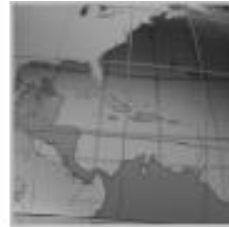


White Paper



Production Printing & Media



September 2015

Optimizing Print to Mail

The Pitney Bowes AcceleJet Printing and Finishing System

Service Areas:

On Demand Printing & Publishing

On Demand Printing & Publishing Europe

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Executive Summary

Pitney Bowes has announced a new product that fits well in the gap between existing cut-sheet electrophotographic and continuous feed inkjet color products. This gap, known as “the Zone of Disruption,” is an area where high-speed and cost-effective products are challenging existing offerings. To be viable in this zone requires an acquisition price less than \$1 million USD, high levels of productivity, and a running cost model below that of toner-based products. Pitney Bowes’ new AcceleJet printing and finishing system meets all of these requirements.

Key Findings

- **Fitting in the “Zone”:** At an average system selling price of \$850,000 and throughput exceeding 500 letter-sized images per minute, Pitney Bowes’ AcceleJet system will challenge current offerings in the “Zone of Disruption.”
- **Automation:** The integration of dynamic perforation, sheeting, and stacking on top of high-speed inkjet printing greatly facilitates print and mail automation for mid-volume users. The AcceleJet system can also be teamed with other Pitney Bowes products, such as the Print+ Messenger inkjet system and the Epic inserting system.
- **Mailroom expertise:** Effective automation extends well beyond the printing of pages, making Pitney Bowes’ understanding of mail processes another important part of the product’s value proposition.
- **Focus:** Pitney Bowes is focusing its efforts on two key target markets: transactional and direct mail. This includes print-for-pay and in-plant operations.
- **Footprint:** The product fits more easily into size-constrained environments than 20-inch continuous-feed offerings.
- **Affordability:** Continuous-feed inkjet products with web widths of 20 inches or wider have had remarkable success in the past few years, but not all users are able to afford a million-dollar plus price tag; particularly if they need to build in a second unit as back-up or disaster recovery as part of their capabilities. Getting underneath a million dollar capital acquisition level opens up new opportunities for these users.

Recommendations

- **The Right Fit:** End users investigating inkjet products should target the right mix of productivity, print volume, running cost, format, substrate choice, workflow, and quality levels suitable for their print applications.
- **Advanced Workflow:** Recent announcements open up the opportunity for users to make the move to color. Closely examine all current workflow needs to see whether new inkjet offerings will allow the shift toward white-paper-in/full-color out workflows: the first step toward true white paper factories.
- **Running cost:** Inkjet systems have the potential to bring improved running cost versus cut-sheet electrophotography. In addition to acquisition price, closely compare consumable, service, and substrate costs when assessing a move to inkjet.

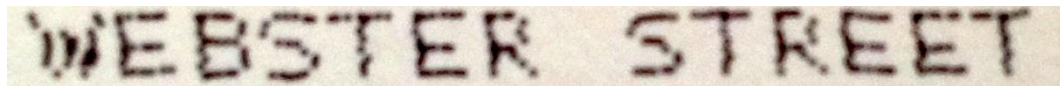
Introduction

Inkjet systems have transformed print and mail markets through their high speeds, strong productivity, and compelling running cost. Yet many of the systems available today require extremely high volumes to be truly effective. This is driven by the sizable capital acquisition investment and a running cost sweet spot suitable for tens of millions of impressions per month. Some vendors are beginning to provide more affordable systems that are designed for more easily attainable volume levels. The Pitney Bowes AcceleJet printing and finishing system is a good example of this. In this sponsored white paper, InfoTrends will explore the market trends that are driving users to cost-effective inkjet solutions.

