Proofing Technology

Presented by: David Watterson
Art Director, GATF
Defining proofs

• Content proofs
  – Preliminary proofs to verify whether text or graphics are positioned correctly on the page
  – Imposition proofs to verify arrangement of pages on plate in reference to the full sheet, and bleed, trim, registration marks, lead edge, etc.
Contract proofs

• A prediction of final reproduction on press
  The standard for contract color approval have historically been photomechanical proofs (Matchprint, Cromalin, Waterproof)
Today in an all-digital environment, we’re seeing a convergence of these two types of proofs:

- As level of an “acceptable” contract proof is redefined,
- As technology advances and quality of digital proofing devices improve.
Categories of Proofs

- Press proof
- Off-press photo mechanical proofs (Analog proofs)
  - Integral (single-sheet) proofs
  - Overlay proofs
  - Laminate proofs
  - Adhesive polymer/dry powder proofs
  - Single-color photomechanical proofs
- Digital proofs
  - Soft proofs
  - Hard proofs
Press Proof

- The first proofing method was to actually put the job on press! The press used was often a small offset press, called a “proof press.”

- This small press attempts to simulate the reproduction characteristics of much larger offset, gravure, or flexo presses.
Analog Proofs – Overlay Proofs

• These proofs are made by exposing and processing dye-coated sheets of clear plastic
  • Each sheet shows one of the process colors
    • Black
    • Cyan
    • Magenta
    • Yellow
Overlay Proofs

• These sheets are taped down in register to either a very reflective white base, or sometimes to the actual paper to be used for the pressrun.

• Unfortunately, all these layers of plastic absorb some of the light—making overlay proofs appear darker than the printed page.
Analog Proofs – Laminate Proofs

- This is most common analog proof still in use
- Laminate proofs (such as Imation’s Matchprint system) use dye-coated sheets of very thin plastic which are laminated to a carrier (or base) sheet
- Each colored sheet is laminated, exposed photomechanically, and then developed
Adhesive Polymer/Dry Powder Proofs

- Adhesive polymer/dry powder proofs obtained popularity by allowing virtually any spot color to be represented
  - DuPont’s Cromalin requires mixing a small quantity of dry powder (toner)
- Printshops often created a Matchprint and then placed one or more layers of Cromalin on top to show the spot colors
• An example of a single-color proof is DuPont’s polymer-based DYLUX material, also known as “blueline” material
  – According to Dupont, bluelines are still the most widely used proof for final sign-off in the world today
Leading digital proofing technologies

- In terms of replacing analog proofs for contract (or final approval) quality prepress proofs, the leading technologies are:
  - **Thermal laser ablative**
    - These are screened halftone digital proofing devices
  - **Inkjet**
    - Drop on Demand (DOD) inkjet
    - Continuous Flow inkjet
Thermal Laser Ablation

• Laser ablative devices use the energy of a tightly-focused laser beam to ablate (remove) dots of pigment from a donor sheet

• These dots of pigment are then transferred to the proofing substrate
Benefits of ablative technologies

- Proofing colors are determined by ink sheets and can use the same pigments as CMYK standard offset inks.
- Ink sheets vary little, making a stable standard.
- Color management not required – as with inkjet systems.
- Little calibration needed. Only adjustment needed is setting dot gain curve.
- Pigment is transferred directly to paper and paper from actual press run can be used.
- In RIP-once-out put-many environment, dots will be identical to those on the printing plate.
  - You can see the dots and catch moire patterns.
Downside of ablative technologies

- The cost of consumables is almost the same as analog proofing systems about $12 per sq/ft.
- There generally aren’t donor sheets for all spot colors - makes packaging work difficult to proof.
- The manually-operated systems are very labor intensive.
- Cost of the equipment is high - can go over $100,000 for some systems. This includes the same high replacement costs for solid state lasers that you see in the CTP market - could be up to $30,000 to replace a laser.
Polaroid’s PolaProof

