



TECHNICAL GUIDE

AN INTRODUCTION TO DECORATIVE INTERIORS

Second Edition

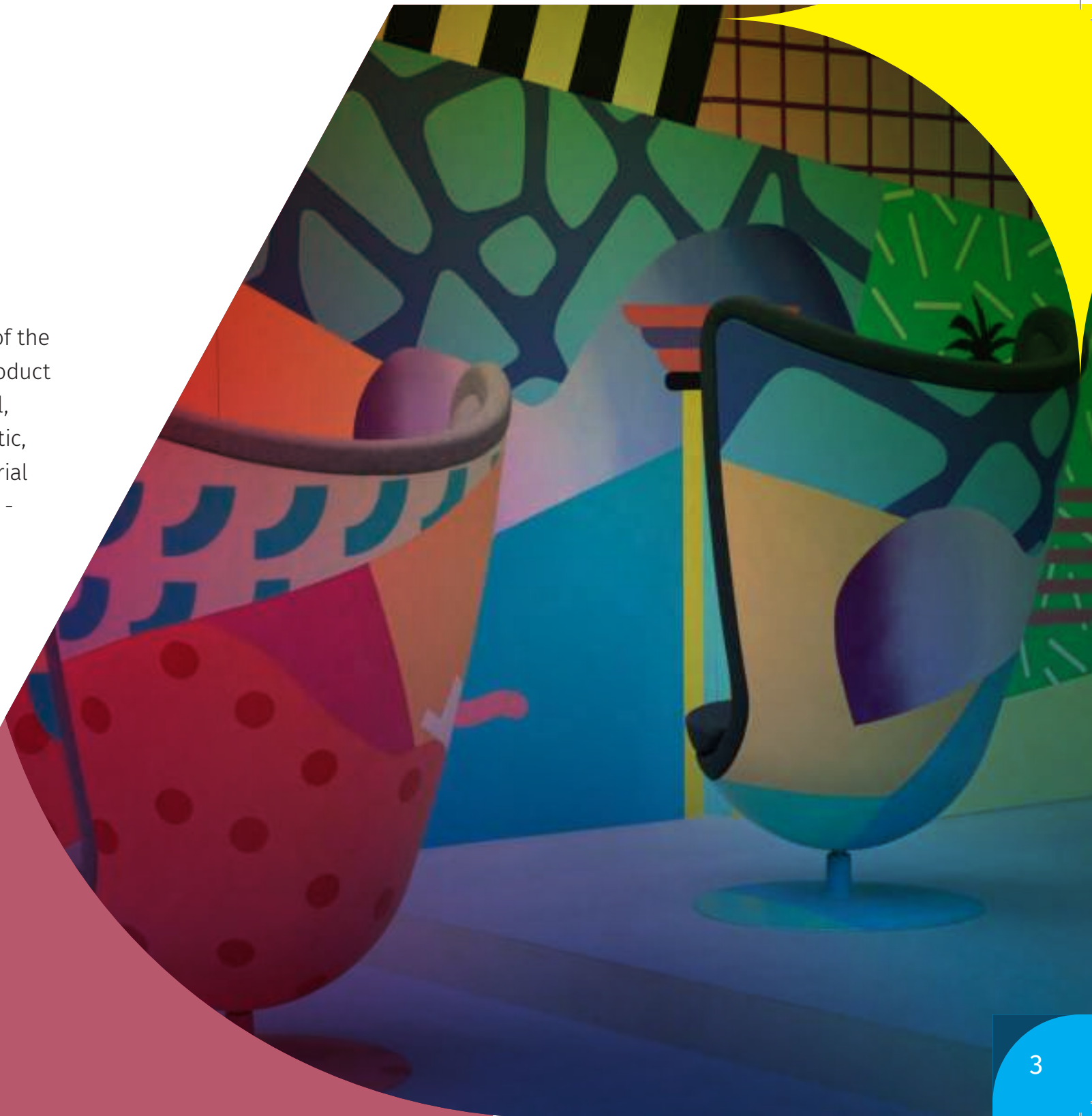
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Decorative Interiors

The Decorative Interiors industry is a complex business that serves an equally diverse marketplace. Driven by a combination of design, style and purpose, the products used in these sectors have to comply with many regulated product performance specifications, whilst maintaining the creative aesthetic. Encompassing the mass market and the Luxury marketplaces, Interiors are becoming increasingly customised as the digitisation of the print industry continues to offer new applications.

