

# The Market Opportunities in Industrial Print

MAY 2017



## Introduction

Printing technology is widely used in manufacturing to decorate an item, to identify it, or to provide information – for example on a switch or a control panel. There is also an increasing trend to use printing as a part of a wider manufacturing process, or even become the manufacturing process itself, as with 3D printing or additive manufacturing.

Industrial print as a catch-all term covers the emerging use of printing for profit in novel areas outside the traditional graphics and packaging arenas.

Printing technology is widely used to decorate many items, from architectural and automotive glass to ceramics and electronics, household items, toys, and textiles. It can be used with special inks to create new functions – including biomedical and photovoltaics, which are becoming significant markets.

There are established sectors – wallpaper printing dates back hundreds of years – and there are emerging sectors that are attracting high levels of hype, such as 3D printing and printed electronics.

Futuristic applications are being described involving printing human tissue or solar powered window films which also act as lighting, while inventors describe new classes of materials potentially opening new opportunities.



**Futuristic applications are being described involving printing human tissue, or solar powered window films**

New revenues can be made as print technology is developed for atypical substrates like glass or metal  
*Source: Glas Primer*

## Market prospects

The overall market for functional and industrial printing is valued at \$67.4 billion in 2015, up from \$32.1 billion in 2010. It will grow to \$107.9 billion by 2020 according to Smithers Pira, and is divided into the following primary areas:

- Décor and laminates
- Glass
- Automotive and transportation
- 3D
- Promotional and miscellaneous.
- Ceramics
- Electronics
- Biomedical
- Textiles

Each of these sectors varies in terms of its current use of industrial print, and its market prospects. For instance, in 2010 décor accounted for 37.7% of industrial print. As the overall market grows, décor's share falls to 18.6% in 2020 as print opens new applications.

Meanwhile printed electronics – like membrane switches, RFID, photovoltaics, displays and lighting – is expected to move from a 17.4% share of the industrial print market in 2010, to almost 40% by 2020.

Industrial printing is also a global pursuit. Asia is the largest region, reflecting its position in manufacturing, but Western Europe and North America will have higher growth rates forecast in 2015-2020, as new high- value applications in biomedical and electronics come on-stream.

There are different pressures and opportunities across the various applications, with little commonality between the sectors. This paper looks in detail at some of the market developments and forecasts for the dynamic sectors of industrial printing.

**Industrial printing is also a global pursuit – Asia is the largest region**

## Growth sectors

There is consistent growth across the industrial functional landscape as demand grows for construction, automotive, electronics and manufactured products that increasingly incorporate print. This is in stark contrast to publication and commercial print, where print volumes are declining.

Many established printers serving those markets are looking to follow the example of large Japanese print companies and move into industrial markets, where they can use their core skills.

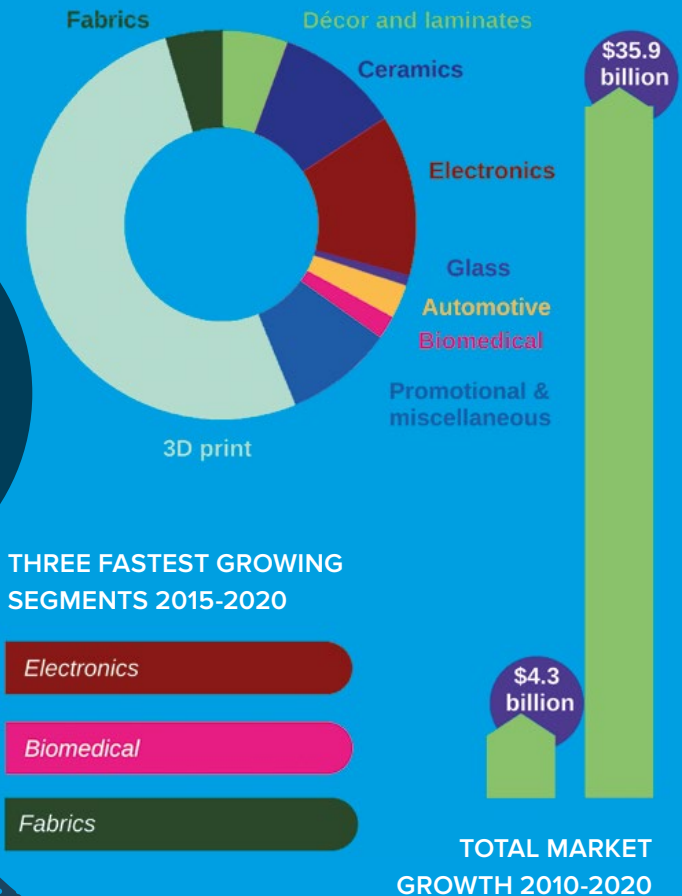
It is also attractive to equipment and consumable suppliers to develop niche applications that may grow significantly, as is the case for inkjet printing of ceramic tiles.