- Polaroid introduced its first laser ablation halftone proofer in 1997
- The laser produces a 10 micron spot, which can simulate halftone dots with frequencies up to 400 lpi with resolutions of 2400 or 2540 dpi
- Polaroid donor sheets contain a “dynamic release layer” which contains molecular aluminum. This is expanded by the laser’s heat, which literally explodes the pigment onto the substrate
Polaroid’s PolaProof

• The original PolaProof line require manual loading of substrate and colorant sheets
• After the proof has been imaged it must be laminated using a separate device
Inkjet: the next big thing

• Inkjet technology - is rapidly overtaking the digital proofing market

• Let’s take a look at the two technologies
  – Continuous Flow Inkjet
  – Drop-on-Demand
Continuous Flow Inkjet (CFIJ)

- CFIJ is the technology behind long time professional digital proofing systems CreoScitex Iris and Dupont Digital Waterproof
- System manufacturers claim CFIJ proofers produce smaller droplets than DOD systems
- Systems have been around for years, so they’ve had time to develop better
Continuous Flow Inkjet: how it works

- **Continuous Flow** ink jet systems apply a static charge to the droplets intended for the substrate.
- Uncharged droplets are collected and recycled.
Dupont Chromalin iG2 and iG4

- Currently offered CFIJ inkjet proofing system
- Media sizes:
  - iG2 - 15.75 x 22” media
  - iG4 - 28.3” x 22” media
- Resolution options
  - 304.8 dpi
  - 609.6 dpi
- With ChromaNet Proof server, RIP and color management
CreoScitex (Iris Graphics) IrisPrint

- Continuous flow inkjet proofer with variable-sized droplets of ink
- Improvement to the ink nozzles - IrisPen technology reduce clogging
- Resolution options
  - 300 - 600 dpi
  - The variable sized droplets are claimed to produce a perceived resolution of up to 2400 dpi.
Drop-on-Demand Inkjet (DOD)

• Large format DOD inkjet systems have been around for years in the “print for pay” market where the final product is the proof itself.

• Until recently, large format DOD systems have had a home in prepress and printing facilities mostly as imposition proofers.
  – Imposition proofs mean that precise color doesn’t matter, the proof is used to show how the print job is imposed for the press.
Drop-on-Demand Inkjet (DOD)

- With the introduction of the Epson 9000 in 1999, DOD systems began to gain acceptance as color contract proofers.
- Most systems today use more than the 3 or 4 colors earlier DOD systems used.
- 6 color and even 8 color devices improve color gamut and ability to reproduce Pantone, hexachrome or HiFi color matches.
  - But color management software must be used for accurate color reproduction.
Drops and Dots

- A drop, or droplet, is the smallest amount of each color of ink fired from the printhead
  - Sizes are measured in Picoliters (pl)
- A dot is the cluster of ink drops that look like a small dot on the page. A dot is made up of one or more colors and is measured in microns
  - But these are not screened halftone dots!

A droplet of ink

A dot
Epson Stylus Pro 7000 & 9000

- First DOD system to be able to output what was considered contract quality inkjet color proofs
- Media sizes:
  - 7000 up to 24” wide,
  - 9000 up to 44” wide
- Resolution options
  - 1440 x 720 dpi
  - 720 x 720 dpi
  - 360 x 360 dpi
- With EFI Fiery RIP
  - Postscript level 3 & PDF capable
  - Full Pantone color seps internal to RIP
Hewlett Packard HP 5000

- Introduced at Seybold 2000, the HP 5000 raises the bar in color inkjet with addition of wider 6 color printheads and high nozzle volume
- HP color thermal inkjet print technology
- Resolution options
  - 1200 x 600 dpi maximum
- Media widths
  - 42” and 60” wide for roll-based
- Speed
  - 8-up proof images in 6 minutes!
  - Compare to 25 minutes for Epson 9000 or 38 minutes for IR thermal half-tone proof
Agfa Sherpa 43/54/62

- Multi-density 6 color Piezo drop-on-demand systems
- Resolution options
  - 1440 x 720 dpi
  - 720 x 720 dpi
  - 360 x 360 dpi
- Media widths
  - 42” and 60” wide for roll-based
- Speed
  - 8-up proof at 720 x 720 images in 8 minutes
- Comes with dedicated spectrophotometer and ColorTune color management system
Benefits of inkjet technologies