Printing for interiors which was once a seasonal marketplace whereby design collections and printed surfaces were finite, and where specifiers worked with Interior designers to select products from stock. Inventory has long been an issue for all markets, and digital production reduces or even eliminates the need for stock. The Décor industry continues to develop within the digital manufacturing environment where new opportunities abound, and innovations drive change. Customisation and Personalisation are now the biggest trends driving change unlocking creativity and the development of new applications for various digital print technologies.

To give some insight into the depth of the Industry, consider the variance of product performance required for Residential, Commercial, Hospitality, Retail, Aquatic, Outdoor, Health, Aviation and Industrial Interiors. Then consider the surfaces - every space, internal or external, is made up of number of substrates and tactile surfaces. Carpets, Lighting, Wallcoverings, Textiles, Wood, Metal and Glass, all of which must be considered and form the content for an Interior designers' scheme, all of which can now be printed using digital technologies.





Zoe Murphy has made great use of both screen and digital printing in her furniture designs.



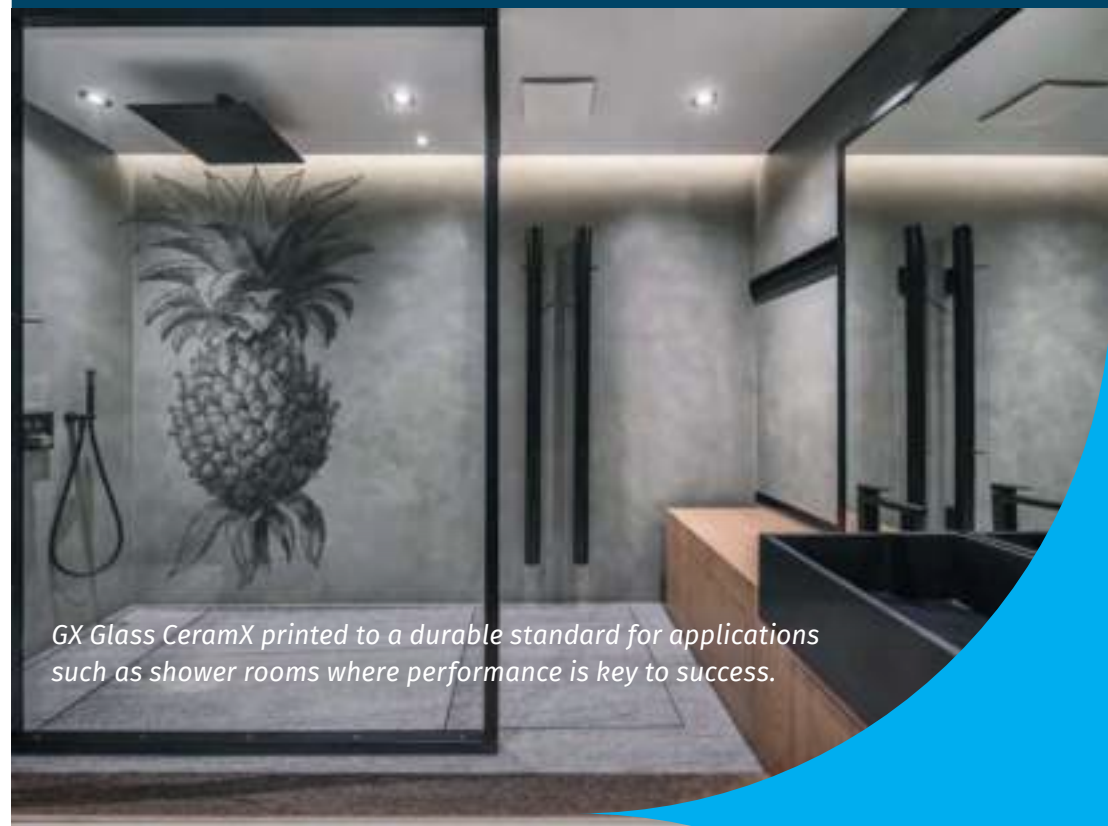
Cotton Bee offer custom printed upholstery in volumes to capture customers with the desire to customise and create unique pieces.



Surfaceview have mastered the offer of print on demand including wallcoverings, tiles, window films and canvases build around a beautiful curated collections from many sources including V&A, National Portrait Gallery and the Ashmolean.



Custom printed carpets from DESSO with their Gravure W range meet all EN 14041 standards for performance and can be printed for any bespoke location and intent.



GX Glass CeramX printed to a durable standard for applications such as shower rooms where performance is key to success.



Raised print created with IQ Demy UV flatbed inkjet with neon inks for composite panels.

Clients for printed interior services range from individuals to businesses and organisations of all kinds. Equally diverse are the Interior design practitioners themselves, whose knowledge of their sector and the product specification required is extensive. Interior designers, design companies, architects, government and local authorities, and many more, are all candidates for printed interior services.