Inkjet's Impact on the Production Digital Print Market

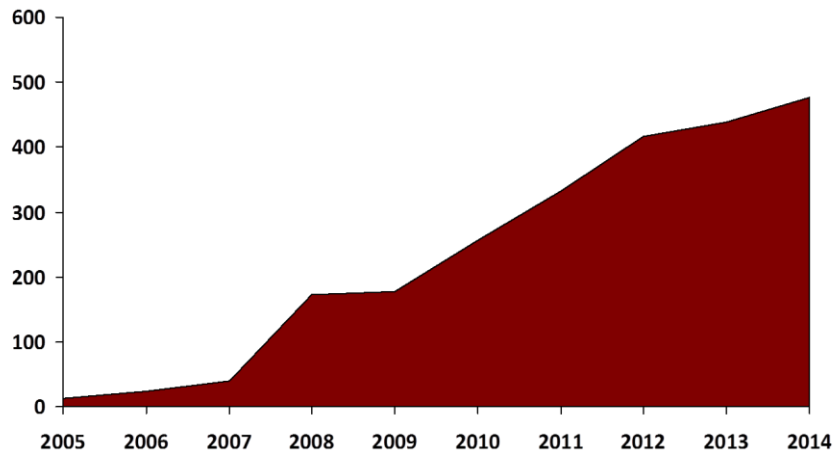
Inkjet technology has been used in the print and mail market for decades. For many years, the primary use of inkjet in document production was very high speed, with low resolution printheads used for addressing envelopes or publications. These types of addressing systems remain in use today. That said, the quality level they produce, while capable of producing legible text, is not suitable for sharp text and line art. Nor can they produce suitable tints and halftones.

Figure 1: Magnified View of Low-resolution Monochrome Inkjet Output



It was not until around ten years ago that inkjet printhead technology began to achieve quality levels that were attractive for applications like bills and statements, direct mail, and books. Systems such as HP's Inkjet Web Press, introduced in 2009, offered a combination of high productivity and low running costs that were very suitable for high production volumes. Not long after these products reached the market, Pitney Bowes and HP announced a partnership to address the print and mail market. Pitney Bowes' IntelliJet printing system family is the result of that collaboration. In the years since that announcement, placements in the high-speed continuous-feed color inkjet segment have risen steadily. InfoTrends defines that segment by its duty cycle; that is, the maximum monthly volume level achievable. The volume that these systems can produce is staggering. They are capable of tens of millions of A4 or letter size color impressions per month. The introduction of this class of systems has had a broad impact on the market. In transactional print, they have facilitated the long-desired move to whiter-paper-in / full-color-out workflows that eliminate the use of pre-printed forms. They also make it much easier to add color economically, and to use that color for targeted and personalized messages in transactional documents and direct mail.

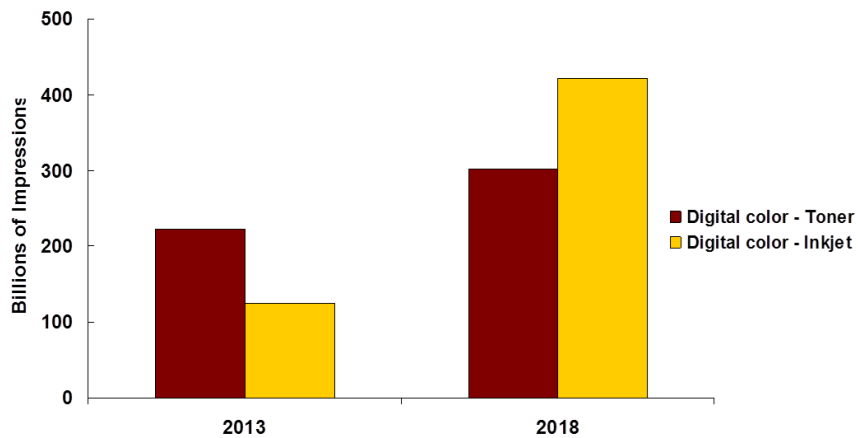
Figure 2: Adoption of High-Speed Continuous-Feed Color Inkjet (Worldwide Print Engine Placements, 2005-2014)



Source: InfoTrends Quarterly Tracker

A relatively small number of these color systems is producing a huge amount of print volume. In fact, InfoTrends expects that before long these inkjet systems will produce more pages than the entire installed base of production color electrophotographic systems. This is an amazing success story, in part because it is happening at a time when the number of pages produced on electrophotographic systems continues to grow.

Figure 3: Global Digital Color Toner and Inkjet Print Volumes Compared



Source: InfoTrends Global Production Printing & Copying Market Forecast: 2013-2018

These high-speed continuous-feed color systems are impressive, but at a capital acquisition price tag of more than a million dollars, they are not affordable to users with mid-range volumes, particularly when adding in pre- and post-finishing components that increase the system cost even further. The next stage of the inkjet revolution involves bringing the value of inkjet to a more accessible price point.

