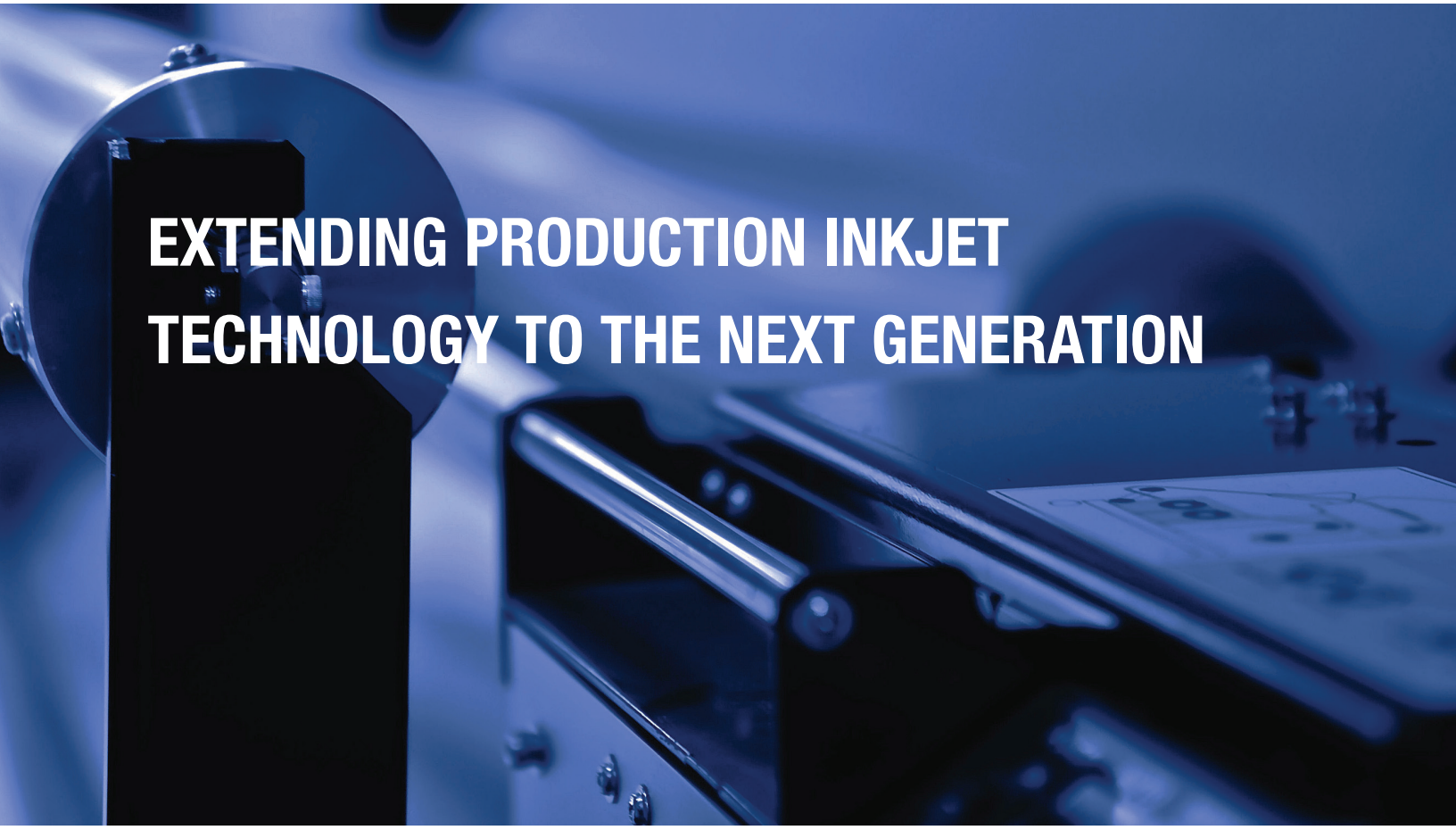
WHITEPAPER



# EXTENDING PRODUCTION INKJET TECHNOLOGY TO THE NEXT GENERATION

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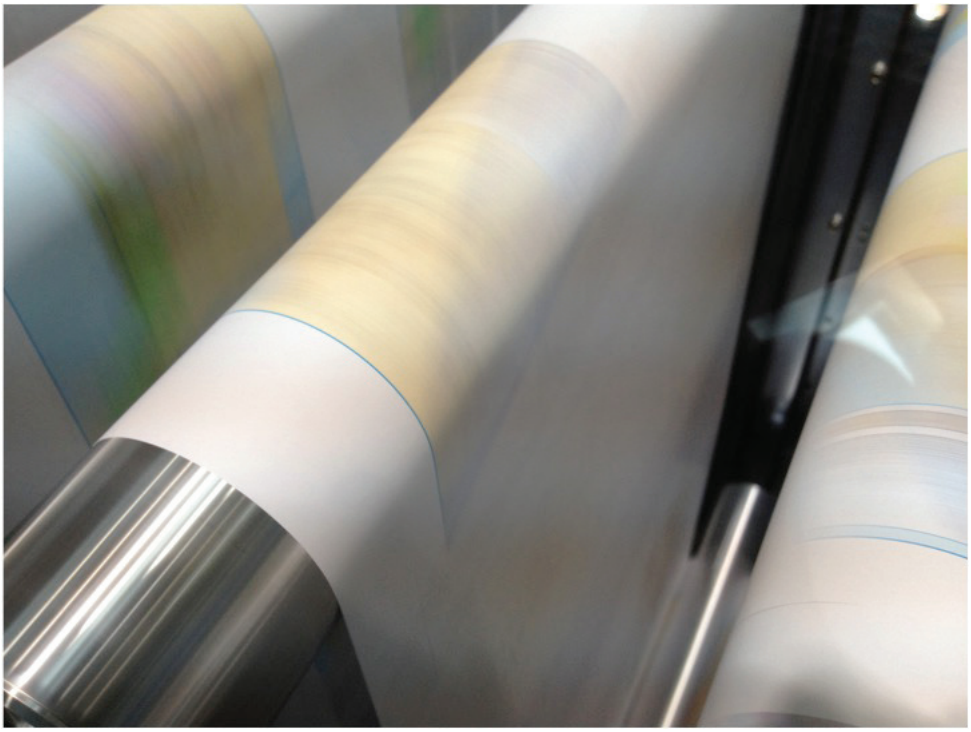
# Extending Production Inkjet Technology to the Next Generation

Inkjet printing technology is pervasive in homes and offices, in poster print shops, even in textile apparel and ceramic tile printing plants. It has been commonly used in continuous feed production printing since 2007 for transaction, direct mail, and book printing applications. Taking it to the next level, Canon Solutions America has now extended the technology, deploying this proven printing technology in cutsheet production printing systems on a broadly accessible basis for the first time, and separately, extending the range of substrates and applications that can be printed with continuous feed inkjet printing systems.

Figure 1. Canon Production Inkjet Printing Systems



Source: IT Strategies, Inc.

Inkjet technology has proven to be a revolutionary printing technology, and as revolutions go, the introduction of inkjet technology into the production printing space continues to be disruptive. However, unlike most other revolutions, this one uses proven technology and has an immediate benefit associated with it: the ability to create a renaissance of the production print industry.

At the heart of inkjet printing technology are printheads, the heart of the system. Canon Solutions America's production Inkjet printing systems features 600dpi or 1200dpi high-resolution printheads, over 30,000 nozzles, each capable of firing up to 30,000-60,000, 3-12 picoliter droplets per second. In layman's terms, this means they can put down a quarter liter or more of ink per minute. They can do

this reliability and consistently over a period that in other Canon Solutions America inkjet systems has proven to be in excess of 24-26 months or more. Since Canon Solutions introduction of production ink jet technology, its customers have successfully cumulatively printed over 150 billion pages.