This guide explains some of the business considerations for printed interiors along with ideas for how printers can tackle new applications, thanks to the new possibilities triggered by having neon, white and clear inks in addition to the standard process colours.

Printing can enhance any surface, so for interiors the array of possibilities is extensive. From large surfaces such as walls, floors, ceilings, doors and windows, furnishings and upholstery, curtains and blinds, and worktops, to small ones such as remote controls, photographs and accessories, the applications are endless.

Here is an example from GX Glass of the print decoration available for glass surfaces.



Interior decoration covers everything from printed surfaces to decorated objects. This includes glass surfaces printed with photovoltaic or insulating materials and acoustic panels for sound proofing.

Digital printing technologies, especially inkjet printing, makes it simple to create new refurbishments for walls and floors, linens and throws, kitchenware and crockery, placemats and coasters, even clothes. Increasingly technology can recreate previously unavailable surfaces such as exotic hardwoods, by mimicking the original substrates through photographic replication and repurposing them using components that meet the specifications of the interior environment.

Markthal, Rotterdam is an example of one of the largest architectural decorative print projects to be undertaken, the level of planning required to achieve success is significant requiring as many engineering as imaging skills.



Another interior where glass door covers have been printed sub-surface to simulate the luxurious finish of Italian marble.

Beyond beauty

Enhancing surfaces through decoration has created business opportunities for centuries. Interior decoration creates a sensory experience, whether it's for reasons of warmth and comfort or to convey status, power, personality or aspirations.

Any Interior is a statement of lifestyle, branding and style regardless of location. The opportunities offered by digital printing and communications technologies have reinvented the traditional supply chain. High resolution image quality and fast, convenient production without the overheads of conventional print methods (and inventory) make printed interiors available on demand.





Surfaceview have removed the challenge for the customer to come up with a design by offering very high quality images from some of the worlds most desired collections.

According to Global Industry Analysts Inc, a market research company, global production of printed textiles will reach 36.8 billion square metres by 2024. Only a small percentage of that is currently produced with digital printing technology.

Advances in wide format digital printing technologies combined with substrate innovation and their availability at low volume creates new possibilities, especially for printed interiors. Communications advances, including the web, social media and mobile computing fuel creative ideas and demand for instant manufacturing.

The transition from conventional to digital production models is well underway, especially in the customised, bespoke sector of the interior marketplace and equally



HP Application Centre features Wallart software helps printers and customers to fit and preview images to fit their spaces through CAD modelling and rendering.

for many high speed retailers, however, there will always be a market for handmade wallpapers, textiles, floorings and goods.

Wide format digital printing systems reduce production costs and make print processes available to a much wider audience, offering new opportunities for refurbishment, creativity and product diversity. Interiors are a lifestyle statement, and their now inherent link to the fashion world and its customer centred trends are driving forward the culture of customised interiors that apparel has stimulated. As such, opportunities are evolving for creative printing business development as the market continues to expand.

Business models that capture a significant share of the printed interiors market require a clear sense of target markets and an understanding of each sector and their specifications alongside technology, both established and novel. The printing method must meet industry standards, with automated, optimised and flexible workflows that enable online ordering, with efficient fulfillment. As this sector of the marketplace evolves there are numerous opportunities, for large and small scale digital production.



Wall art

Wallcoverings have been around for centuries and its production has gone through multiple reinventions, evolving in line with printing methods and taste. Today most paper and vinyl wallpapers are produced using rotary screen, flexo or gravure printing methods.

Wallpapers for specialist markets are often still printed using block and surface printing, however digital printing is steadily gaining market share in custom wallpaper production. Wallcoverings have been manufactured at high speed for many years, however niche sectors will always exist within the luxury market for hand painted or hand-printed coverings using woodblocks or stencils.

In order to understand the choice of digital imaging presses available to this market the top priority is to invest in creating the appropriate production capacity for your target customers.

Emerson and Renwick combined rotary gravure and rotary screen presses run at 120 metres per minute for high volume mass production.



Surface Print formed in the 1880s have continuously produced wallpaper using screen, flexo, roller and digital techniques. This 4th generation family owned printing business based in Lancashire in the UK supplies its customers globally with a vast array of products.

As with all areas of digital inkjet printing there are many printer solutions, some are about low cost of entry, some for special effects and single pass inkjet presses are well suited to large numbers of smaller orders on common stock.





III Single pass inkjet developed with Konica Minolta for high speed mass customization.



