

Lowering Entry Barriers
in Digital Printing for Packaging
**Opportunities in
Inkjet Label and
Packaging Applications**



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Inkjet printing is creating new opportunities in label and packaging applications for current providers and those organizations looking to expand in this print market. Technology innovations in printheads, inks, and substrates are yielding printing systems that are enabling printers and converters to transition work from analog to digital or create new products previously not possible.

Competitive cost structures, faster printing speeds, enhanced image quality, and the ability to print on a wider variety of substrates are breaking barriers that previously restricted inkjet technology from wider use in printing labels, corrugated, folding cartons, and flexible packaging.

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RESEARCH FINDS INKJET IS REDUCING BARRIERS TO PACKAGE PRINTING

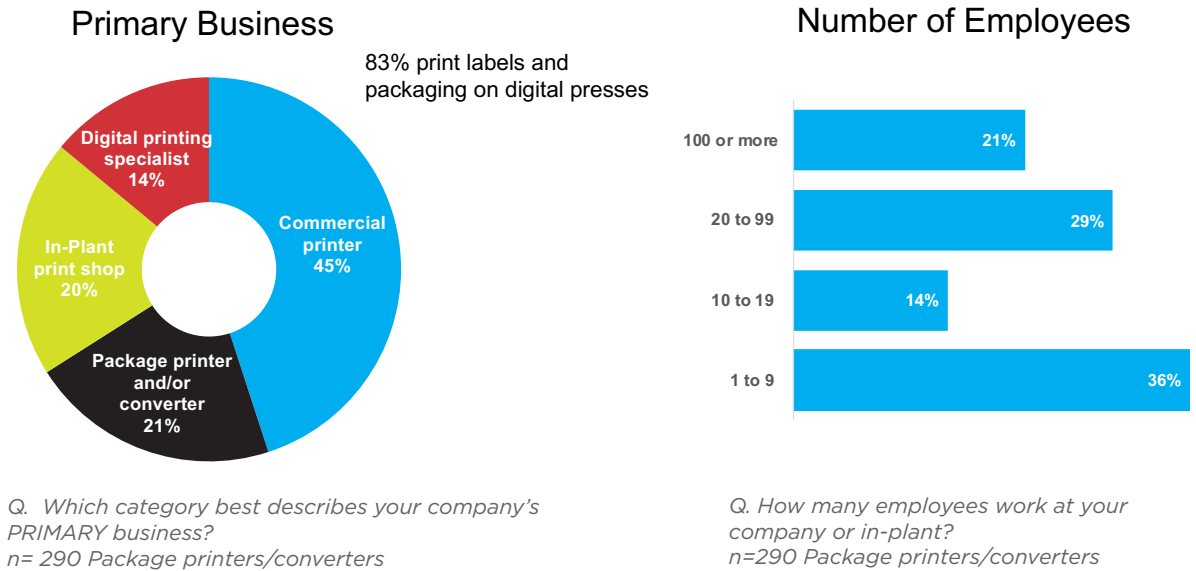
In an effort to document current market and technology trends that are reducing entry barriers to digital printing of packaging, NAPCO Research (a unit of NAPCO Media LLC, the parent company of *Printing Impressions*, *Packaging Impressions*, and *In-Plant Impressions*) conducted survey research that captured close to 300 responses from organizations that print labels and packaging. The research study and resulting report series on survey findings are sponsored by Memjet.

The survey focused on capturing printers' and converters' experiences with digital printing, factors driving or impeding investment, and customer demands driving the use of digital printing.

Survey Respondent Profiles

Of the 290 survey participants, 45% described their primary business as a commercial printer, 21% a package printer or converter, 20% an in-plant print shop, and 14% a digital printing specialist (Figure 1). Survey respondents' companies varied in size with 36% reporting 9 or fewer employees, 14% having 10 to 19 employees, 29% employing 20 to 99, and 21% with more than 100 employees.

Figure 1: Survey Respondent Profiles



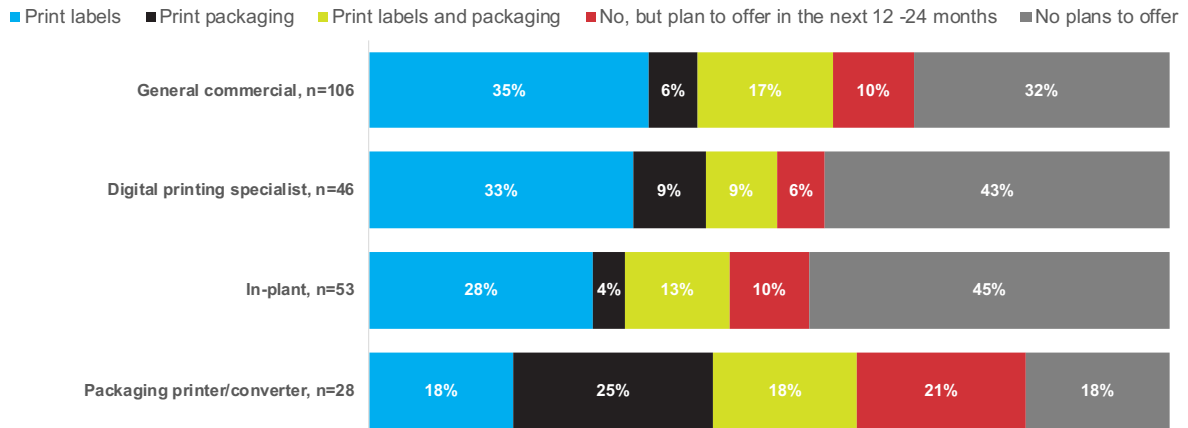
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Inkjet is a Key Process for Respondents