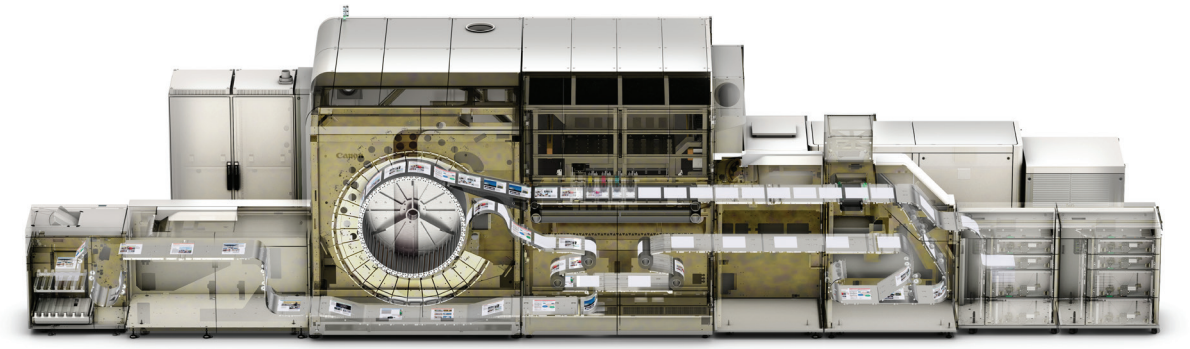
Continuing the development of a renaissance in the production printing industry, Canon Solutions America is bringing to market in 2015 two new pioneering products that build upon its proven production inkjet technology: a cutsheet production inkjet printer called the Océ VarioPrint i300and a graphic arts-quality continuous feed inkjet printer able to print on offset coated stocks, called the Océ ImageStream Series.

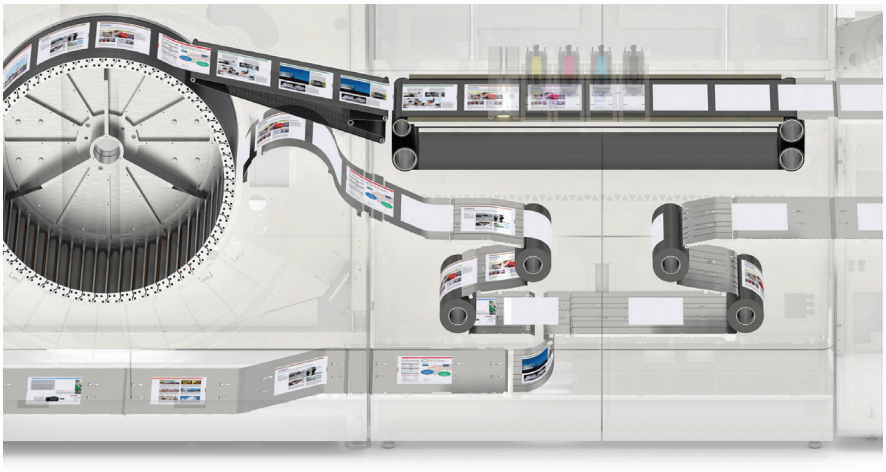
Capable of printing up to 10 million pages per month at less than half the typical acquisition cost of a continuous feed inkjet printer, the Océ VarioPrint i300 opens up new markets (color) and applications previously inaccessible due to the high total ownership cost of color digital toner-based production printers. The Océ ImageStream Series is an even more productive inkjet printing system, capable of printing in excess of 100 million pages per month. Unlike most other continuous feed printing systems, it has the ability to print directly onto offset coated and uncoated stocks – enabling leverage of economies of scale for offset press owners in purchasing media.

## *The Océ VarioPrint i300*

The Océ VarioPrint i300 sheet-fed inkjet press (previously known as the Niagara Project) offered by Canon Solutions America, breaks free from the productivity limits of traditional cutsheet toner printers, while adding the ability to print color output at levels equal to the Océ ColorStream Twin Series continuous feed printers. But why does the printing industry need another technology when toner technology too has a proven track record and dominates the installed base? Simply: to keep up with habit change.

Figure 2. Océ VarioPrint i300 paper path



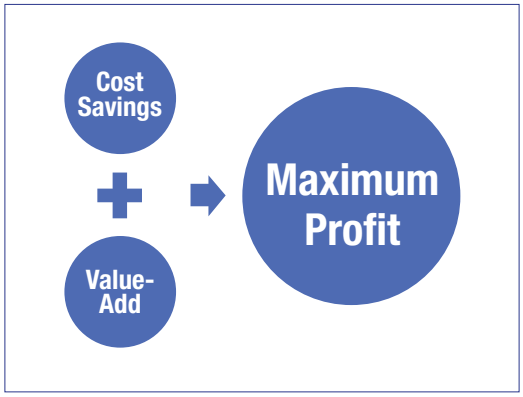


We are moving from well-planned, predictable volume jobs to more last minute rush orders. The frequency of orders for these last minute jobs is ever increasing. The existing – often fully amortized infrastructure (toner printers) – are starting on a trajectory of a long-term inability to keep up with changes in flow and volume, and at some point become a liability (more money required to keep them functioning properly, finding new operators as older one retire, etc.). Just as print buyers are looking to find more flexible solutions, so does the print industry need to find more flexible, productive printing platforms to accommodate print purchasing habit changes.