This HP Latex 335LV prints on 1630mm media at up to 13 M2 per hour. This class of printer is perfect for small project work where maximum flexibility is required. Where self-adhesive vinyl, canvas and light box graphic may all fit into a design scheme.



The Dimense prints at 1600mm wide at 20 metres per hour enabling raised image embossing of up to 1mm height for that extra tactile element.

The Canon and Fotoba Wallpaper Factory has been developed to handle jumbo rolls to be printed and finished into single wallpaper rolls in line.





PG Prints offer volume printers the PIKE décor 700 single pass press running at 70 metres per minute.

The Palis 2250mm single pass production inkjet press can reach speeds of 160 metres per minute.

The specified application, interior environment and quality expectations are primary considerations, so if you are adding capacity for printing wallcoverings, make sure you understand the demands of the sector and relevant product specifications, alongside the cost of raw components in order to balance your business proposal.

New types of wallpaper come onto the market all the time. Conductive inks for instance are being designed for use in touch screens that can be incorporated into wallpaper. Wallcoverings can



The theme at Marco Polo in Venice continues on the rubber sections of the baggage delivery belt, to provide a taste of Venice before you've even collected your luggage.

be printed with special coatings to block WiFi and mobile phone signals. Surfaces can emit light and messaging. It's even possible to create wallpapers that act as a computer interface with motion sensors and webcams. All of these emerging technologies have a place and purpose, and could have considerable relevance in public spaces, such as transportation hubs.

As a surface wallpaper offers a blank canvas, and often a considerable space for creative installations such as interesting surface textures, embellishments, or even lighting using crystals and LEDs to a space. Using a digital printer and adding LEDs by hand for this type of printed interiors is not currently scalable, however it adds a new design option that is relatively simple to exploit with wide format digital printers. Wallpaper is also used for window blinds, drawer linings and shelf coverings, so adding light to these applications extends the range of the concept. The creative applications are endless.

Print Diversity, New business

Prospective printed interior customers may already be clients but may not have considered applications beyond sign and display and commercial print applications. Printed wall coverings for locations and venues are already an established product for commercial interiors, therefore companies who run events, and indoor fairs and conferences, can gain new business and exploit contemporary wall murals and new applications and printing technologies.

Commercial buildings, Sports clubs, homes factories and offices, shops, bars and restaurants, indeed any shared space that benefits from decoration can present an opportunity for print.

Signbox demonstrated their FESPA award winning skills at the London Bankside project for Cardinia Real Estate's offices. It featured numerous installations including murals in the reception at 14.8 x 3.8 metres.

Capturing such opportunities requires an understanding of final application and the practical considerations of the chosen substrate. Shrinkage, Stretch, instructions for professional installation and end-use specifications must all be addressed and controlled for short run digitally printed wallpaper production.

Great care should also be taken to understand how the substrate being printed onto reacts to the print process. Tension, heat, humidity and ink load all have an impact and must be measured and standardised.



Designs may include repeating patterns which must be matched, or large scale panel prints, all must match perfectly to ensure that the end result is a consistent design across the width and height of all walls and where walls meet, regardless of final project scale. Artwork will need to be adjusted to take into account the behavior of the substrate during the print process. The same rules apply for conventional and digital wallcoverings, wastage can be an issue and a consequence of poor design.

The environment in which the coverings are to be used, and compliance with standards such as EN13501-1:2018, the fire classification standard, must be considered. EN13501-1 compliance allows a wallpaper to be used anywhere in a commercial building. Toxicity standards such as EN 15102:2019 apply to all forms of wallcoverings and must also be respected. Test methods such as the ANSI/BIFMA M7.1 determine Volatile Organic Compound (VOC) emissions from furnishings and must not exceed regulatory levels. The Martindale rub test measures substrate durability using abrasion to simulate wear and tear and provides guidance for surface quality.





Picture courtesy of Sketchup

And then there are the usual considerations a printer must take into account: file delivery, preflight checking, proofing, colour management, ink performance, substrates, finishing expectations and so on. You will need to plan for larger file sizes, new data formats and a wider range of preflight checks. Besides PDFs, creative and design customers may want to delivery their jobs as TIFFs or native Illustrator files for repeating patterns. They may even want to send you EPS, so be prepared for preflight challenges, and especially check that there is a sufficient bleed (if required) in wallpaper designs to take into account irregularities in walls and trimming. Site surveys are recommended to avoid unforeseen issues at the fitting stage. For larger projects is now fairly common practice to utilise 3D Laser scanning tools to capture the space for CAD modelling and visualisation.



FARO Focus S 3D Laser scanner and SCENE software enable 3D space acquisition for modelling and measurement.