Of the respondents that are printing labels and/or packaging on digital printing devices, just over half (53%) print label and/or packaging applications on inkjet printing devices (Figure 2). Use of inkjet is particularly strong with commercial printers (58%) and packaging printers/converters (61%).

In addition, packaging printers/converters also have the highest percentage of respondents (21%) that do not currently use inkjet for labels and packaging but are planning to add this capability. A likely explanation for this finding is that compared to other print segments packaging printers/converters have different equipment ecosystems and different adoption rates of digital printing equipment. Because printers that focus on commercial print work (i.e., brochures, postcards, forms, marketing materials, publications) typically print on digital presses, they are more experienced with the digital printing technologies and workflows needed for migrating into adjacent markets like packaging.

Figure 2: Respondents Printing Labels and/or Packaging on Digital Inkjet Equipment



Q. Do you print labels and/or packaging applications on digital inkjet?

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FORCES EXPANDING BENEFITS OF INKJET IN LABELS AND PACKAGING

Many forces are at play to allow more companies to leverage the benefits of inkjet in printing labels, corrugated, folding carton, and flexible packaging. Here is a brief overview of the most influential factors enabling more providers to leverage the benefits of printing core packaging applications on inkjet devices:

Less Complex Printing Process

A key benefit of all types of digital printing devices is that they eliminate the need for make-readies, saving hours of production time. A major advantage that inkjet technology has over toner is that the marking process — how the print engine applies the marking agent (ink) to the substrate — requires fewer moving parts and is a non-contact process. While ink jetting is itself full of complexities in terms of ink formulation, jetting/spraying, droplet size, and adhesion, these complexities reside in the inkjet heads and the ink itself. Toner, on the other hand, requires multiple parts and mechanisms to apply the marking agent (toner) to the substrate. Inkjet, in this sense, is a simpler process requiring fewer parts than toner-based technologies and thereby requiring far less device maintenance and subsequent downtime. Because inkjet is a non-contact printing process, meaning pressure is not being applied to the print surface during printing, it can reduce the cost of packaging in some applications like corrugated where lighter-weight media is often used to reduce substrate cost. It is easier to print lighter-weight materials via inkjet since the board does not require additional strength to withstand pressure applied during an analog contact printing process.

Modular Printheads

Disruptive technology innovations, including printheads with modular designs — versus fixed print bars — enable flexibility in developing solutions for a wide range of applications and investment budgets. The ability to stitch together multiple printhead modules enables equipment manufacturers to build simple but powerful entry-level inkjet presses as well as high-end production equipment with speed and quality that can be adapted for a broad range of substrates. This means companies can enter packaging without having to make large investments in complex equipment.

Pigmented Inks

Aqueous-based pigment inks can achieve offset-quality output on a wide range of coated and uncoated substrates while also being resistant to damage from light, moisture, and rubbing. These inks are making inroads in label printing, and are emerging into flexible packaging, folding cartons, and corrugated packaging as well. These inks also offer advantages to providers serving the food and beverage markets — one of the biggest users of labels and packaging — as product manufacturers must follow strict guidelines to ensure product packaging protects human health. Water-based, low-migration inkjet inks can minimize the impact on food and human health.

Substrate Availability

In the early days of inkjet, compatible substrates were limited to uncoated paper, or specialty inkjet treated paper. Today, inkjet can print high-quality output on a wide variety of substrates from paperboard to foils to corrugated, offering brand owners many options to make their products stand out. Inkjet manufacturers have also developed priming solutions to enable inkjet printing on existing media, including packaging materials like corrugated and flexible plastics.

Print Quality

Inkjet print quality has improved dramatically, with certain technologies capable of resolutions up to 1600 x 1600 dots per inch (dpi), enabling inkjet to produce sharp images, smooth blends and gradations, and an expanded color gamut.