One of the key growth areas is clearly décor. The sector is expanding rapidly as consumer demand dovetails with a host of new print and substrate technologies. The potential of these is explored in full in the separate sister FESPA White Paper – *New Frontiers in Interior Print*.

One press builder looking to exploit the décor segment is Mtex. As with other producers it typically supplies a range of printers allowing for an entry level and then upgrades with the same machine family.

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### Industrial Inkjet 2016



Source: Smithers Pira



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Mtex showed its Dragon, Scorpion and Eagle machines at FESPA 2017. The Dragon machine is a roll-to-roll press that can handle substrates up to 1.9m wide and print in eight colours at speeds to 137m<sup>2</sup> hour.

The Scorpion is ideal for knitted or stretch fabrics, with the Eagle the widest machine at 3.2m, designed to output home textile at 543m<sup>2</sup>/hour.

All three printers run at a maximum resolution of 1,440 dpi and have variable drop sizes of 3-24pl. Machines like these speak to the expanding commercial textile print sectors.

## Industrial print processes

Analogue processes are well represented – specifically gravure, screen and pad printing – with the fastest growth observed in inkjet.

Suppliers have developed equipment to broaden applications, with new inks, coatings and functional fluids providing enhanced flexibility, adhesion and durability, together with novel capability in electronics and biomedical. There are also bespoke proprietary methods, often closely guarded by manufacturers.

As in most printing processes, there are always possibilities to reduce wastage, reduce the time and cost of the process, or to increase the quality of the print and of the item.



**Ceramic printing has proven to be one of the busier markets in terms of industrial print development**

Wide format textile printers can be used for dynamic signage and interior décor  
*Source: Mimaki*

Expertise of experienced print service providers (PSPs) may be helpful to specialist manufacturing operations. There will be efforts to improve sustainability, and to reduce the environmental impact of the overall manufacturing process.

### Equipment developments

Machine manufacturers are also witnessing the direct-to-object print market evolving, and developing machines for it. A number of entry-level machines exist for PSPs looking to make an initial investment – like the UJF MkII from Mimaki.

The UJF is a small format LED UV flatbed printer that can handle substrates up to 153mm thick using a choice of LH-100 or LUS-120 inks, each with nine colours including white, clear and primer. If the user subsequently wants to upgrade the press, Mimaki offers the larger JFX200 as the next step up.

PSPs also have other machine options including the Mutoh ValueJet 426UF that offers a 1.63m print table. FESPA 2017 included details of the VersaUV range of UV-LED flatbed printers from Roland, including the new LEF-200 that is designed to fit into a retail environment. With a list price of \$26,000 it has a small footprint – 1.20m x 0.96m x 0.55m, yet is versatile enough to print onto an array of consumer items.

PSPs that want to enter the large format market could also see at FESPA 2017 the Azon Matrix series of wide format printers. The machines have the capability to print conical and cylindrical objects. Azon Matrix printing solution with optional S, M and L bed sizes; 0.7m x 1.9m, 0.7m x 2.5m and 1.2m x 3.3m using TurboJet inks. It offers CMYK, plus white and gloss configurations.

**Manufacturers  
are witnessing  
the direct-to-object  
print market  
evolving**

Within the décor sector, wallpaper has seen its popularity expand over recent years, with consumers returning to paper wall coverings. This has been supported by the development of new print effects, principally in inkjet technology.