For smaller projects a Photoshop mock-up will usually provide enough insight for the client to understand your offer. Design and artwork specifications must be clarified, and final print formats detailed and communicated with your client. Poor communication creates waste and ultimately dissatisfied customers. Sampling is often expected as a free service within the interior design industry and must be costed for in product margins.

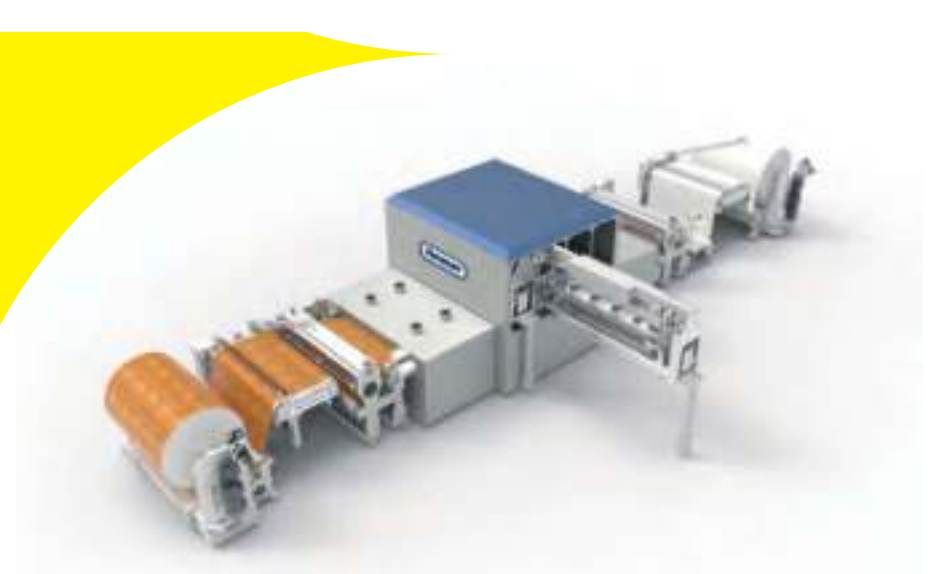
Colour matching could be demanding if you are producing work for lots of different surfaces and fabrics. Make sure you understand viewing situations and manage colour data to take into account the effect of different lighting environments on colour appearance. You should also ensure you have profiles for the required ink and substrate combinations.

Floored

Production of printed flooring such as carpeting, wood, tiles, linoleum, vinyl, laminates and rubber has followed a similar trajectory to that of wallpapers. Synthetic flooring is widely available as printed tiles, planks, sheets or rolls, and is generally selected for its durability, stain resistance, convenience and cost, as well as its appearance.

Compared to wallpaper the performance criteria for floor coverings and mats are obviously more demanding. Surfaces must be durable, lightfast and able to resist staining and damage from sharp objects dropped onto them. Inks for printing floor coverings must be flexible and robust and work with different surfaces including fibres, acrylics and vinyls.

Picture courtesy of Hymmen



The Hymmen Saturn Décor paper single pass inkjet printer has been developed to print wallcoverings and papers for laminates in applications such as flooring and furniture. It is engineered to run at 15/35 metres per minute at resolutions of 1200dpi and roll width of 2300mm.

Innovations continue to emerge within the flooring sector as the number of manufacturers of printed flooring using a variety of substrates and technologies increase. Digital technologies meet the growing demand for customisation and personalisation and the sector continues to witness the application of digital printing methods to replace conventional floor coverings whilst creating new markets for custom printed floors. With flooring, functional requirements are strict. They must be durable and comply with building regulations as well as VOC emissions, safety and fire standards. Floor coverings must withstand abrasion caused by high volume footfalls, and exposure to strong sunlight. They must be both durable and withstand industrial cleaning without loss of coverage or colour.



Picture courtesy of Surfaceview

Printing ceramic tiles for kitchen and bathroom applications is now virtually entirely a digital process. High humidity interiors can be decorated in other ways using digital technology, printing on glass and mirrors for instance. Prints used in these environments must be lightfast, and conform to recognised standards such as the Bluewool test used in Germany, and the ASTM D2247-02 standard for steam resistance.

Digital technologies have made it possible to replicate any design on a flooring substrate, meeting both the designers



GX Glass design selector on their partition walling visualiser

and the consumers' expectations, for quality and durability. But the production system should be flexible with maximum uptime and minimal production waste to remain efficient. Hybrid printers provide the option to print on both flexible roll-to-roll media as well as rigid substrates. But if carpet printing for instance is a priority, select a machine capable of printing at least three metres wide and designed for the application.