TRENDS INFLUENCING INKJET'S APPEAL

Macro trends among buyers of labels and/or packaging are resulting in demands for smaller quantities, faster turnaround times, and more versioning. In addition, brand owners increasingly need to customize and/or personalize what is printed on their labels and packaging. Inkjet printing can accommodate many features brand owners expect in their packaging. Buyers of labels and/or packaging expect their providers to offer products that:

- Are compelling and visually attractive
- Engage customers
- Meet color standards
- Adhere to tight deadlines and fast turnaround

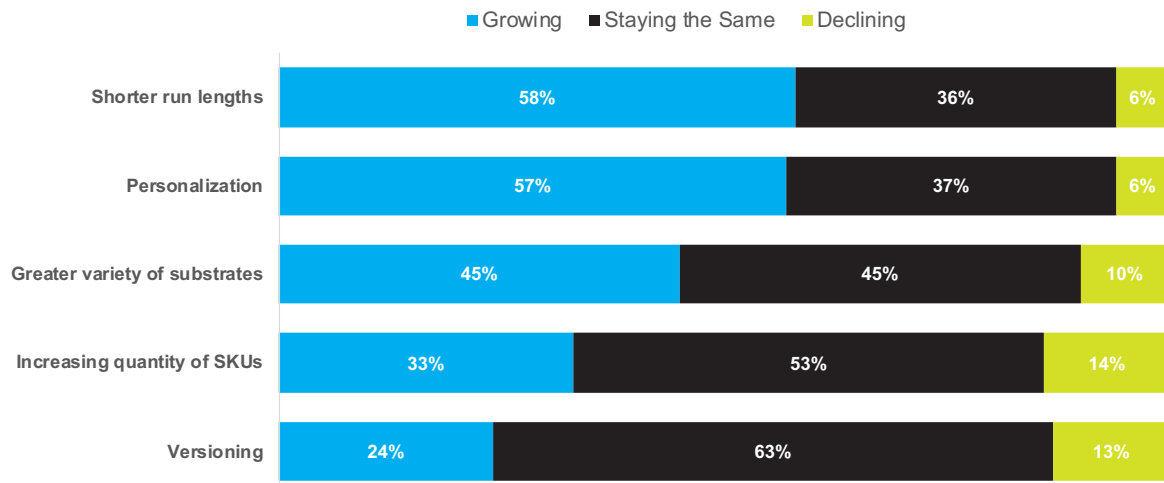


- Can be ordered in desired (required minimum) quantities
- Accommodate higher numbers of SKUs
- Support more targeted versions
- Comply with changing regulations
- Meet environmental standards

Survey data supports these trends as respondents that use inkjet to print labels (Figure 3) and packaging (Figure 4) identified key areas of customer demand. The survey asked respondents to rank the level of customer demand for shorter runs, personalization, versioning, accommodating more SKUs, and more substrate variety.

More than half of respondents that printed labels or packaging on inkjet presses report growing customer demand for shorter run work and personalization. Demand for more types of substrates is also growing, while demand for versioning and meeting increasing SKU requirements are growing more than declining. Inkjet printing enables providers printing labels or packaging to meet these growing customer demands.

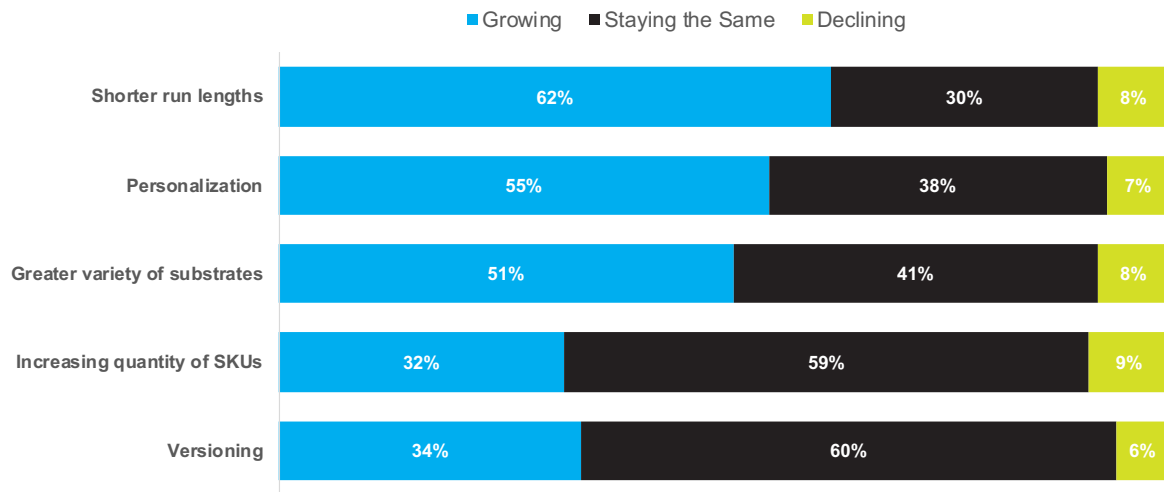
Figure 3: Growing Customer Demands, Print Labels Via Inkjet



Q. Please indicate if demand from your label and packaging customers for the following requirements is growing, staying the same, or declining.
n=106 companies that print labels on inkjet presses