• Major cost savings!
  – Consumables, much, much less expensive
  – Proofing devices much less expensive than thermal ablative

• They are generally faster than other proofing methods
  – Roll-based units can be queued up to run unattended

• They can be color managed
  – Thermal ablative technology, like analog proofs, are fixed by their color ant sets, so you cannot really color manage them
  – Inkjets, with their more than 4 color capabilities, allow for the reproduction of a number of color gamuts
  – Can color manage to match the press!
Downside of inkjet technologies

• Screening method is stochastic - no halftone dots
• Without color management, it is difficult to control the color on inkjet proofers
  – Much wider gamut than an offset printing press
• Still some market perception that inkjet proofs can’t be true contract quality
  – Will have to “sell” the concept to clients and maybe press operators
• They must be regularly maintained
  – Calibration is a 15 minute to 1/2 hour process
  – Clogging of nozzles has been an issue in past
Dye Sublimation

- Also called Thermal Dye Diffusion, these proofers utilize thin plastic color donor in the form of a roll, usually referred to as a ribbon.
- A single ribbon carries all four process colors:
  - the first quarter of the ribbon is yellow, the second quarter is magenta, the third quarter is cyan, and the final section is black.
- Signals from the microprocessor cause a motor to fast-forward through the ribbon to the appropriate color section.
Kodak
DCP
9000
Dye Sub: How it Works

• The dyes on this ribbon are turned into gas by the application of thermal energy – not a laser beam!

• A small metal strip is heated to one of 256 different temperatures to produce the needed thermal energy

• This vaporization occurs in close proximity to the special receiver paper, which absorbs (or sublimates) the colored gas
Dye Sublimation

• Until the advent of quality inkjet, one of the major digital proofing technologies used

• Advantages include:
  – Low cost of both the device and the consumables
  – Easy to set up and maintain

• Disadvantages include:
  – Low resolution (300 to 400 DPI maximum)
  – Difficulty rendering certain colors in shadow areas
Laser Dye Sublimation

• This term refers to the Kodak Approval’s method of imaging proofs
  – the principle is similar to laser ablation

• The Approval images proofs by using a laser beam to vaporize varying amounts of colored dye from a donor sheet
  – The laser turns each spot of color into gas, which is quickly deposited onto a sheet of silver mylar
  – After all colors have been sublimated, the mylar sheet transfers the CMYK image onto the final substrate
Kodak Approval XP-XP4

- Produces true halftone dots
- Resolution
  - 2400 or 2540 dpi (must be selected at time of purchase)
- Media size
  - XP - 2 page, XP4 - 4 page on many different substrates
- Interface & special features
  - Can interface with many different RIPS, ROOM
  - With Recipe Color - metallics and full Pantone set can be reproduced
Kodak Approval XP4
IR Thermal Laminate

Proofs

- Imation’s Matchprint Laser Proof allows the creation of proofs with exactly the same halftone dots that will appear on the plate.
- Using your platesetter, you’ll image heat-sensitive materials with a thermal laser.
  - CreoScitex uses Imation Matchprint Laser Proof for the Spectrum proofing option on Trendsetters.
  - Presstek has also integrated this material to work with it’s platesetters - the system is called PEARLhdp.
Dot Do’s

- Once school of thought believes that halftone dots are required on contract proofs as the only way to show moire patterns and complex trapping.
- There is a comfort level associated with dot-based proofs; we’re used to seeing them.
- Dot-based proofing systems, like laser ablative or IR thermal laminate proofs, use colorants that more closely match printing inks.
Dot Don’ts

• The other school of thought holds that there is no advantage to dots, especially in a digital proofing environment.

• Print buyers care about color accuracy, whether the printed product matches the proof:
  – Many wouldn’t even know how to examine dot structure.

• Advances in print heads, print engine technology and color management systems mean color fidelity of inkjet systems is only growing and is predicted to soon pass that of laser ablation technologies.
Bottom line: Money talks!