Zimmer multi-pass inkjet for industrial carpet print production.

Dress up

Carpet printing is just one small part of printing textiles to enhance interior spaces. Within the FESPA community and beyond, digital textile printing is of interest to many wide format printers keen to serve fashion and garment printing customers. Besides linens, upholstery, cushions and drapery, another option is uniforms and customised clothing, such as sportswear, athleisure, footwear and related gym equipment. Standards apply here too and the most important is the globally recognised OEKO-TEX Standard 100, an independent certification and testing method for textile products.

Rapid adoption of digital textile printing technologies, changing fashion trends and fast fashion, and rising purchasing power in developing countries are driving growth in digital textile printing across multiple markets. Digital technology makes possible direct to garment printing, mostly with inkjet dye sublimation printers using specialty inks.



Linn Warne designer and a winner of FESPA's Printeriors design contest.

Objectify

Printed interiors are about much more than wallpapers, floors and textiles. Interiors are about surfaces, and all of which can now be printed using a wide variety of print applications and technologies that meet the needs of a highly specified marketplace. Digital printing supports the production of all of these complex sectors plus objects such as electronics and furnishings, and conventional prints such as pictures and banners.

Many opportunities for providing print to enhance interior spaces are specific to different sectors. But consider the possibilities for supplying objects such as promotional gifts, trophies and plaques, wayfinding signs, and sports and leisure equipment such as surfboards and skis. There is also a place for more conventional forms of print in the printed interior sector, such as menus and table graphics, health and safety notices, signed original artworks, customised appliances, decals and stickers, adhesive logos. Anything that goes along with hospitality décor and event po-ups that can be personalized and custom printed, as can backdrops, scenery and costumes for theatre productions or school prize days.

Technology options

Dye sublimation printing onto synthetic fabrics uses printed transfer paper, heat, dwell and pressure in the right combination to achieve the desired image quality. This chemical process vaporises dyes to transfer images via transfer paper into a synthetic polyester substrate (un-coated) where they then bond at the molecular level with surface fibres, once heat set, the fabric is ready for end use.

Direct Dispersed inks, for polyester, just like reactive printed fabrics require steaming and washing to remove excess ink and to improve the final handle of the fabric, by removing post coatings. This technology produces a wide gamut of vibrant colours, and deeper penetration into the cloth, but uses precious resources; water and energy and is less efficient than other processes.

There has been a steady move towards direct inkjet dye sublimation technology in recent years. These machines are available as both desktop and high speed industrial printers, and require no intermediate step, directly printing images mostly onto pre-treated fabrics, although eco-conscious direct inks with no need

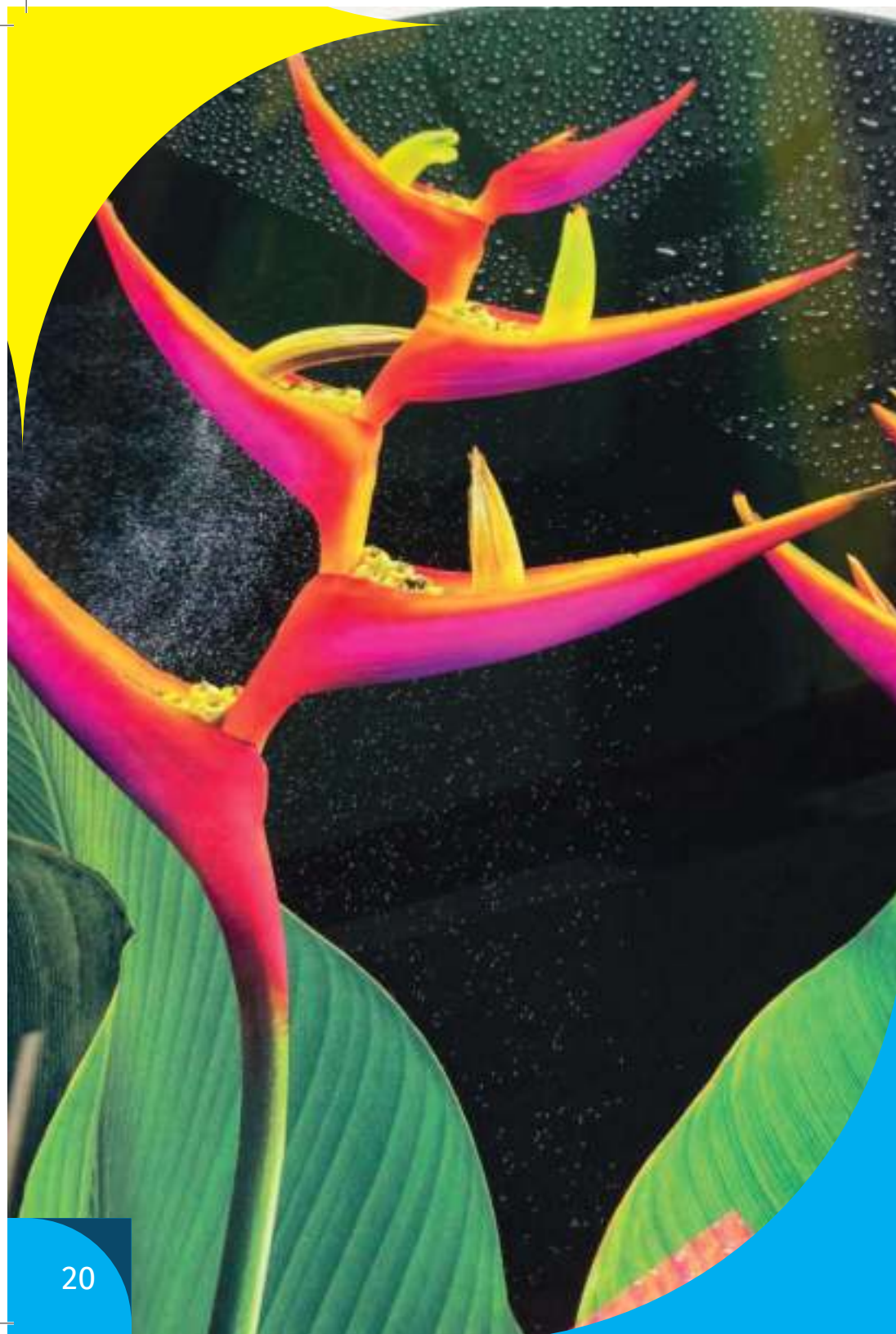
for fabric coatings are now available. Once heated inks fuse during the heat transfer process to fix the image.

