

DIRECT-TO-FILM PRINTING'S IMPACT on the Apparel Decoration Industry

The DTF market keeps growing faster than expected. Here are a few reasons why.



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In the ever-evolving landscape of the apparel industry, technological advancements continually reshape production processes and consumer experiences. Among these innovations, direct-to-film (DTF) printing has emerged as a transformative force, revolutionizing the way garments are designed, printed or decorated, and distributed. This article explores the history, benefits, and applications of DTF technology and its profound impact on labor efficiency and distribution within the apparel sector.

A Brief History of DTF Technology

Direct-to-film printing, also known as DTF printing, traces its roots back to the early 2000s. Initially developed as an alternative to traditional screen-printing methods, DTF technology offered a more efficient and cost-effective solution for apparel decoration. DTF printing is a bit of a misnomer because it's not a direct-print process, it's a transfer process. The film is imaged (in reverse) and then applied to the substrate via a heat press. Early iterations of DTF systems were rudimentary, with limited color capabilities and substrate compatibility.

However, as customizable and high-quality prints gained interest, manufacturers invested in research and development to enhance DTF technology. Over the past two decades, significant improvements have been made in

printer precision, ink formulation, and software integration, leading to the emergence of sophisticated DTF systems capable of producing vibrant, durable prints on various fabrics.

Growth Potential of DTF

In recent years, DTF technology has witnessed exponential growth in North America, and shows no signs of slowing down with adoption rates surging over the past five years. The growth potential outlined in a report published by Valuates Reports states, "The global Direct-to-Film Printer market was valued at U.S. \$375 million in 2023 and is anticipated to reach U.S. \$649.9 million by 2030, witnessing a CAGR of 8.2% during the forecast period 2024-2030."¹

Key factors contributing to the widespread adoption of DTF technology in North America include:

- **Customization:** Consumers increasingly seek personalized and unique apparel items, driving demand for on-demand printing solutions such as DTF.
- **Technological advancements:** Continuous innovation in DTF technology has led to improved print quality, faster production speeds, and enhanced substrate compatibility, making it an attractive option for manufacturers.
- **Sustainability:** As environmental consciousness grows, more businesses are turning to eco-friendly printing solutions like DTF to minimize waste and reduce their carbon footprint. Key DTF technology advancements include:
 - **Enhanced print quality:** Manufacturers have refined ink formulations and printing techniques to achieve sharper details, more vibrant colors, and superior washability.



DTF technology can be used to embellish finished garments, such as the sleeve on this denim jacket. | Credit: Mimaki USA

• **Improved substrate compatibility:** Modern DTF systems can print on a wide array of fabrics, including cotton, polyester, blends, and even leather, opening new possibilities for apparel customization.

• **Integration with digital workflows:** DTF technology streamlines the production process by seamlessly integrating with digital design software, allowing for rapid prototyping, on-demand printing, and mass customization.

Labor Efficiency Through DTF

One of the most significant advantages of DTF technology is its ability to streamline the labor-intensive process of garment decoration. Some traditional methods require intricate setup, extensive manual labor, and specialized skills.

DTF technology simplifies the printing process in many scenarios — particularly smaller runs, and personalized or custom work — reducing the need for manual labor and setup time. With automated printing and heat transfer processes, DTF systems can produce high-quality prints in a fraction of the time. This efficiency not only lowers production costs but also enables

manufacturers to meet tight deadlines and fulfill orders more quickly.

Moreover, DTF technology minimizes material waste and ink consumption. By eliminating the need for screens and minimizing ink residue, DTF printing reduces cleanup time and material overhead, which makes for a more efficient and eco-friendly production process.

Promoting the Distribution of Labor

DTF technology also promotes the distribution of labor within the apparel industry, fostering collaboration between designers, manufacturers, and retailers across geographical boundaries. With its digital workflow and on-demand printing capabilities, DTF enables decentralized production and localized customization that empowers small-scale businesses and independent designers to compete in the global marketplace.