A good example here, and shown at FESPA 2017, is the Dimensor Model S printer from Veika. Its unique capabilities enable it to print images and also emboss wallpaper substrates at the same time. The 1.6m wide machine offers a maximum speed of 20m<sup>2</sup>/hour or 12m<sup>2</sup>/hour when running its highest quality CMYK mode.

## Ceramic printing

Ceramic printing has proven to be one of the busier markets in terms of industrial print development over the past few years. The printed ceramic industry covers a wide range of product categories, including floor and wall tiles, sanitary ware, and table and kitchen ware, along with technical and artistic ceramic products.

As the pottery industries have developed over thousands of years, there have been many types of decoration applied to enhance the final item.

As pottery became industrialised, the higher volumes and lower cost demands led to the introduction of printing to replace costly and slow hand painting. In many instances printing is used to replicate the appearance of a more expensive material, to provide a consistent colour item, or to provide a particular decorative pattern or effect.



**Ceramic printing has [been] one of the busier markets over the past few years**

Firms such as Xaar have made major inroads in the digital printing of ceramics  
*Source: Xaar*

There are many methods of printing and decorating ceramics – these may be direct printing, or indirect through the application of decals and transfers. Analogue techniques, screen, flexo and pad printing involving contact have been in use for many years.

Since 2008, the use of non-contact inkjet has grown spectacularly, with a reduction in breakages and providing greater flexibility of design with printing to the edge of a tile.

In some cases, the base weight and thickness of some wall tiles may be reduced using inkjet, resulting in considerable material and energy savings, alongside lower distribution costs. Inkjet equipment and consumable suppliers are looking to see how other sectors might follow suit.

### Tiles

Ceramic tile printing has been transforming over the last few years thanks to advances in inkjet technologies. At FESPA 2017, Ricoh showed its EFI H1625 Hybrid UV LED wide format printer that featured images taken on the Ricoh Theta 360-degree camera.

The printer is not designed just for ceramics; it can also handle other substrates, including 3mm black board, 6mm polystyrene and clear Perspex.

In addition, Ghost showed its white toner, which can be used on ceramics.

German ink developer Marabu displayed a range of new inks. This included its Tampa Glass TPGL, which can be used for glass and ceramics applications, and is ideal for object printing.

At the same event, 3M also had five new additions to its Décor Overlaminates range in the 8600 Series and a new Fasara Glass Decorative Film.

**There are complex routes to market and supply chains across industrial functional print**



## Architectural

Associated with the rise of more diverse use of print within décor applications is also how building design and architecture are embracing print as a fundamental component of their creations. Architectural glass printing involves companies such as Dip-Tech, fusing ceramic inks into the glass substrate during manufacture, and is an example of how specialised R&D can open a new market.

This process offers consumers and commercial specifiers a material with high resistance to scratching, as well as deterioration by UV and weather conditions. Though this is having to compete with a new range of enhanced printable laminates.

Developments like this join a growing market for ceramic printing that is now being offered by a range of PSPs to the commercial and consumer sectors.

## Automotive

Another key area of development for industrial printing is the automotive industry. Cars, buses, trucks, aeroplanes, trains and ships contain many printed items. There is upholstery, carpets, interior, switches, windows, dashboards and instrument panels.

For this sector, print may be either decorative – like a wood-effect interior; or functional – like a windscreen de-mister or radio antenna. In some cases, it will be both: for example, instrument panels can be designed to be easy to understand, with opaque panels interspersed with translucent colours showing alarms.



**Another  
key area of  
development  
for industrial  
printing is the  
automotive  
industry**

Ceramic inks can add exciting new design elements for glazing and interior glass surfaces  
*Source: Sedak*

The possibilities of printing a roadworthy car – not just minor components – are being explored. In 2015, the first car with an integrally 3D printed load-bearing structure and body was demonstrated.

Named the Strati, it was produced by US start-up Local Motors. The vehicle is made from 212 layers of acrylonitrile butadiene styrene (ABS) plastic reinforced with carbon fibre. Some of the electrical and electronic parts will be printed into the car as it is built up by the 3D printing process.

### 3D print

The 3D printing segment has been maturing for several years and now forms a component of many manufacturing processes in applications, such as jet aircraft components or parts for classic cars. As it continues to advance, it will touch many more industries and potentially revolutionise manufacturing.