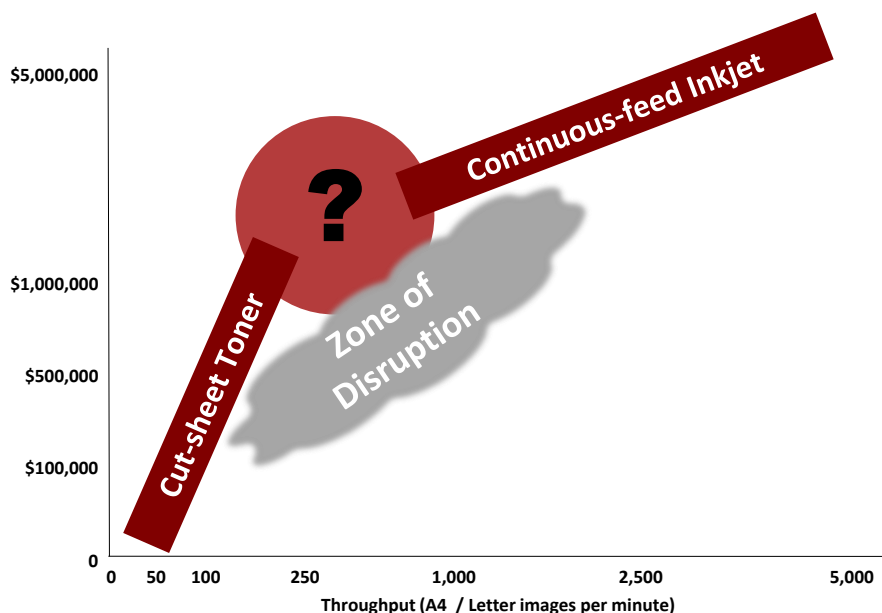
Inkjet and the Zone of Disruption

Two major classes of production color printing systems exist today:

- **Cut-sheet electrophotographic systems:** These systems have speeds of less than 200 images per minute (ipm) and are used for low to mid-volume short-run, quick turnaround, and print-on-demand work. They print at high quality levels across a wide range of substrate types.
- **Continuous-feed inkjet systems:** These systems can produce output at high speeds and very high volume with quality levels that are very well suited to transactional and direct mail applications.

There is a gap of unmet need between these two areas that InfoTrends calls the “Zone of Disruption.” There is a disruptive opportunity in this zone for new high-speed inkjet solutions like Pitney Bowes’ AcceleJet printing and finishing system.

Figure 4: The Zone of Disruption



About AcceleJet

Pitney Bowes’ AcceleJet printing and finishing system is a narrow-web, continuous-feed to cut-sheet, inkjet printing system capable of speeds up to 246 feet per minute (75 meters per minute). Intended for a monthly volume range of four to ten million letter/A4 images per month, Pitney Bowes is targeting the AcceleJet at market segments such as service bureaus, direct mailers, and in-house operations in nonprofits, financial services, insurance, healthcare, utilities, and government.

Figure 5: Pitney Bowes AcceleJet Printing and Finishing System



Table 1: AcceleJet Printing & Finishing System Specifications

| Metric | Description |
|-----------------------|---|
| System Type | four-color, single-engine duplex, one-up, tight web, continuous feed |
| Speed | Performance Mode: 246 feet per minute (75 meters per minute) for 536 letter-sized impressions per minute (505 A4 impressions). High Quality Mode: 164 feet per minute (50 meters per minute) for up to 358 letter-sized impressions per minute (336 A4 impressions). |
| Duty Cycle | 7.75 million letter (7.3 million A4) images per month |
| Printheads and Inks | Kyocera piezo drop-on-demand inkjet printheads supporting 600 by 600 dot per inch multi-bit resolution ¹ and printing water-based (aqueous) pigment inks |
| Maximum Web Width | 10" (254 millimeters) |
| Maximum Imaging Width | 9.75" (248 millimeters) |
| Media Weight Range | 60 to 120 gsm (16 to 32 lb.) |

¹ Pitney Bowes notes that its Kyocera heads produce output that is perceived to be equivalent to 1,200 dot per inch resolution because of the head’s multi-bit capability. So even though the printheads’ resolution is only 600 dot per inch, its ability to produce multiple gray levels gives the resulting output a boost. One explanation of the math behind this jump in perceived resolution goes as follows: Take the square root of the number of levels (in this case the four drop sizes) and multiple it by the resolution. Therefore 600 times two equals 1,200.