Figure 4: Growing Customer Demands, Print Packaging Via Inkjet



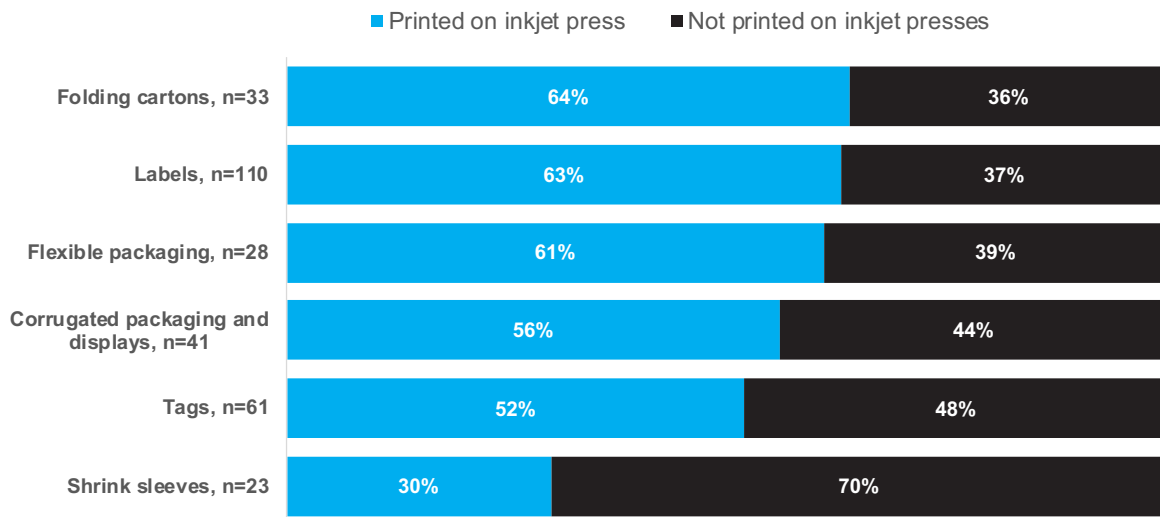
Q. Please indicate if demand from your label and packaging customers for the following requirements is growing, staying the same, or declining.
n=53 companies that print packaging on inkjet presses

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INKJET OPPORTUNITIES ACROSS APPLICATIONS

Survey respondents print various types of packaging applications on inkjet devices. Over 50% of respondents printed folding cartons, labels, flexible packaging, corrugated packaging (and displays), and tags on inkjet devices. This is a testament to the capabilities of current inkjet devices to address label and packaging printing requirements.

Figure 5: Label and Packaging Applications Printed on Inkjet Devices



Q. Of the packaging applications you print, which are printed on inkjet devices?



THE INKJET OPPORTUNITY FOR LABELS CONTINUES

Labels are essential in supporting brand owner and product manufacturers in marketing, identifying, promoting, and selling products. Digital printing continues to open many new printing opportunities that inkjet will accelerate. Trends in product manufacturing and marketing are increasing demands for shorter lead times, smaller quantities, and more product versions.

Labels have long been printed on digital printing devices. Digital label printing systems include electrophotographic (toner) presses and single-pass and multi-pass inkjet printing devices that print directly onto rolls of papers, films, foils, and other materials that can be converted into different types and sizes of labels

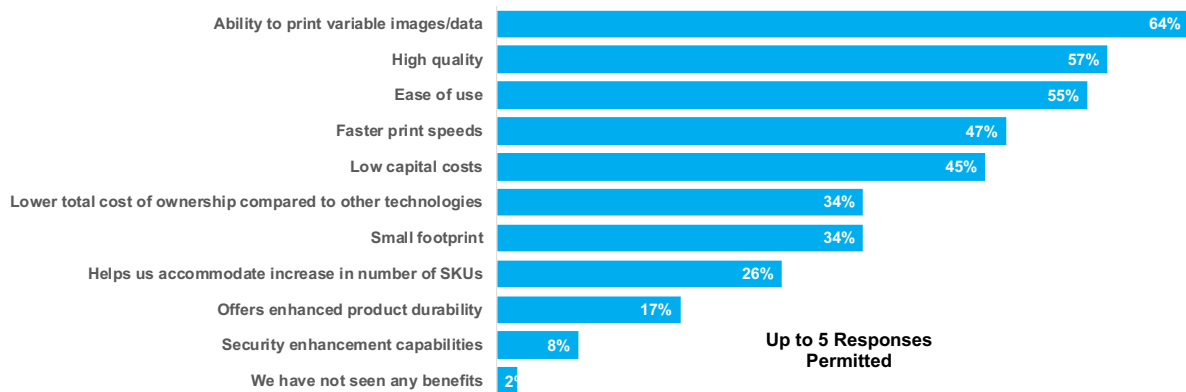
As a non-impact printing technique, inkjet prints on a wider variety of industry-standard substrates more efficiently and cost-effectively than other technologies. Inkjet printing can meet brand owner demands for eye-catching designs, and personalization elements such as expiration dates, tracking barcodes, and serial numbers.

Inkjet label printing technology has advanced to a point where there are options available for any type of printing environment. For example, the quality of table-top label printers has become increasingly impressive and useful for both print service providers and small manufacturers.

In addition, wide-format inkjet printers and printer/cutters are often used to print large labels that do not fit on narrow web presses. While not a very high productivity solution, a low-cost wide-format printer can provide great flexibility to deliver small quantities very quickly.

