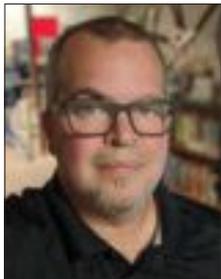


A combination of flatbed printer and flatbed cutter, along with specialized software, can combine to make a packaging prototyping system.

Exploring Today's Top Opportunities in Industrial Applications

Cross-segment opportunities are abundant in the industrial segment.



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As inkjet technology continues to evolve, it's opening pathways for print providers to tap into markets outside of their traditional scope, including the industrial print segment. What are the top applications in industrial printing for those already in or considering this market? This article will discuss these possibilities and the applications that present the best cross-segment opportunities while discussing the role the latest technologies play.

Before jumping in, it's important to understand where inkjet technology fits within the scope of industrial applications. In manufacturing environments, inkjet technology is just one of many printing methods available and has been an integral part of in-line processes for several years. For example, an analog gauge face or the graphics overlay panel on a membrane switch touchpad may have been printed on an inkjet printer. As inkjet technology has improved over the years, it moved from behind-the-scenes to front-and-center of industrial applications. Roll-based inkjet printers can be used to produce myriad commercial goods – whether vinyl-, paper-, or textile-based – for the hospitality and home goods markets. Flatbed inkjet printers are increasingly being used for hyper-personalization applications, volume novelty decoration, garment and textile production, and awards personalization. Inkjet-based 3D printers can be used for rapid visual prototyping and additive manufacturing (the manufacture of prototyping pieces both functional and



Digital graphics added to short-run electronics enclosures for the musical instrument market is a classic flatbed printing opportunity.

visual). Additive manufacturing also includes direct digital manufacturing.

In a survey conducted by IDC (Production & Large Format Printer Survey, August 2021), participants were asked what new opportunities they were considering adding to their current offerings. Nearly 43% of respondents indicated “adding 3D printing services,” and almost 38% replied “T-shirts/direct-to-garment printing.” Additionally, 26% shared they are considering “adding new direction/production tools [to create items] such as ADA signage or engraving.” These are all examples of direct digital manufacturing under the industrial applications umbrella.

Digital Textile Printing

Digital textile production is a growing market, and it has space for a wide variety of production scenarios. According to Smithers (The Future of Digital Textile Printing to 2026), digital textile printed volume will increase from 2021 to 2026 by 13.9% CAGR, reaching 5.531 billion square meters. Major textile houses use digital machines that can produce thousands of square feet of printed fabrics per day, but there is room for lower-volume participants as well.

Performance and activewear – particularly in team sports – are ever-changing due to a variety of reasons including seasons, players, sponsors, etc., and often need a fast response with customization availability. ▶

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These garments are nearly always made of polyester materials, which are well-suited for dye-sublimation transfer printing. The process does not require pre-treated fabrics, post-process steaming, or washing, which keeps cost and resource usage to a minimum. Dye-sublimation transfer printing produces imagery with sharp edges and highly defined details, which is of high importance for products in the sportswear sector. This process can be employed at all levels, from entry-level presses to high-end production models, enabling a wide range of printers to offer additional goods to their customer base.

Beyond team shirts is a growing demand for bespoke textiles for the luxury hospitality industry. Wallcoverings, curtains, seating area fabrics, bed linens, pillow covers — even staff uniforms — can be produced using digital printing methods that express the venue's individuality.

Short-run décor for hospitals is a prime opportunity for digitally-produced textiles. Conferences,

corporate events, weddings, and reunions are also prime opportunities for customized décor.

The term “textile” in décor is not limited to fabrics — it can include laminates or wood for flooring, and ceramics, which each represent multi-billion-dollar markets worldwide. Tim Greene, Research Director at IDC, shared with us that “ceramics are a good example of the potential for inkjet throughout the décor industry. Tile printing is a huge industry that has been transformed by digital printing, which addressed inefficiencies in the traditional screen printing processes used for tiles, as well as the serious challenge of managing inventory in light of rapidly changing design trends.” Digitally printed ceramic tile is just one example of how market forces that caused the analog-to-digital transformation can apply to many other applications available to print service providers.

While there is a bit of a learning curve in starting up a digital textile printing operation, there are also

many resources available from printer manufacturers and their authorized distributors, textile providers, and industry organizations, such as PRINTING United Alliance.

Packaging Prototyping

One area we haven't touched on yet is packaging prototyping. This segment is more likely to be an in-plant application, but is also one that might be of interest to commercial printers as a way to leverage their expertise while easing the convergence into wide-format digital printing. A recent report published by *Printing Impressions* magazine (Hot Markets Forecast for Print Demand in 2022, conducted by Vincent Mallardi) showed the top two markets to be Packaged Foods (\$1.836T) and Medical/Pharma (\$971B). Both segments, according to the report, are expected to grow about 9% each in 2022, which is good news for the package production industry. But those packages need to be designed and tested first, and digital systems — flexible or

iClick utilizes a benchtop Mimaki flatbed printer to customize mini speakers for a client.



Industrial applications utilizing digital technologies can help bridge the gap between the consumer and manufacturer, enabling print providers to deliver just-in-time production, develop customer intimacy through personalization, and reduce time-to-market.

flatbed printers and cutters — are well-suited for rapid prototyping.

For corrugate packaging alone, Acute Market Research estimates this segment to expand to \$307.9 billion by 2025, a CAGR of 4.6% from 2017 to 2025 ¹. Digital technology enables print providers to work with design agencies and brand owners to provide rapid responses to their clients. Using tools with which they're already familiar, designers can work with a print provider to implement a complete prototype solution that gives them the flexibility to go from design to final mock-up within hours. This type of rapid response can command premium prices.