Digital dye sublimation technology has long been used for Interior decoration, particularly for synthetic fabrics with inherent fire retardancy. The technique also works with 3D objects that have a polyester based surface coating. It takes the sublimation process a step further, printing images directly onto treated polyester and polymer coated substrates. Direct imaging can yield higher quality and reduce consumables usage, however printheads are vulnerable to clogging due to the size of the particles in the dyes. Dye sublimation transfers require technologies based on advanced printheads capable of achieving consistent and reliable print density at low cost.

A word of caution; The dye particles used in dye sublimation printers for textile printing are designed to bond with polymers. This means that the fabrics being printed need to have a high polyester content. Make sure the ink choice works for preferred substrates and applications.

Consider also productivity expectations. Digital printing innovations for textiles, as well as other flexible and





surfaces are moving very quickly, with speeds of many hundreds of square metres per hour. Production capacity must be balanced against your business model. If this is a new business direction, consider investing in a slower less expensive device before risking all with a top of the line high speed printer.

Throughput capacity rises with the sophistication and cost of the printer. Investment decisions should consider speed, uptime, consumables costs (including printheads), substrate flexibility, service agreements, format and output resolution. Take care to choose the correct technology that fits the needs and diversity of your business model.

Considerations include; the number of inks the machine can print is an important factor, for instance printing an additional white ink to increase colour intensity when printing rigid surfaces, or merely to create a white background or print base. Choose wisely between flatbed and roll-to-roll technology in line with your objectives. A lower risk option might be to invest in a hybrid device that can print on flexible and rigid substrates. Keep in mind that additional investments for roll to roll textiles require additional equipment for pre- and post-treatments, such as calendaring, washing, cutting and sewing may be needed.

Inks

Ink options change constantly as developers come up with new formulations. In addition to dye-sublimation inks there are aqueous inks suitable for printing on canvas, board, card and paper. Solvent inks work for these as well as foamboard which can be used for interior paneling, Aluminum Composite Material (ACM), acrylic and polycarbonate, meshes, textiles and static films. The lighter eco-solvents work for these applications with the exception of self-adhesive vinyls. Latex inks and UV cured inks are equally versatile but only UV works well with materials such as wood, glass and metals. An alternative to UV cured inks is to print self-adhesive vinyl with latex ink for instance and use it as a laminate.

Ink performance and colour consistency are also important and once again the application drives requirements. Adhesion to hard surfaces, particularly if exposed to cleaning fluids or moisture, matters as much as lightfastness and rub resistance. If the ink requires material surfaces to be coated or baked, this impacts workflow, production times and costs. Inks can be cured to different





and cost. Applications requiring flexible materials, such as for laminating a curved surface require inks that stretch without cracking or lifting from the substrate.