The top five benefits that respondents who print labels on inkjet printing devices are experiencing include the ability to print variable images/data, high-quality output, ease of use, faster print speeds, and low capital costs. Interestingly, many of these benefits counter the reasons respondents give for not printing labels on inkjet devices (Figure 6).

Figure 6: Top Benefits for Printing Labels on Inkjet



Q. Of the packaging applications you print, which are printed on inkjet devices?

Up to 5 Responses Permitted | **NAPCO RESEARCH**

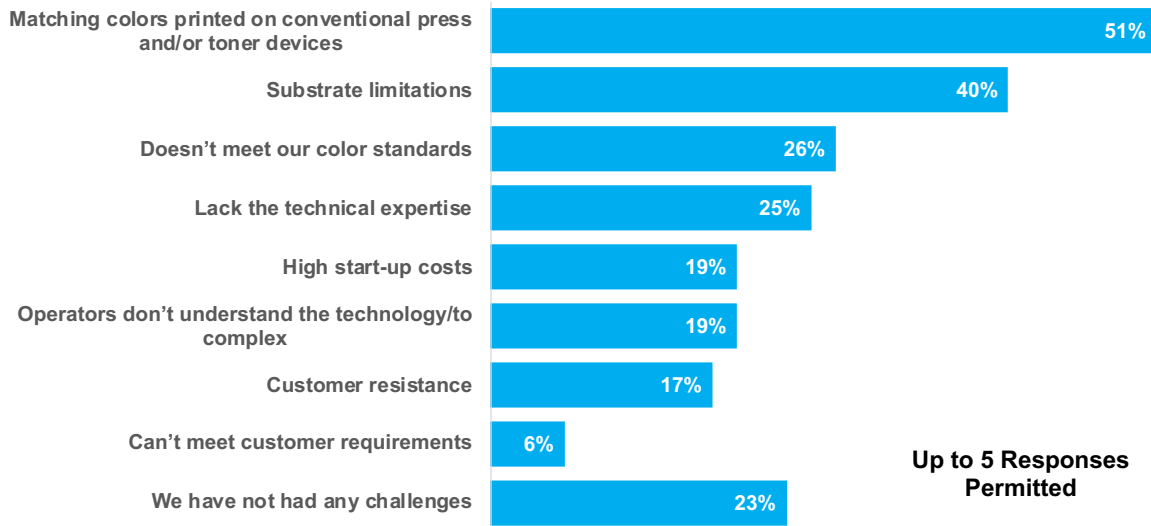
Another important benefit for survey respondents is the faster print speed of inkjet (47%) compared to other digital print technologies. In addition, 45% of respondents appreciate inkjet's low capital cost, reflecting innovations in printheads that are allowing more entry-level and lower-cost devices to enter the market.

Respondents that print labels on inkjet printing devices report their top two challenges are matching output with conventional and toner devices (51%) and substrate limitations (40%) (Figure 7).

Optimizing color across printing devices and processes is a challenge in nearly all industry segments. As print providers embrace new technologies, color management practices often lag. With more labels being produced in mixed printing technologies, providers will focus resources on improving internal color management practices.

Close to a quarter of survey respondents (23%) report having no challenges in printing labels on inkjet printing devices.

Figure 7: Challenges Printing Labels on Inkjet Presses



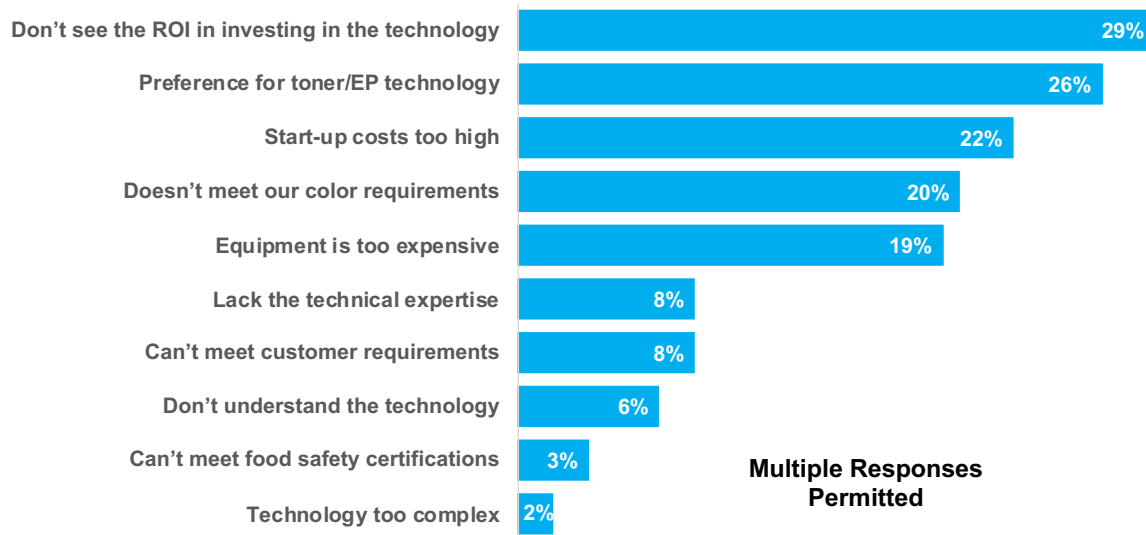
Q. What are the top challenges of printing labels on inkjet printing devices?
n=53 respondents that print labels on inkjet printing devices