## Factors to consider when replacing older monochrome toner printers with a Océ VarioPrint i300

There are three views when considering the acquisition of an Océ VarioPrint i300: a cost savings-only perspective, a value-add through color perspective and greater productivity perspective, and a combined view looking at both cost savings and incremental value-add. All are important, but a combined case of cost savings and value-add makes the strongest case for profit of all.

Figure 3. Decision Factors in considering Acquisition of a VarioPrint i300




Source: IT Strategies, Inc.

## The Cost Savings Perspective

The first hurdle many prospective buyers run into when considering an Océ VarioPrint i300 to replace older toner-based printing systems is the issue of having to pay for new hardware, at a time when their installed base of older machines is often fully amortized. Due to the age of those mono toner systems, many pay a premium for maintenance and a higher click charge than one will pay for a new Océ VarioPrint i300. Every situation is different of course, but a simple model as shown below will quickly confirm what the hurdle rate could be to justify the acquisition of an Océ VarioPrint i300 strictly on the basis of cost savings. This model assumes the replacement of pre-printed offset shells with a white paper in, digital color print out business model.

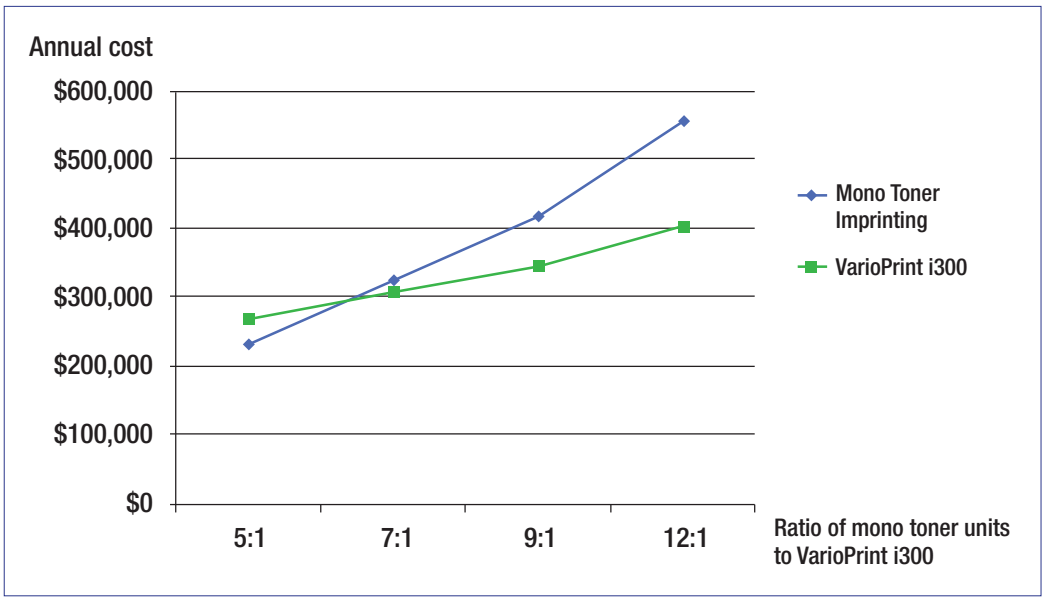
### Figure 4. Cost savings Hurdle Rate Calculation Model

| | Mono Toner Systems | VarioPrint i300 |
|---|---|---|
| **COST - MONO** | | |
| Installations | | |
| Annual HW cost @ 60 mnths. | | |
| Maintenance cost/unit | | |
| Total Maintenance Cost | | |
| Pages Printed annually | | |
| Click charge/page black | | |
| Total page cost mono | | |
| Total mono cost | | |
| **COST - COLOR** | | |
| Cost/page of color offset shells | | |
| click charge/color | | |
| Total Color Cost | | |
| **TOTAL COST ANNUALLY** | | |

Source: IT Strategies, Inc.

Plugging in some "industry averages" - every situation is different so there is no "industry average" -figures for costs and print volumes, IT Strategies estimates that the hurdle rate on the basis for cost-savings alone is a replacement of approximately 5 older toner-systems with one single new Océ VarioPrint i300 assuming total combined toner print volumes of about ranging from 1 to 2.5 million pages per month.

Figure 5. Cost Savings-Only Hurdle Rate




Source: IT Strategies, Inc.