It has many applications in automotive and other engineering sectors. Many of the components that a car contains are typically machined from metals that could be 3D printed. Established press builders are looking to stimulate a commercial, rather than hobbyist, market.



**The 3D printing segment now forms a component of many manufacturing processes**

Automotive interiors present a premium forum for enhanced print effects, and increasingly 3D printed components  
*Source: Nakan*

## THE MARKET OPPORTUNITIES IN INDUSTRIAL PRINT

HP launched the Jet Fusion in 2016. It recently noted that 'industry-leading companies such as BMW Group, Jabil, Johnson & Johnson and Nike' are interested in its 3D print platform.

HP is also cooperating with Henkel to evolve the material set available for use in the Jet Fusion's printheads. This will utilise Henkel's engineered light-cure and thermal acrylics, sealants and polyurethane adhesives – all materials that will be used in automotive manufacture, as 3D printing takes hold of more production processes.

At the current time the 3D equipment market is dominated by smaller specialist companies like 3D Systems, XYZ Printing and Stratasys. It is telling that all these companies saw sluggish quarters before the launch of the Jet Fusion, indicating HP's print pedigree may give it a competitive advantage.

For non-plastic parts further evolution of flatbed metal sintering platforms is necessary, along with refinement of the metal powders.

## Biomedical

There are many diagnostic tests that need accurately monitored amounts of reagent for health screening – increasingly, these are printed to replace costly lab testing by highly skilled technicians. Here the burgeoning wearable technologies sector will merge with diagnostics, with the tests embedded in new generations of smart clothing.



**Established  
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market**

Jet Fusion is HP's answer to the growing interest in commercial 3D print  
*Source: HP*

Already e-textiles have shown they can have devices woven into them, for heart rate monitoring for instance. The printable electronics section that itself is developing stretchable circuits is showing what the future could look like.

Reagents and bioassay materials can be printed with a high degree of precision to deposit the right amount of material onto a substrate to test breath, urine, blood, and saliva samples.

One of the first applications for 3D printing has been the construction of medical prostheses, which typically have to be individually tailored to a patient's body.

Researchers at the University of California in Los Angeles (UCLA) have developed a bioink that could be used to print pills and tablets. It may, for instance, be possible to combine technologies like this with the PolyJet 3D printer from Stratasys to develop personalised medicines.

In the UK FabRx is seeking to commercialise the work in progress from University College London that has developed what it calls 'Printlets' that can be used to 3D print personalised drugs. Personalised multi-vitamins can also be 3D printed and purchased today by MultiplyLabs.

It is not just for human health: the UK government's Technology Strategy Board is funding a \$1.75 million project to develop a disposable plastic electronic sensor for diagnosing bovine tuberculosis in a matter of minutes.