| Metric | Description |
|------------------------------|--|
| Maximum Input Capacity | Supports roll diameter up to 40" Multiple core sizes are available to support regional standards: 3", and 6" (U.S.); 70 mm, 76 mm, and 152 mm (elsewhere) |
| Maximum Output Capacity | Two 2,800-sheet stackers support a total of up to 5,600 sheets |
| Size | 25.3 feet (length) by 5.9 feet (height) by 6.6 feet (width) |
| Weight of Key Components | Total – 7,623 lbs. (Unwind unit – 1,323 lbs.; Print Engine – 3,300 lbs.; Finishing unit – 3,000 lbs.) |
| Digital Front End | AcceleJet Controller (PDF standard, IPDS optional) |
| Average System Selling Price | \$850,000 |
| Configuration Includes: | The print unit plus the AcceleJet PDF controller, an unwinder, and a finishing unit with dynamic cross and linear perforation, single-edge trim, sheeting, and stacking |
| Controller Option | IPDS |
| Finishing Options | Additional Dynamic Linear Perforation unit 2D Reader for Dynamic Perforation Recipe Full Bleed Option for Sheeter (includes two-edge trim, chip cutter, and waste evacuation unit) |

AcceleJet is a Pitney Bowes design that leverages two important partners: Domino (now owned by Brother) for the paper transport, and Kyocera for the print head technology. The AcceleJet system has some similarities to a narrow-web Domino product for label printing. Inside AcceleJet, five Kyocera printheads are assembled to produce a 21-inch array. One half of the array prints one side of the web, the other half prints the other side. There are two performance modes. In ‘Productivity’ mode, AcceleJet runs at 246 feet per minute and is capable of printing 536 letter-sized impressions per minute. In ‘High Quality’ mode, AcceleJet runs at 164 feet per minute and is capable of printing 358 letter-sized impressions per minute. Both modes run in 600 by 600 dot per inch resolution, but in ‘High Quality’ mode the system employs one additional drop size (four drop sizes in total compared to three for ‘Productivity’ mode).

Tight web paper handling is facilitated by dual web guides (one for each side of the web). The primary advantage of this tight web configuration is the control that it maintains over the web. This reduces the likelihood that the web will move side to side unexpectedly, while also improving the ability of systems to track the movement of the web through the system. It also provides firm control over the paper during printing and drying to avoid wrinkling or malformation of the final output.

Finishing is an important AcceleJet differentiator. Perforation can be done in parallel to or across the web. Pitney Bowes notes that up to 63 dynamic perforation ‘recipes’² are possible. A single-edge trim unit is part of the standard configuration, and can remove up to a half-inch strip. This is intended to remove trim, top of form, and dynamic perforation marks. Users wishing to print full bleed pages can add a second trim unit. A single-blade, rotary cutter converts the system’s web into sheets. These sheets can range in length from eight to 14 inches. The sheets then are transported via a shingle conveyor to a dual stacking unit. These two stackers support up to 2,800 sheets each (for a total of 5,600 sheets). Once one stacker box is full, the operator slides the shingled sheets back on the conveyor and moves the other stacker box into position. The conveyor and stack continues to advance and begins to fill the other stacker box. When a stacker box fills up, the system informs the operator. If the operator does not respond then the system slows down. It will stop on its own if the stacker box is not emptied in time.

To compete in the “Zone of Disruption,” products must have very compelling running costs. Pitney Bowes has provided an example showing its expectations of AcceleJet service and consumable cost for two typical transaction document pages (see Figure 6). In this example, at a volume of two million letter images per month, Pitney Bowes estimates the service and consumable cost for the higher coverage page to be well under a cent (and even less for the lighter coverage page). At higher volume, the service and consumable costs drop even further. This ability to handle low coverage color pages in an extremely cost-effective fashion is a hallmark of high-speed inkjet systems.

Figure 6: AcceleJet Service and Consumable Cost at Different Volumes



² A recipe defines where the cross and linear perforations occur for applications like remittances and coupons. For example, recipe #1 could execute a cross perforation at 3.5" and 9" on an 8.5" by 11" page. Recipe #2 could have a perforation across the page at 3.5" and a linear perforation from 3.5" to 0" in the center of the page. These recipes are preloaded into the system. A recipe is encoded into the print file, digested by the system, and executed dynamically. Recipes can vary from page to page (i.e., page 1 might use recipe #1, while page 2 has no perforation, and page 3 uses recipe #2).

Strengths, Weaknesses, Opportunities, and Threats

When looking at any production digital print device, InfoTrends discerns the product’s strengths, weaknesses, opportunities, and threats (SWOT).