The more toner-based units installed, the stronger the replacement case becomes on a cost-savings only basis. This cost-savings-only perspective may however belly the real benefit of acquiring a sheet –fed color inkjet printing system. The value-add enabled by the Océ VarioPrint i300 has some "soft" benefits that may ultimately outweigh the cost-savings in importance.

## The Value-Add Perspective

The value of the Océ VarioPrint i300's capability to print color goes well beyond its ability to eliminate offset shells. Of course streamlining a white paper in, finished color output model creates efficiencies that previously did not exist for print volumes in excess of 1 million+ pages/month. In some cases it also enables the print shop owner to retain the pass-through revenue currently spent on procuring offset shells from outside offset print suppliers, thereby immediate increasing their bottom-line.

The real-value however ultimately will come from the "soft" benefits. These are benefits that are difficult to express in the beginning as hard numbers, but are nonetheless very real. Among those are:

- Efficiency gains to meet changing customer "new normal" delivery expectations
- The ability for the print shop's sales staff to sell something new, provide a reason to call upon dormant accounts and prospects
- The excitement created internally from a new investment, a new technology for operators to challenge themselves on, to improve the operations of the plant
- The ability to take on new accounts due to the dramatic increase in productivity and capacity
- The ability to create mass-volume, high-relevancy, personalized pages

### *Efficiency Gains*

Just like many of our personal habits and expectations are changing with regards to purchases, so are the habits of print purchasers. Shorter lead-times, lower-volume but higher frequency orders, and in general just-in-time order and delivery expectations need to be met in order to retain existing customers business. The "high-efficiency white-paper factory" enabled by the Océ VarioPrint i300 makes it possible to met those "new normal" customer delivery expectation without breaking the back of the operations staff. No longer does one have to plan as carefully ahead of the customer's order intentions to ensure adequate inventory pre-printed offset shells, and tie up capital in idle inventory often without being able to charge the customer for this.

### *Sales Excitement and Motivation*

The ability to meet the "new normal" customer delivery expectations also provides the print shop's sales staff with something new to revisit dormant accounts and call upon new ones. It is a tool to open the conversation for other services, including design, fulfillment, and perhaps even data management. When tied with re-structured compensation incentives for acquisition of new business, it is amazing what a new tool like the Océ VarioPrint i300 can do for increasing business.

### *Operations Excitement and Motivation*

Frequently print shop owners will ask whether it is better to re-train their offset operators or mono-toner operators to run a new inkjet device like the Océ VarioPrint i300. In all of IT Strategies prior research on the transition from continuous feed toner to continuous feed inkjet we have found the single biggest denominator for a successful implementation of inkjet at an operator level is attitude and willingness to learn, rather than previous skill. Many long-term operators find the challenge to implement something new refreshing, often leading them to find unexpected additional efficiencies in the operations of the plant.

### *The Pinnacle of Value: Mass-volume, High-relevancy, Personalized pages*

The "Holy Grail" of the Océ VarioPrint i300 is the ability to economically print at mass-volume (millions of pages) highly relevant, personalized pages. This value is as dependent upon availability of relevant data and front-end software as it is upon the capability of the machine to produce this output efficiently. The sales process to get customers on-board to leverage this capability tends to be a sophisticated process: this typically means adjustment of the customer's own internal sales and marketing process, inventory process, and getting the customer's IT department on board. The learning curve to deploy mass-volume, high-relevancy, personalized pages tends to require commitment (code for time and stamina). The earlier one climbs to the top of this learning curve, the better the odds at securing a customer for life. More critically, it offers one of the few ways in the print market to shift the conversation from cost to value.