- The main reason that inkjet proofs, and most particularly, drop-on-demand inkjet systems will continue to gain market share is that they are much cheaper than other quality systems.
  - Equipment:
    - DOD inkjet engines can be had for $10,000 - $15,000
    - CFIJ systems can go for up to $70,000
    - Thermal ablative systems range from $80,000 to $200,000
    - Extras, like service contracts are priced accordingly, too
  - Consumables:
    - DOD inkjet proofs are about 1/4 the price of analog or halftone digital proofs!
Some dollar figures

<table>
<thead>
<tr>
<th>Material</th>
<th>List Price per sq/ft finished</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog Proof (average)</td>
<td>$12.50</td>
</tr>
<tr>
<td>Thermal Ablative (average)</td>
<td>$11.75</td>
</tr>
<tr>
<td>Digital Waterproof</td>
<td>$5.00</td>
</tr>
<tr>
<td>DOD with special papers</td>
<td>$3.50</td>
</tr>
</tbody>
</table>

Assuming a usage of:

- 10 4-up (22” x 28”) proofs per day or 42.78 sq/ft/day
- If 261 days of operation, total square ft usage per year
- Would be 11165 sq/ft per year

<table>
<thead>
<tr>
<th>Avg Sq ft</th>
<th>Total Sq ft/yr</th>
<th>Annual $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog proofing average</td>
<td>$12.50</td>
<td>11165</td>
</tr>
<tr>
<td>Thermal ablative average</td>
<td>$11.75</td>
<td>11165</td>
</tr>
<tr>
<td>Digital waterproof</td>
<td>$5.00</td>
<td>11165</td>
</tr>
<tr>
<td>DOD with special papers</td>
<td>$3.50</td>
<td>11165</td>
</tr>
</tbody>
</table>

Savings of $100K per year just in materials!
Remote Proofing

- When we talk about remote proofing, we mean providing some kind of a proof to the client at their site.
- This can take the form of a soft proof, an on-screen only representation of a piece of a piece.
- Or, it can be a hard proof, which will print out on a printing device placed on site with the client.
<table>
<thead>
<tr>
<th>File Name</th>
<th>Folder/File</th>
<th>Publishing Status</th>
<th>Reviewing Status</th>
<th>Type</th>
<th>Size</th>
<th>Uploaded</th>
<th>Modified</th>
<th>Annotations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rolers.tif</td>
<td></td>
<td>Annotations</td>
<td>In Progress</td>
<td>TIFF</td>
<td>75.373 mb</td>
<td>Mar-09-2001 01:50</td>
<td>Mar-09-2001 19:11</td>
<td>6</td>
</tr>
<tr>
<td>Hansa SCT</td>
<td></td>
<td>Annotations</td>
<td>UnReviewed</td>
<td>Sotex CT</td>
<td>422.324 mb</td>
<td>Mar-09-2001 01:51</td>
<td>Mar-09-2001 01:51</td>
<td>2</td>
</tr>
<tr>
<td>Test Target 2400DPI.ep</td>
<td></td>
<td>Annotations</td>
<td>UnReviewed</td>
<td>PostScript</td>
<td>65.259 mb</td>
<td>Mar-09-2001 02:03</td>
<td>Mar-10-2001 09:47</td>
<td>1</td>
</tr>
<tr>
<td>ChedBacon-P1.assg</td>
<td></td>
<td>Annotations</td>
<td>UnReviewed</td>
<td>Sotex Page</td>
<td>0.004 mb</td>
<td>Mar-09-2001 02:06</td>
<td>Mar-09-2001 02:06</td>
<td>6</td>
</tr>
</tbody>
</table>
RealTimeProof
Communication considerations

- The type of communication method used depends upon the number of proofs which will be generated on a daily basis
  - More obviously means a faster protocol will be needed
- Must be high speed connection
  - ISDN direct single line = 50 megabytes per hour
  - ISDN direct multiple line = 200 megabytes per hour
  - SDSL = speeds range from 50 mb to 400 mb per hour
  - Tier 1 internet T1 line = 400 megabytes per hour
  - Private direct T1 = 600 megabytes per hour
Remember... a reliable, consistent, accurate digital proofing system is the cornerstone of an all-digital workflow
Thanks for Listening!