For textile printing, consider the inks required to print natural fabrics such as linen, silk, cotton, wool and blends, and synthetics such as lycra. How these materials will be used matters: you cannot use UV-cured inks for textiles, in case uncured ink comes into contact with skin, but they are fine for rigid furnishings. Consider the ink's performance when printing textiles on both sides as well as only one.

Materials

Printer versatility, its printhead, substrate and ink options determine what can be printed. If you want to sell refurbishment and re-modelling services for printed interiors, consider which materials printed interiors customers are likely to want to use. Alternatively consider printing to laminates that can be applied to surfaces, such as flooring, windows and furniture. Furniture and objects such as electrical appliances can be customized with total or partial wrapping with printed materials, if inks and substrates meet industry requirements.

Wallpapers are available in many textured finishes and constructions. Dependent on print application and end-use check that the substrate specifications meet the requirements of the clients project.

By example; Some wallpapers for digital printing are pre-pasted and have an approved fire certificate, so they meet commercial wallcovering standards. Indoor permanence should be rated for at least two years, and preferably up to twenty years. Another example of performance innovations are; Self-adhesive fabric wallpapers that can be removed and repositioned, are



Fred's Kitchen, Amsterdam by Bull Creative this small section of a very large wall mural demonstrates the atmosphere created through strong artwork and digital printing.

suitable for temporary installations such as events and parties. Synthetic and natural fabrics such as satin, suede and canvas can now be printed for wall coverings.

As the décor market place expands new substrates and print technology is becoming available for creating textured surfaces and a whole host of other interesting special effects, each pushing print boundaries further with every new creative application.

The range of materials is clearly vast: flexible coated and uncoated substrates including backlit materials for signage, meshes, banners, vinyl's, metallised films, photographic



Naomi D'Cruz, a winner of FESPA's Printinteriors design contest.



UV Printing on brushed aluminium composite creates an exciting range of coloured metallics.



Direct to wood printing bring a host of finishes from simulated marquetry to transparent print allowing the grain to shine through.



Sub surface prints on polycarbonate and acrylic sheeting offer high gloss surfaces with vibrant imaging protected beneath.

and fine art papers, canvas, wallpapers, polypropylene, eco leather, fabrics and films. Films are available to provide one way viewing into or out of a space, and window tinting and blackout films can be printed for privacy or to reduce sunlight glare. There is even work underway for printing solar cells within window glass, though there are no products yet.

Besides glass, the range of rigid options suitable for interiors includes acrylic plastic and polycarbonate, plus ACM which can be printed direct or used

with a preprinted self-adhesive vinyl. Besides composites, metal and plastics, rigid materials include ceramics and glass plus natural materials such as wood.

Prior to any investment, test candidate ink and material combinations, ensuring that inks and substrates perform in the printing system as required.

It is worth considering whether final lacquering or lamination will be useful in giving the product the expected durability.

Finishing

As with all forms of print, without finishing processes there is no end printed interior product. For this application finishing ranges from the trimming of wallpapers, to the installation of floor coverings, and the cutting and sewing of textiles. Technology provides some answers, but practical considerations determine cost effectiveness.

Remember the workflow

For years the graphics industry has focused on the performance of output devices. However for a digital generation, workflow and data management take precedent for on demand work. Printed interiors workflows should assume every output path is unique, providing three big benefits: such a set up requires an understanding of the production workflow's scope, and it provides a foundation from which to expand capacity and output type as the business grows, response to new output requests is immediate.

Business opportunities in this sector are as wide as the range of applications, but this is an exploding and therefore competitive market that requires imagination to exploit. Services for printed interiors can be limited to the print or could take





the form of subcontracting for organisations such as event managers, marketing and advertising agencies, and even wedding planners and caterers. This extends to other entities such as local authorities and municipalities, flooring and interior design companies, sporting venues such as racecourses, tourist destinations and theme parks. Local schools and universities might even be interested in marketing services for use in waiting rooms and elsewhere in their premises. There are even opportunities to provide print services for transit lounges, on escalators and in baggage halls.

Next steps

The world of printed interiors is clearly enormous, so setting up a new business to exploit the opportunities requires a great deal of market research and solid business planning. Start with identifying niches that aren't too crowded and consider existing constraints and budget. Devices for production come in all sizes, small, medium and industrial scale machinery options, built for a new customised, and highly diverse marketplace.

Most important is the technology investment choice, choose wisely. The golden rules apply: price, quality, speed. It's often said that you can only have two of these three, but digital printing technologies can break that convention. This benefits the business and creates amazing opportunities for customers.



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