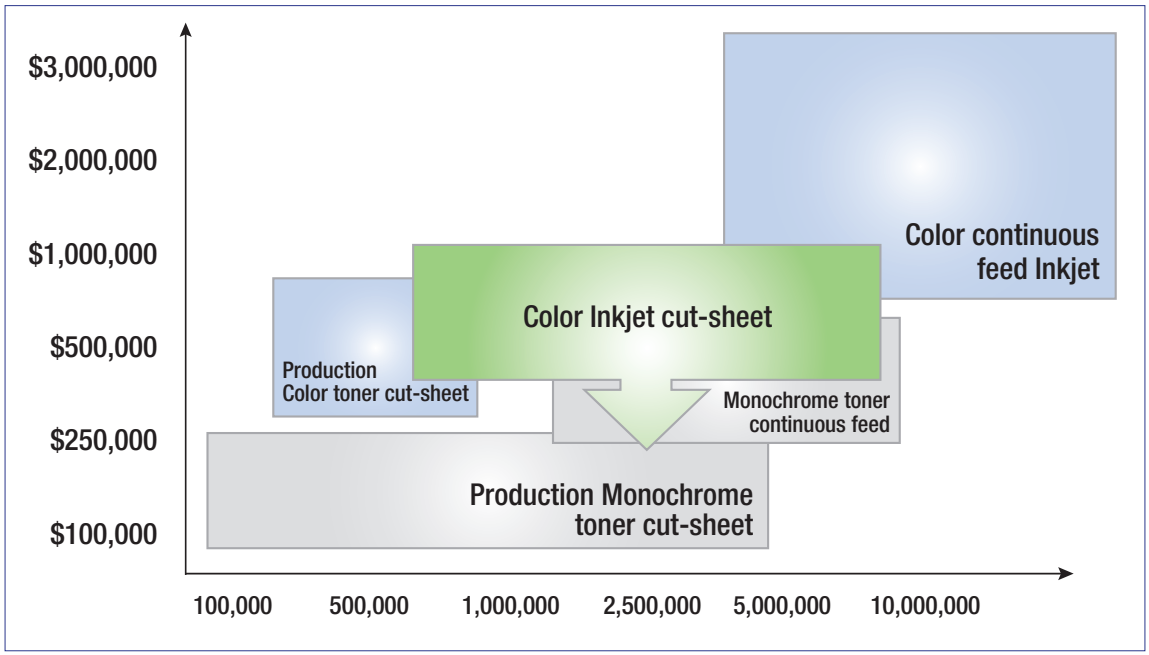
## Other Eligible Printers for Replacement

One of the things we've learned over the decades is that customer never exactly follows what the manufacturer had intended for the products that they acquired. In the case of the Océ VarioPrint i300, replacement of multi-installation mono cut-sheet toner printers is the most natural fit. However, it is highly likely they will also be used to replace or add to the functionality provided by:

- continuous feed toner printers (especially for those older systems whose monthly print volumes have decreased significantly)
- continuous feed color inkjet printers at sites that need a more flexible solution for re-prints, small jobs, or a broader substrate/ frequency mix
- production digital color toner cut-sheet presses, ones at accounts where a different level of quality at a different price point opens up new opportunities or solidifies existing relationships that are under significant cost/margin pressure

With continual improvements in inkjet print quality (think inkjet proofing system-quality output) and substrate range flexibility, we will likely see replacement even of offset presses at some point in the future.

### Figure 6. Other Eligible Printers for Replacement




Source: IT Strategies, Inc.

Initially, IT Strategies expects the Océ VarioPrint i300 to:

- Replace mono-toner imprinting on pre-printed shells
- Print color at near monochrome toner cost
- Replace some offset print
- Replace some production color toner cutsheet
- Open up high-volume production color with frequent paper changes

We would not be surprised however if other applications emerge for printing on the Océ VarioPint i300. For example, one interested potential customer believes that the sheet-size will allow him to capture a sizeable point-of-purchase poster business.

### Other considerations for implementing a Océ VarioPrint i300

The Océ VarioPrint i300 provides a lot of power for a cutsheet printer. What this means is that other processes at a print plant needs to be prepared to handle this amount of power. One consideration is additional or new software that allows the plant to combine small jobs together to make large jobs to ensure that the press runs at its maximum profitably. Inserters may need to be adjusted or upgraded to handle the larger print files. For those transitioning from monochrome to color, print files may need to be optimized for best RIP processing speed (color). Most important of all, adopters of the Océ VarioPrint i300 should implement a job tracking management information systems to allow them to see live data, cost, and profit. This information provides a dashboard that provides real-time information about each job's profitability.

## *The Océ ImageStream 2400/3500 series: A Solution to Inkjet Production Printers' Number One Wish*

The number one request for product improvement among current continuous feed inkjet press owners is the ability to print on coated offset paper, enabling them to buy paper in volumes that are significantly lower in cost than existing special papers used with inkjet presses. The fundamental challenge is that most coated offset papers are relatively non-porous, making it difficult for the water to pass through the coating to be absorbed while maintaining control over the colorant desired to stay on top of the sheet. The result is unintended dot gain, or the creation of a puddle of color, since the water carrier cannot be absorbed or evaporated quickly enough to prevent the colorant from spreading uncontrollably.