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Reasons for Not Printing Labels on Inkjet Devices

The top reasons respondents don't print labels via inkjet are they don't see the return on investment on the technology; prefer printing labels on toner devices; believe the start-up costs are too high; and don't believe the color produced by inkjet devices meets their requirements. Interestingly, there wasn't a stand-out reason for not using inkjet for printing labels, and the top response (don't see the ROI) represented only 29% of respondents that don't print labels on inkjet devices.

Figure 8: Reasons for Not Printing Labels Via Inkjet



Q. Why don't you print labels via inkjet printing devices?
n=126 respondents that don't print labels on inkjet devices

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INKJET EXPANDING PACKAGING OPTIONS

Ongoing innovations in inkjet printing technology, inks, and substrates are lowering entry barriers for offering folding carton, corrugated, and flexible packaging, all applications packed with opportunity for growth. Here is a brief overview of each application and the opportunity offered by inkjet.

Corrugated, More Than a Brown Box

Much more than just a plain brown box for shipping and storing products, corrugated packaging is used to display, promote, and package almost every product consumers see and buy. According to the Fibre Box Association, corrugated packaging and displays is a \$35.2 billion a year industry.

Flexography is often used to print one or two colors on corrugated, while offset is used to print graphics on liners that are glued to the box. However, inkjet printing is enabling brand owners and retailers to add more color and special effects to corrugated, broadening its use from simple shipping containers to decorative shelf-ready packaging and high-end boxes for luxury items such as perfumes and colognes. Moreover, single-pass inkjet technology for corrugated is offering print quality levels comparable to or better than conventional corrugated printing technologies.

The ability to print corrugated on digital inkjet devices offers brand owners the ability to test new concepts and produce short runs in a cost-effective and time-sensitive manner. Inkjet also enables targeted versioning. Rather than printing a static version of a product package, images and text can be modified to address customer demographics within a certain region or location.

The types of companies printing corrugated materials vary greatly, from very small sheetfed printers to very big, fully integrated manufacturers.

Before digital printing, the corrugated segment was a difficult market to enter, because printing and finishing equipment is mostly quite specialized. Today, both multi-pass and single-pass color inkjet printers have lowered the entry barriers. Single-pass printers include both sheetfed systems for post-printing board and roll-fed systems for pre-printing corrugated liner. These systems use inkjet heads to print the entire width of the media in one pass. (While these single-pass printers are normally very big and very costly, they also include a small, entry-level category, namely manually-fed inkjet printers, that cost less than \$150,000 and are mainly used by small print service providers and some manufacturers.) Inkjet technology can also be added as a component to existing finishing and filling equipment, bringing variable digital printing capability further downstream in the process.

Folding Cartons Used for a Huge Range of Products

Made from single-ply media, usually paperboard up to about 22 points or 600 microns in thickness, folding cartons are printed on a wide variety of presses. Because folding cartons are produced from heavier paper-based stocks, they can be printed by a wider range of processes including offset, digital toner, and digital inkjet presses.

Folding cartons are used as primary packaging for a huge range of goods, from breakfast cereal to cosmetics to consumer electronics, and often to convey quality and luxury.

Most printing of folding cartons is done on sheetfed offset presses. While that printing is essentially the same as commercial printing applications, folding carton finishing is different and specialized. At a minimum, it includes diecutting, folding, and gluing, but it may include other processes as well, such as foiling.

Progress in sheetfed inkjet and finishing have opened up possibilities for both commercial printers and packaging converters to take advantage of new inkjet technology offerings. Inkjet sheetfed presses with B2 sheet size and greater rival offset press image quality with 1200 x 1200 resolution. They can also address a wide variety of folding carton requirements with their support of thick paper — up to 400 gsm or 0.6 mm — and sheet sizes up to 23" x 29.5".

In addition, digital finishing systems and embellishing presses that can apply foil and specialty coatings are allowing established converters and new entrants to offer a new level of service to print customers and in turn add to their own profitability. Enhancing folding cartons with decorative elements is gaining in popularity as new digital printing technologies have enabled these features to become more cost-efficient to produce, and as brand owners and product marketers look for new ways to maximize shelf appeal.

Flexible Packaging, An Emerging Opportunity

Flexible packaging is made from paper, plastic, film, foil, and metallized or coated papers, and any combination of these materials. The most common forms of flexible packaging are pouches, bags, and other pliable product containers. Although it is growing in popularity as an alternative to rigid formats, flexible packaging has not experienced the same level of adoption as other applications. Due to the nature of roll-fed production along with film-based substrates, there are more restrictions on the printing processes that can produce flexible packaging applications.