**The  
burgeoning  
wearable  
technologies sector  
will merge with  
diagnostics [in]  
smart clothing**



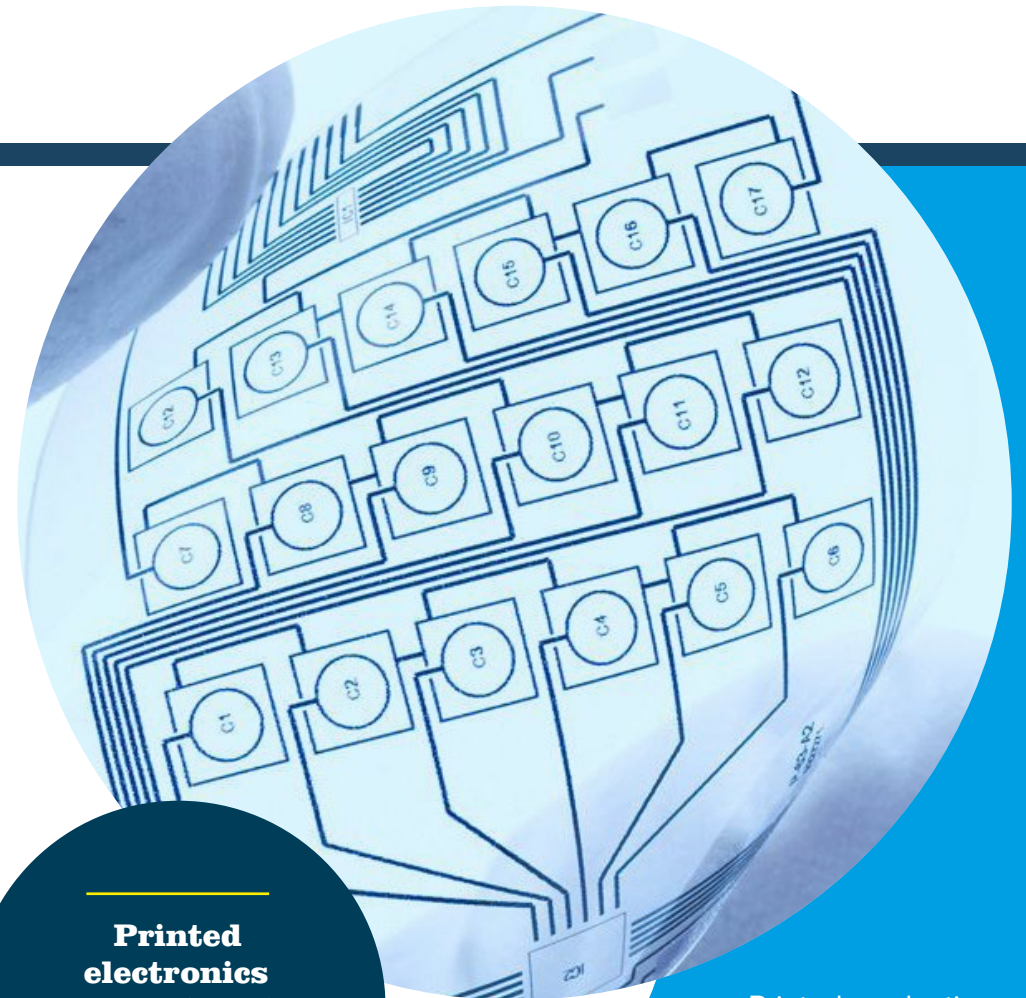
## Electronics

Currently, print output for electronics is dominated by screen printing technologies. With advances in inkjet and 3D printing, and the need for more advanced electronics that will appear in packaging, textiles and other applications from biomedical to automotive, inkjet will eventually become the dominant form of print output in this sector, as it has the potential to vastly reduce cost and increase versatility, especially when roll-to-roll output has been perfected on large commercial scales.

Companies such as FlexEnable are illustrating how far flexible electronics can be pushed with technologies that show the benefits of FlexEnable's organic thin-film transistor (OTFT) technology that gives plastic liquid crystal displays (LCDs) the same optical performance as glass LCDs, while removing the constraints of glass.

As printed electronics lends itself to many applications, the industry in general will develop many of its sectors in parallel and in partnership. Leading developers, such as ThinFilm, will leverage their technologies across a number of sectors, most notably packaging aimed at the retail market.

With NFC offering many advantages across numerous sectors with cost saving and efficiency gains being the key drivers, printed electronics will move into the mainstream, with interactive packaging being the first to appear over the short-term.



**Printed electronics lends itself to many applications**

Printed production is one of the most potentially disruptive trends for electronics companies  
*Source: DuPont*

## Conclusion

With these and the other primary industrial print sectors identified earlier in this paper, there are numerous opportunities for print firms to diversify and grow outside of conventional graphics printing.

There are complex routes to market and supply chains across industrial functional print, but this is opening as the topic is featured in conferences and exhibitions, with users looking for innovation and process efficiencies. This will provide many opportunities for print companies and for their suppliers.

Greater coverage of the topic in trade press and events is raising awareness by the established players, which might improve their print and decoration using new techniques from new suppliers.

It is evident that the industrial print industry as a whole, will see new applications open, some of which could be massive new markets especially when printed electronics is concerned.

From augmenting buildings, new materials and decoration for transport, vast arrays of new consumer products and 3D print techniques will open new opportunities; PSPs will need to partner with businesses in these sectors to leverage their current skills and processes. They need to innovate and begin to expand their services to encompass the new demands their customers will place on them to deliver new print-based services.

**There are numerous opportunities for print firms to diversify and grow outside of conventional graphics**