3D Opportunities

Three-dimensional inkjet printing in industrial applications often starts in the design stage, where this technology lends itself well to producing a range of prototypes, from components to a finished facsimile of a product. A full-color 3D printer in these scenarios can reduce design time as elements can more easily be identified visually, and adjustments made on-the-fly. As well, 3D printing is the common term for additive manufacturing — the process of additively building up a part, one layer at a time. It's also used to create replacement parts and pieces that are not easily sourced (or are obsolete),

and can be used to augment a product, such as making a bracket or a stand.

3D printing can also be used in educational or informational venues to exhibit concepts that are difficult or otherwise impossible. 3D printing is ideal for producing musculoskeletal models for education, or models of microscopic elements for further studies, such as a model of a virus — just to name a few examples.

Flatbed Printing

Flatbed printing is usually the method most considered when we speak of industrial applications. Component marking, membrane switch panels, dashboard panels, and the like are all ▶



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examples of where flatbed printing is integrated into a production process. The ability to add personalization as a revenue stream is a natural path for wide-format print service providers. It rarely requires additional equipment, as most personalization can be done using existing flatbed printers, roll-based printers, or a combination print-and-cut device, depending on the application.

Personalization has always been a solid revenue generator for flatbed owners, and right now the hyper-personalization market is growing. The ability to customize objects in a real-time workflow, and deliver with a quick turnaround, has increased the demand for specialized printing services and equipment. The addition of cutting and engraving products with cross-connectivity through software has helped expand this space. For many, it also enables them to express their creativity using digital technology with complete control over the results.

In one day, flatbed printers — fitted with appropriate jigs — are capable of producing hundreds of personalized items, such as writing instruments, magnets, key fobs, phone covers, gifts, and more. Specialty flatbed printers fitted to print on cylindrical objects can produce personalized stainless steel tumblers, bottles, cans, vases, packaging, and candle holders.

Roll-based printers can create decals, personalized wall decorations, and transfers for garments and household goods decoration.

Automation and complementary technology can combine to open new avenues for revenue generation. If you own a flatbed printer and a laser cutter, they can be used independently for regular graphics business, and can be used to produce personalized awards to commemorate employee recognition, and team and individual sports. For example, acrylic blanks can be reverse-printed with the company, team, or event name, and be held until needed. The individual's name and statistics (if necessary) can be added by the laser cutter at a later date.

Think of this process as a microfactory: there are existing technologies — including digital printing, associated inks, and media; cutting, finishing, and fabrication — that can be assembled to create a pop-up microfactory for a variety of finished goods. Using the microfactory concept, print providers can utilize digital technologies to bridge the gap between the consumer and manufacturer by enabling them to move from concept to final design, and then production to sales within hours instead of weeks or months. The microfactory can be a business unto itself, or can be used as a model and

scaled up for larger production runs.

One company that transitioned from short runs to higher volumes using flatbed technology is Seattle-based iClick², now an award-winning promotional products decorator and supplier. The company began in 2001 branding small consumer electronics using a pad printer. As it grew, iClick recognized digital printing was the way to go. It purchased a small flatbed printer, and now runs a fleet of full-sized flatbed printers to produce a range of products including mobile accessories for cell phones and tablets, mini speakers, power banks and chargers, phone cases, and PopSocket collapsible phone stands. iClick is an example of a company that evolved beyond its analog roots to embrace high-volume digital printing in a niche market.

Why UV Inkjet Technology?

In the industrial printing market, we are usually talking about UV inks. And with UV, the main issue is adhesion: finding the right combination of ink, substrate, and, in some cases, adhesion promoter. If a print provider already has a UV flatbed printer, it's a simple task to start testing on some of the more common products such as promotional items like USB drives, phone cases, and chargers to see which

A functional radio-controlled scale model of an F1 racing car, 3D-printed in full color.



materials work best with their current UV ink sets. Another possibility is to add a benchtop UV flatbed printer, which is a great way to get into the industrial printing market with a low cost-of-entry while still having very high quality and throughput.

Another advancement in UV printing has been the development of frequency-specific ink. The LED lamps can be waveform-specific; they can be programmed to generate UV waves at a specific frequency. This allows for frequency-specific ink, which increases the cure efficiency and enables greater variability in ink characteristics, such as flexibility. Flexible ink is not a new concept, but the advancement has created an expansion of available inks and achievable applications.

In addition to rigid substrates, UV ink technologies also perform well on other materials, such as polycarbonates, polystyrenes, synthetics, and more exotic surfaces, such as wood, metal, and leather. The ability of UV curable inks

to bond directly to the surface of virtually any material and the instant curing characteristics have made them popular in direct-to-substrate applications. The introduction of advanced flexibility characteristics has seen UV curable become more popular in mid-length exterior applications, such as fleet graphics on vans and buses that are exchanged every few months or years. UV curable ink has also given print providers the ability to offer applications that may have historically been created through engraving, screen printing, or pad printing, such as wall placards, nameplates, ad specialties, and awards. UV-LED printing — available from tabletop to full-floor models — is the most versatile, flexible, and adaptable of the wide-format technologies available.

Opportunities abound

How and what consumers buy is changing, as buyers see high value in quality, personalized goods, and services that deliver an experience, connect, and resonate with personal

expression. Industrial applications utilizing digital technologies can help bridge the gap between the consumer and manufacturer, enabling print providers to deliver unprecedented just-in-time production, develop true customer intimacy through personalization, and reduce time-to-market by enabling them to move from concept to final design; and then from production to packaged, sales-ready, customized products within hours, instead of weeks or months. ■

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