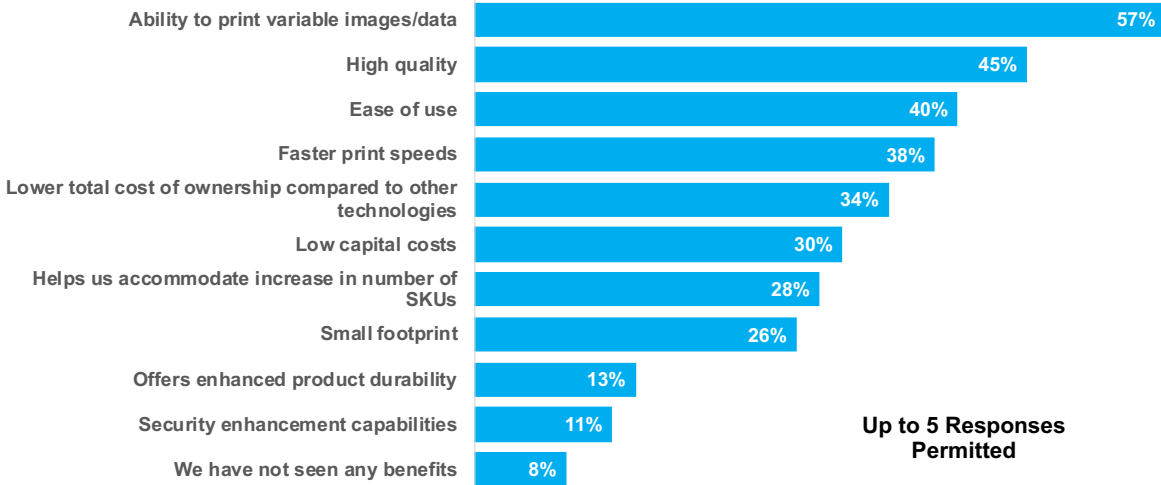
The majority of flexible packaging is produced via flexographic or gravure printing, with less than 1% printed on digital printing devices. Digital printing of flexible packaging started on electrophotographic devices, but the introduction of high-speed inkjet devices is likely to expand its use.

According to the Flexible Packaging Association, food packaging represents half of U.S. industry sales. Given that half of flexible packaging is purchased for use in food applications, food safety is a critical requirement. In addition, image quality is critical, as the flexible pouch/container typically displays the brand and often a high-resolution image of the product. Now available are aqueous inkjet devices that can deliver image quality of 1600 x 1600 dpi, while printing at up to 150 feet per minute. However, aqueous inkjet for flexible packaging is minuscule today, and mostly based on prospective or recently launched products.

Top Inkjet Benefits for Printing Packaging

Survey respondents that print packaging on inkjet devices identified the top benefits as the ability to print variable images/data, high quality, ease of use, faster print speeds, and lower cost of ownership compared to other printing technologies (Figure 9). These benefits reflect that inkjet is offering more providers an easier-to-use printing method that can enhance brand experiences.

Figure 9: Top Benefits for Printing Packaging on Inkjet

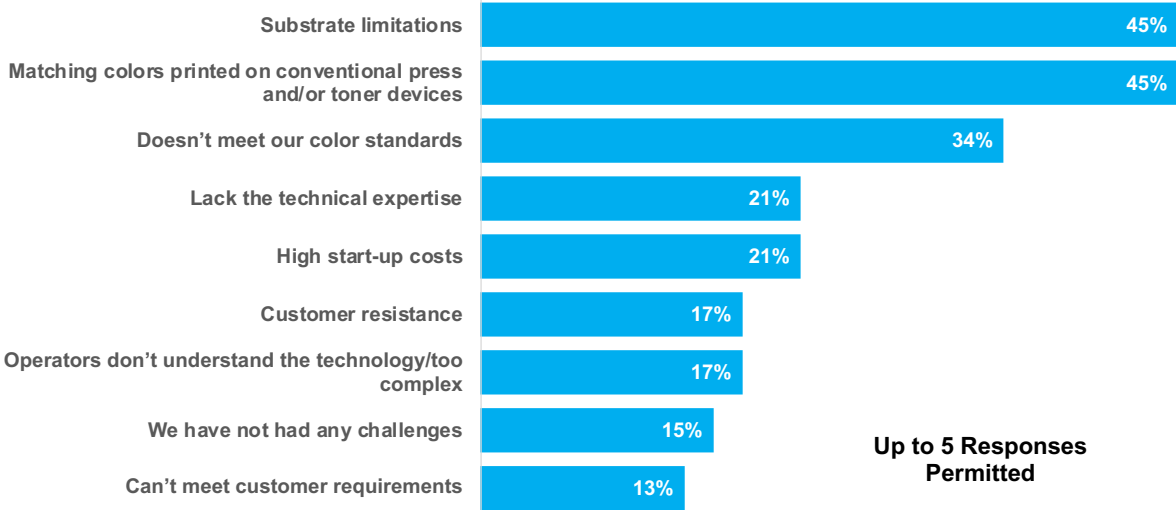


Q. What are the top benefits of printing packaging on inkjet printing devices?
 n=53 respondents that print packaging on inkjet printing devices



The top challenges of respondents that print packaging on inkjet devices include substrate limitations, matching color to conventional presses and toner devices, and meeting color standards (Figure 10).

