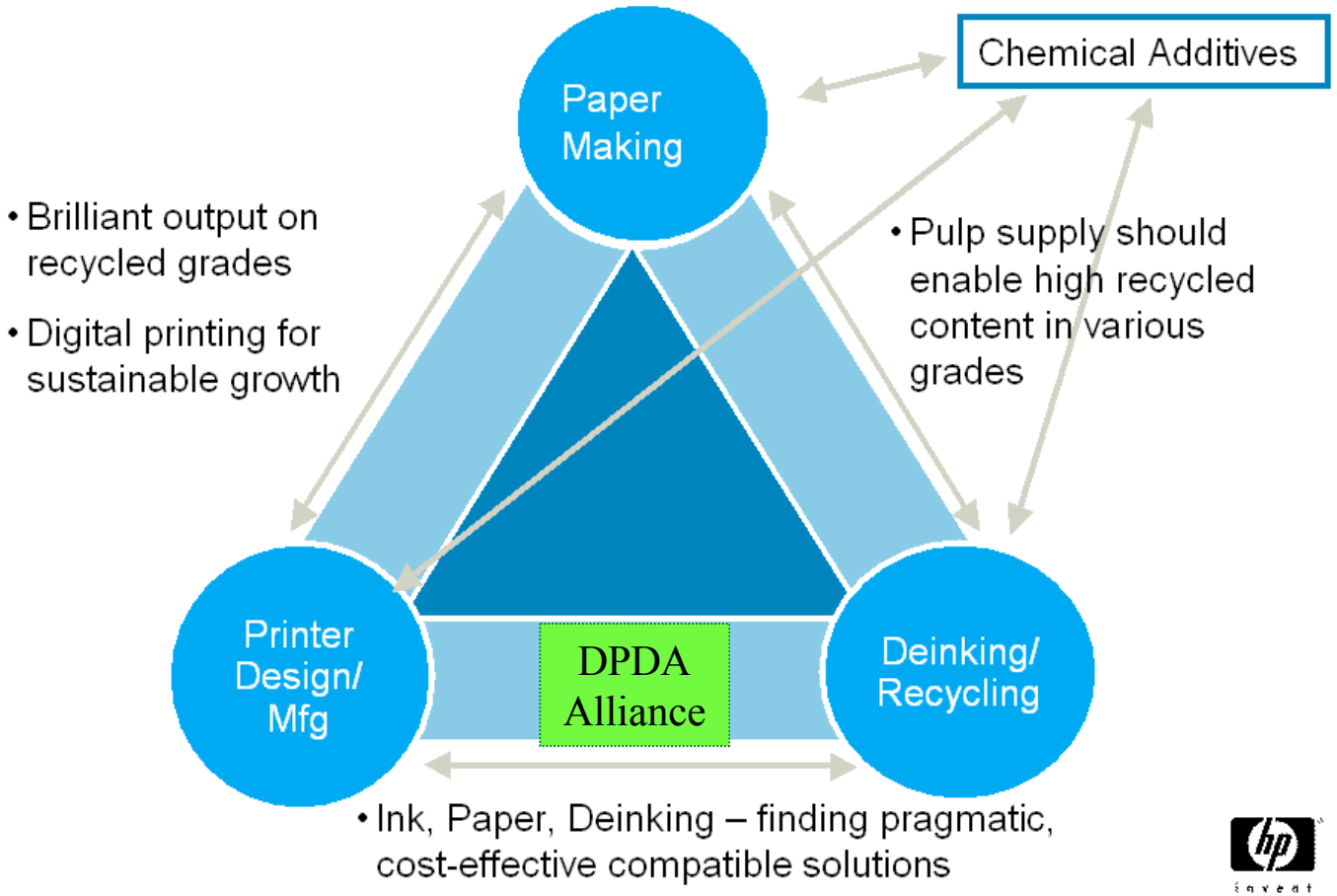
Benchmarking & NGO Validation

Sustainable Digital Print Solutions
Creating Value for Key Stake Holders

New Business Model: Inter-industry cooperation will be the key

Develop & Manage…

- Base Sheet Design
- Paper Chemistry
- Deinking Programs
- Print Environmental Foot Print or "Life Cycle" Analysis



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