By addressing the constraints of traditional supply chains and minimum order quantities, DTF printing provides for agile, just-in-time manufacturing, reducing inventory overhead and minimizing financial risks. This decentralized approach to production not only fosters innovation and creativity but also promotes economic inclusivity

and sustainable growth within local communities.

Upskilling: A Must in the Digital Textile Industry

Technology's influence on the textile industry's transformation is only growing, and that raises the stakes for workforce preparedness. Digitization creates exciting potential — but to fully harness it, upskilling across the board is essential.

Digital transformation reaches every corner of the industry. Factory workers once focused on manual tasks now operate complex digital machinery, requiring them to be tech-savvy and have an understanding of software interfaces. Designers fluent in sketchbooks must also master CAD, while those in supply chain roles must become adept at data analysis, not just managing inventory. Even the traditional boundary between designer and programmer blurs as collaborations on “smart” textiles demand new communication skills.

And even the push toward sustainability demands new knowledge. Understanding the lifecycle of innovative materials, tracking waste-reduction metrics, and contributing to circular fashion models all require a workforce educated in ways that were unheard of even in the recent past. ►

Customize wearables from hats to T-shirts using a DTF printing process. | Credit: Mimaki USA



The urgency is clear. Companies failing to invest in upskilling risk being outpaced by more digitally agile competitors. A skilled workforce is key to attracting top talent and staying innovative. But the greatest advantage may be adaptability — an upskilled workforce is your best asset in the ever-evolving digital textile landscape.

DTF: The Small Business Equalizer in Apparel Decoration

It's no secret that larger screen-printing operations have long dominated the custom apparel market. But the rise of DTF technology is adding to that landscape, giving smaller businesses and independent designers the tools to compete on a whole new level.

Let's break down how DTF is changing the playing field:

No. 1: Breaking Down Barriers

- **Lowering the Cost of Entry:** DTF printers and supplies represent a smaller investment than a full screen-printing setup, and they take up less valuable studio or shop space.

- **Skills for Success:** DTF's simplified process means smaller teams can master it, reducing reliance on finding skilled screen printers.

- **Launch Pad for the Next Generation:** Another bonus due to its low cost of entry and ease of use is to place DTF printing units in schools to help educate future designers and digital print operators. Doing so gives students the necessary knowledge and skills as they advance in the digital textile world.

No. 2: Flexibility is Power

- **No More Minimums:** DTF means a single shirt can be as profitable as a large run. Small businesses can say "yes" to niche designs and limited editions.

- **Trendsetters, Not Followers:**

Short setup times empower small brands to be the first to capitalize on a viral design or niche trend.

No. 3: Speed Wins Customers

- **Beating the Clock:** DTF's streamlined process means smaller operations have the ability to do fast turnaround, winning clients who need it.

- **Idea to Market, Faster:**

Designers can prototype new ideas affordably with DTF, getting their products to customers ahead of the competition.

No. 4: Leaner Means Profitable

- **Automation Advantage:** DTF reduces labor costs. Smaller teams can manage larger workloads, boosting their bottom line.

- **Waste Not, Want Not:** Less ink waste and fewer mistake prints mean more profit on every job, which is especially crucial for smaller runs.

No. 5: The World is Your Storefront

• **Local Heroes:** DTF is ideal for hyperlocal merchandise or businesses wanting to emphasize that their products are “made nearby.”

• **Online Integration:** DTF works seamlessly with e-commerce. A solo designer with a great idea can have a global reach with zero physical storefronts.

Applications and Substrates: Where DTF Excels

DTF technology’s versatility and ease of use make it ideal for a wide range of apparel and accessory applications such as:

• On-Demand and

Customized Apparel: DTF enables customization, quick turnaround streetwear drops, and highly personalized T-shirts, hoodies, and activewear. Its fast production times and lack of minimum order quantities are perfect for this niche.

• Fashion Accessories With

Impact: Add intricate, full-color designs to hats, bags, scarves, and even patches. DTF offers the detail and durability to take accessories beyond the ordinary.