To solve this problem when using aqueous inks, one can:

- Pre-coat the paper with a priming layer by flood coating the entire substrate
- Pre-coat the paper in just the areas to be printed
- "Lock" the spread of each droplet by applying a fixing agent immediately after printing
- Switch ink chemistry from aqueous to another form of ink chemistry able to dry faster

Figure 7. Canon Océ ImageStream 3500: Where is the pre-coat?

Source: Canon

## The Océ ImageStream does not need a pre-coat or bonding agent

Today the most common solution among inkjet production printer manufacturers is to offer some form of pre-coat. Canon Solutions America claims to have come up with a simpler solution. The Océ ImageStream 3500 is the first inkjet production printer able to print on coated offset stock using aqueous ink without the need for a pre-or-post coat. The technical details of the Océ ImageStream's ability to print onto coated offset stock (matte, gloss, satin – ultimately expected to work on 50-220 gsm stock) without a pre-coat appear to be a secret. Canon Solutions America will not comment on the details of how the Océ ImageStream can print directly onto coated and uncoated offset stock, except to say that it is a combination of software, chemistry, and mechanical advances.

The smaller droplet size plays a key role in the ability to print on offset coated substrates without a pre-coat. A higher pigment load also plays a role, as does a higher surface tension of the pigmented inks. Ultimately one gets the sense it is really a combination of the interaction between the printhead's small droplets, the way the droplets are generated, and components in the ink chemistry used. What is not a secret is the output result.

The Océ ImageStream print quality is intended to compete with offset and digital color press print quality. It is designed to be able to print the equivalent of 20-100 million A-4 simplex impressions per month. At those duty cycles, the Océ ImageStream can produce upwards of 3-10X the volume of a digital color press and volumes equal to an offset press. The key difference between offset and digital color presses is that the Océ ImageStream will be able to handle these volumes with 100% variable data printing capability. The ability to print this much high-relevant, personalized variable data on coated/uncoated offset stock will open up high-value print applications that could not be produced previously, such as highly targeted catalogs, magazines, direct mail, and other similar graphic arts intensive applications.

Will the Océ ImageStream be as cost efficient as offset printing? No, digital print technology's value proposition is about its ability to create things that offset cannot. Will it be able to meet turnaround deadlines not possible on offset today? Yes, the elimination of many of the pre-press tasks required for offset in fact allow it to be more productive for the ever more popular short-run print jobs that are common today. Will it be able to do so with variable data value add? Yes, and Océ ImageStream's productivity allows it consolidate many multiple existing digital color presses at lower running costs.

The Océ ImageStream technology provides an unprecedented amount of horsepower. The combination of throughput and the ability to print on a range of standard offset stocks are disruptive. It will open up the ability to print a range of applications that were not cost effectively addressable previously. As a pioneering product, learning curves will be encountered along the journey. Canon Solutions America's commitment and investment into production inkjet technology however will smooth the curves, and the early adopters are posed to become the leaders of the next generation of the print business.

## *Canon Solutions America Production Inkjet Business Outlook*

Looking beyond 2016, when the production inkjet printer market for transaction, direct mail, and book printing as we know it today will be 10 years old, all inkjet manufacturers will need to find new applications in order to expand the "pie." The ability to print using lower acquisition cost cut-sheet production inkjet printers and continuous feed production printers that can print on standard offset stocks is the beginning of this direction to expand the "pie" for both Canon and its customers alike.

In the end, it is all about application addressability rather than technology. Yes, Canon Solutions America has taken a pioneering role in production inkjet technology development. But the only way its customer's make a profit is for that technology to enable them to become even more efficient, while adding value in ways that could not be done previously.

The Océ VarioPrint i300 aims to do this by addressing the needs of the broad market, bringing unprecedented color productivity to the cut-sheet production printing market. The Océ ImageStream aims to do this by addressing the needs of the graphic arts market, bringing even great unprecedented color productivity on standard offset stocks. The journey forward will be focused on getting the TCO pricing model right. But compared to the technical challenges, the financial model challenge will quickly be self-evident and should be able to be fine-tuned quickly. These are exciting and dynamic times, and Canon Solutions America is clearly not sitting idle. Its commitment to investment in production inkjet technology is unwavering, as is its commitment to lead the renaissance in print.