Table 2: SWOT Analysis of the AcceleJet Printing & Finishing System

| Strength | Weakness |
|---|--|
| <ul style="list-style-type: none"> • Affordable price point and small footprint compared to 20-inch continuous-feed inkjet models • Volume capability targeted to needs of mid-volume users • Throughput up to 505 letter-sized images per minute • Integrated dynamic perforation, sheeting, and stacking | <ul style="list-style-type: none"> • Some sites will prefer a system with cut-sheet input rather than rolls |
| Opportunity | Threat |
| <ul style="list-style-type: none"> • Monochrome to color conversion; pre-printed form replacement; cost-effective mixed color and black & white output • Competing in the “Zone of Disruption” • Meeting the needs of continuous feed inkjet users with lower volumes • Providing a more affordable redundant back-up system • Transactional and direct mail environments that cannot afford Intellijet 2-up or larger offerings | <ul style="list-style-type: none"> • Cut-sheet electrophotographic and inkjet competition • Low-end 20-inch inkjet roll-fed competition • Narrow-web inkjet competition |

Inkjet Product Offerings from Pitney Bowes

With the addition of the AcceleJet, Pitney Bowes now offers four continuous feed inkjet solutions (see Table 3). No other vendor currently has products covering the one-up through four-up letter format range.

Table 3: Continuous-feed Systems Offered by Pitney Bowes

| Product Name | AcceleJet | IntelliJet 20 | IntelliJet 30 | IntelliJet 40 |
|--|---------------------------|---------------|---------------|---------------|
| Maximum Web Width | 10" | 20.5" | 30" | 42" |
| Maximum Throughput (Feet Per Minute – Color) | 246 fpm | 400 fpm | 600 fpm | 600 fpm |
| Maximum Throughput (Letter Images Per Minute – Color) | 536 ipm | 1,744 ipm | 3,928 ipm | 5,236 ipm |
| Duty Cycle (Letter Impressions per month) | 7.75 million ³ | 25 million | 75 million | 140 million |

Print+ Messenger and Epic

Two other Pitney Bowes offerings extend the impact of the AcceleJet system:

- Print+ Messenger:** The Print+ Messenger inkjet system is capable of producing personalized color images, messages, indicia, and addresses on envelopes at 600 by 600 dot-per-inch resolution at speeds of up to 26,000 pieces per hour for a #10 envelope. Its handles a variety of envelope sizes up to 10" in height and 13" in length (with a maximum print image height of 4.25").

Figure 7: The Pitney Bowes Print + Messenger Inkjet System



- Epic:** The Epic inserting system can handle roll or cut-sheet input and a wide variety of envelope sizes. For a #10 envelope, it produces flat, bi-fold, or tri-fold output at

³ Pitney Bowes calculates the duty cycle for AcceleJet based on a two-shift, five-day-a-week operation. A site running a third shift could safely exceed this calculated duty cycle.

speeds ranging from 14,000 to 21,000 cycles per hour. Supporting up to fourteen feeders, it is designed to facilitate quick change-overs to handle shorter runs profitably. It can also be configured with an inkjet module to produce 100% variable full-color inserts and envelopes. Multiple streams are automatically merged and synchronized. Additional document integrity scanning options are also available.

Figure 8: The Pitney Bowes Epic Inserting System



These systems contribute additional components of a white paper factory workflow that starts with blank paper and envelopes and produces every component of the mailing in an end-to-end process.

InfoTrends' Opinion

AcceleJet is an important new market addition in the “Zone of Disruption” that will bring the benefits of high-speed color inkjet to a new class of users. In a market place where color is king, personalization is the norm, and manufacturing is not only lean, but also just-in-time, AcceleJet has the potential to help producers of transactional documents and direct mail to address document complexity, compliance risks, and reply rates in a highly automated fashion.

With AcceleJet, Pitney Bowes now has an inkjet printing system portfolio that stretches in format from one-up to four-up to meet the application and volume needs of a broad range of users. Pitney Bowes' expertise in the print and mail market is another important aspect of the announcement. None of the other continuous-feed inkjet printing system vendors brings the same level of accumulated knowledge about mailstream workflow as Pitney Bowes. Together with Pitney Bowes offerings such as Print+ Messenger and Epic, this assembled package should be very attractive to users in print and mail environments who want to gain the advantages of a white paper factory at a scale that fits their needs.

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