• Team Uniforms and Fan Gear:

DTF delivers the vibrant colors, complex logos, and wash-resistant prints needed for custom sports uniforms, fan jerseys, and spirit wear.

• Corporate Branding Elevated:

DTF offers new possibilities for branded merchandise with its ability to print on diverse items. Think custom lanyards, tech accessories, or durable branded workwear that stands out.

DTF Substrates: A Wide Range With Considerations

A wide range of fabrics are suitable for DTF printing:

• **Cotton:** The best choices are mid-to-heavyweight cotton fabrics for producing vibrant and long-lasting prints on T-shirts, tote bags, and more.

• **Polyester:** This textile has excellent color saturation and durability, which makes DTF a good fit for sportswear and performance apparel.

• **Blends:** DTF handles fabric blends well, enabling a mix of

properties in garments (e.g., cotton/poly for breathability and softness).

• **Beyond the Basics:** Some advanced DTF systems can transfer to leather (e.g., footwear and bags), canvas, and other niche substrates, offering exciting creative possibilities.

One caveat: Very thin, highly textured, or stretchy fabrics might pose challenges for DTF adhesion and print quality. Experimentation is critical to make sure your chosen substrate works well with your film and powder combination.

The Power of White:

Unlock DTF’s Full Potential

In the world of direct-to-film printing, white ink isn’t just another color — it’s the key to unlocking vibrant prints, a wider color range, and the ability to handle a huge variety of fabrics. Let’s dive into why white ink is such an essential part of your DTF toolkit.

Remember, DTF involves a transfer step. Without a white ink base, the color of your T-shirt, tote bag, or whatever your substrate is would muddy the color you’re



The Mimaki TxF300-75 Direct-to-Film printer finishes the white layer before transfer to a garment. Once the film is imaged, it is placed onto the garment and transferred via a heat press. | Credit: Mimaki USA



Heavy cotton fabrics produce vibrant and long-lasting prints when using the DTF process. | Credit: Mimaki USA

trying to achieve. White ink acts as a blank canvas, letting your CMYK inks shine at their brightest. This is crucial on dark fabrics, which would otherwise dull the final print. Here is where white ink shines:

- **True-to-Life Color:** DTF's reputation for vibrant prints rests largely on that white ink foundation. Pastels, bright hues — it all needs that white base for accuracy.

- **Photos and Details:** If a client wants a photographic image on a garment, white ink is essential for those subtle tones and highlights to pop. White ink also provides for effects such as distressed looks and simulated underbases, giving designers even more design options.

Know Your Options

DTF printers offer various options for white ink application, including single-pass, double-pass, and underbase techniques. Understanding

the capabilities of your printer and experimenting with different settings will help you achieve optimal results for your prints.

While always important to understand DTF's limitations, white ink helps expand those boundaries. It's what sets your DTF prints apart — achieving color vibrancy that rivals other apparel decoration techniques on a diverse range of fabrics. As inks and printers evolve, the use of white will remain a cornerstone of successful DTF work.

Many Benefits, Many Opportunities

DTF technology is versatile, easy to use, suitable for a wide range of textiles, usable in almost any environment, and an eco-friendly printing solution. It equalizes the playing field in apparel decoration and gives designers the benefit of expanded creative possibilities. The opportunities

for using DTF in textile decoration are myriad, enabling catering to pre-made blanks for soft goods and garments, as well as promotional items. This technology offers small businesses and entrepreneurs a faster time to market and increased production flexibility without high minimum order quantities. ■

Reference

¹ *Valuates Reports. "Global Direct-to-Film Printer Market Research Report 2024." reports.valuates.com/market-reports/QYRE-Auto-11Z16875/global-direct-to-film-printer*

Josh Hope is a print professional with more than 35 years of experience in the printing industry. As director of marketing at Mimaki USA, he leads the business development teams for the Sign & Graphics, Textile & Apparel, Industrial Printing, and 3D segments, and is responsible for the company's overall marketing program.