Figure 10: Top Challenges for Printing Packaging Via Inkjet



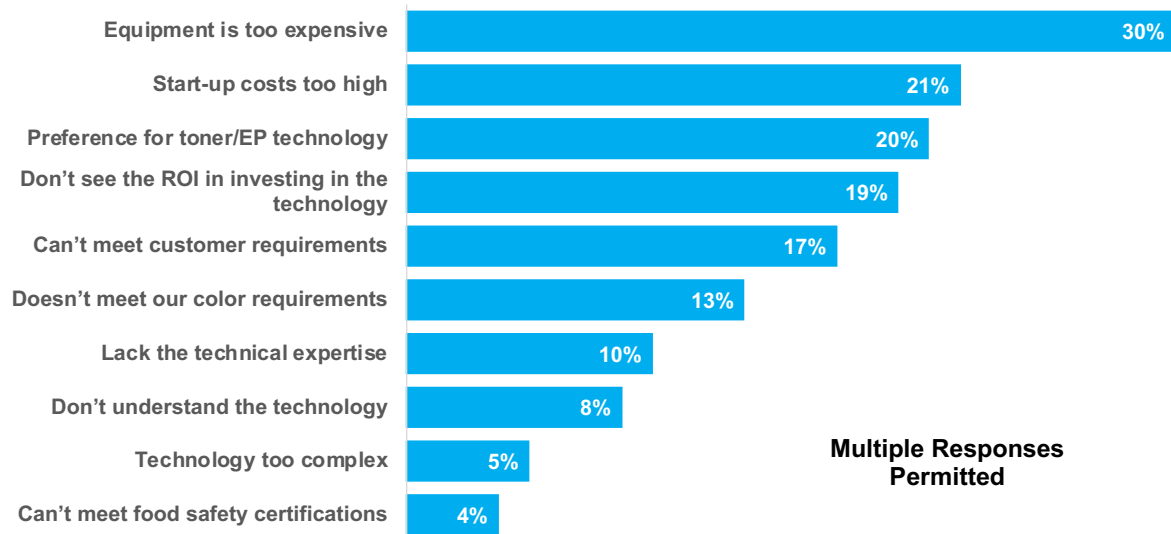
Q. What are the top challenges of printing packaging on inkjet printing devices?
n=53 respondents that print labels on inkjet printing devices



Reported challenges reflect the early limitations of inkjet technology, where the image quality was not sufficient and compatible substrates were limited to uncoated paper, or specialty inkjet treated paper. Continued progress in inkjet technology is reducing these barriers, but it takes time to shift providers' mindsets. These challenges and perceptions will shift as more inkjet printing systems for packaging become available and applications continue to migrate to inkjet production.

The top reasons survey respondents don't print packaging via inkjet are perceived high equipment and start-up costs, preference for printing on toner devices, and inability to see the ROI of investing in inkjet technology (Figure 11).

Figure 11: Reasons for Not Printing Packaging Via Inkjet



Q. What are the top challenges of printing packaging on inkjet printing devices?
n=53 respondents that print labels on inkjet printing devices



CONCLUSION

Advancements in inkjet printing technologies are removing previous barriers to its use in fundamental packaging applications. Certain inkjet devices can now meet requirements for quality, substrates, speed, productivity, and cost for labels, folding cartons, flexible packaging, and corrugated packaging.

As a result of these achievements, inkjet printing is poised to meet brand owners' growing demand for customization, personalization, shorter print runs, and quicker turnaround times in ways that conventional label and packaging printing technologies cannot address in a timely or cost-effective manner. For these reasons, adopting inkjet printing technology to meet customer demands and drive growth opportunities is a must both for established label and packaging converters and for commercial printers seeking to expand their label and/or packaging business.

ABOUT THIS RESEARCH

Lowering Entry Barriers in Digital Printing for Packaging is a research study that explores the market trends, innovations, and forces that are reducing obstacles for organizations looking to either enter or expand offerings in label and packaging printing. Based on an in-depth survey of the readers of *Printing Impressions*, *In-plant Impressions*, and *Packaging Impressions*, the research is divided into the following three reports:

- Inkjet Primed for Mainstream
- Opportunities in Inkjet Label and Packaging Applications
- Revolutionizing Food Packaging with Inkjet

WHO WE ARE

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NAPCO Research crafts custom data-centric solutions that leverage our highly engaged audiences across the markets in which we operate, our industry subject matter experts and in-house research expertise. We partner with our clients to identify their unique business problem and create solutions that enable deeply informed decision-making.

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Memjet is a global leader in the design and development of innovative thermal inkjet printhead technology, supporting modules, and aqueous inks. The modularity and technical components, combined with Memjet's commitment to customer success, empower OEM partners all over the world to develop fast, cost-effective printing solutions to grow and succeed in new markets. Together, we are building the future of print.

Memjet's range of digital technology powers the way we print today:

1. [VersaPass® technology](#)
2. [DuraLink® technology](#)
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