# XAAR’S CERAMIC SECTOR WHITE PAPER

**INTRODUCTION**

Digital inkjet printing has revolutionised ceramic tile manufacturing in a very short time. Just over a decade ago, the only way to decorate ceramic tiles was using traditional printing methods, the most common of which was screen printing. This was a mature technology with little scope for innovation; it was difficult for ceramic tile manufacturers to make their products stand out from the competition and differentiation was mostly down to price. The process had other disadvantages, including high set-up costs, long production runs, and the difficulty of exactly matching tile colours on repeat orders.

Today, digital inkjet is the “must have” technology for ceramic tile manufacturers. It is no longer a case of offering digital tiles as an “optional extra”; digital capability is expected, and digital inkjet is the only viable option. In Europe the majority of ceramic tile manufacturers in the major producing countries, Spain and Italy, have already converted to digital inkjet printing. By doing so, they have cut production costs, reduced waste, work-in-progress and stocks of finished products, and slashed turnaround times. And these are just some of the advantages. These ceramic tile manufacturers are also producing higher-quality tiles that offer more realistic reproduction of marble and other natural materials. They are doing so in the short runs that buyers demand - using digital, a single ceramic tile can be produced cost- effectively. Instead of competing on price, these manufacturers can compete on creativity and innovation, and do so in new markets.

The revolution in digital ceramic tile decoration blossomed in the difficult economic conditions since 2008, when the European market saw a significant reduction in the building of new properties - the primary source of demand for new ceramic products. Ceramic tile manufacturers who embraced digital decoration found that their life-like designs, at cost-effective prices, captured an increasing share of the shrinking demand. It is no exaggeration to say that “going digital” could be the difference between success and survival. The combination of benefits such as life-like designs and improved tile quality with reduced costs gave digitally-equipped ceramic tile manufacturers a huge advantage over rivals who were still using traditional methods. As the global economy recovers, these companies are well-placed to reap the

rewards of their forward-looking investment.

We are now seeing that the change from traditional to digital ceramic tile decoration is gathering momentum in the rest of the world. China, Brazil and India, countries with an enormous installed base of traditional ceramic tile production lines, have begun a very rapid conversion to digital inkjet decoration. As worldwide production of ceramic tiles grows - in 2011 it broke the 10 billion m2 barrier[1](#bookmark0) - it is creating huge opportunities for suppliers of digital inkjet ceramic tile printers and ceramic inks.

This Xaar white paper explains why and how this revolution has come about. You may be a ceramic tile manufacturer interested in the significant production benefits and efficiencies of digital inkjet decoration, or wanting to broaden and deepen your product range with innovative new designs. If you are, the white paper will explain how exactly digital inkjet decoration can transform your business and - very importantly - help you arrive at the right printhead technology to enable you to achieve your goals.

Or you may be an Original Equipment Manufacturer (OEM) developing a digital inkjet printer. This paper will give you the information you need to choose the best partner to supply, integrate and support the all-important printhead.

Or you may simply be curious about the history of the take-up of digital inkjet printing technology in ceramic tile decoration. How has a technology from label printing and wide-format graphics printing managed to transform a vastly different market segment in such a relatively short time?

Whatever your reason for wanting to know more about the digital decoration of ceramic tiles, we hope you find this white paper useful. We begin by describing traditional ceramic tile manufacturing and establishing the place of printing in the process. Next, we look at the benefits that digital inkjet brings and the reasons why it has had such a dramatic impact on the industry.

The most important section of the white paper explains the crucial role of the inkjet printhead, and complementary functions, in delivering high-quality print in the

reliable, consistent manner demanded by ceramic tile manufacturers, under the harsh manufacturing conditions in the ceramics plant. We pay particular attention to Xaar’s revolutionary TF Technology™ and Hybrid Side Shooter™ architecture in the Xaar 1001 GS6 and GS12 printheads, and how they address the need for true ink recirculation to enable maximum production uptime. The Xaar 1001 family was launched in 2007 and is now recognised as the “breakthrough technology” that has driven the digital transformation of the ceramic tile manufacturing market.

Finally, we take a brief look into the future of digital inkjet decoration of ceramics to give a taste of the very exciting opportunities that are around the corner.

# THE MARKET & PRODUCTION PROCESS

In 2011 the global production of ceramic tiles was 10.5 billion m2 - a rise of 10.1% over 2010. By far the biggest manufacturing area was Asia (68.3%), followed by the European Union (11.2%) and Central and South America (10%). China alone produced 45.7% of the world’s ceramic tiles.[2](#bookmark1)

The sheer scale of ceramic tile production facilities is also impressive. They occupy significant areas of land, situated close to the raw materials they consume. Large manufacturing facilities are needed to house the large-scale mechanical equipment the process employs - hydraulic presses, ceramic tile kilns, and so on. Traditional manufacturing sites also need large areas in which to store work-in-progress and finished tiles.

Producing those 10.5 billion m2 calls for big manufacturing plants too. They house a capital-intensive process that uses enormous amounts of water, hydraulic pressure and heat, among other resources, to power the huge presses and kilns that turn the raw materials into finished tiles. Due to the drawbacks of traditional printing methods, considerable space is also needed to store work-in-progress and finished tiles. We will explain the reasons why later.

# How tiles are made

The first step in manufacturing ceramic tiles is to quarry and refine the various sands, clays and other raw materials used. These are then transported to the ceramic tile

plant, where they are stored until required.

The materials are dry and in powder form when they arrive. The powders must be milled into finer powders before they are mixed in the right proportions and fed into tanks where water is added. The liquid material this creates is called “slurry”.The next stage is to return the slurry to a powder form, which is done by spraying it into a large tank and feeding in a current of hot air. As the slurry becomes airborne it rapidly dries to form a fine, atomised powder.

The powder is then ready to be moulded into a ceramic tile body. Large hydraulic presses are used to compact the powder under extremely high pressure - up to 400 kg/cm2 - which generates a lot of heat. The combination of the heat and

pressure from the press forms the unbaked tile, or “biscuit”. The press also gives the ceramic tile its size, shape and, in the case of digitally-decorated ceramic tiles, its texture. The tile may then be dried further to remove more moisture and ensure it remains stable on its way to the kiln.

The residual moisture in the powder gives the “biscuit” some strength, but as the name suggests, it is still very fragile. After applying the glaze, a glass-like matt or gloss liquid coating, the tile is now ready to be decorated. As we explained in the Introduction, screen printing (flat or roller) has traditionally been used, applying each of the colours in the pattern using a separate roller. (We will look more closely at what the printing process involves in a moment.) As well as enhancing the aesthetic appeal of the tile, glazing and printing add features such as water repellency, durability and hygienic properties to the product.

The final stage in production is to fire the tile in a kiln. This process solidifies the body of the tile and fuses the glaze and the decorative inks to generate the final pattern on the tile. The kiln is usually the most expensive piece of equipment in the manufacturing plant and it is therefore optimal to keep the kiln running 24 hours a day, 7 days a week, avoiding wasting energy each time it has to be ramped up to the correct temperature. As a result, there will often be more than one ceramic tile production line feeding each kiln with tiles ready for firing.

Kilns come in different designs, but a roller hearth kiln - the most efficient - can be several hundred metres long. As the tiles pass through the kiln - which can take

over an hour - the temperature gradually increases until at the centre of the kiln it reaches around 1200oC. After this, the tiles cool down before they leave the kiln.

They are then sorted into batches and large stacks of identical finished tiles are stored ready for distribution.

# The limitations of the traditional process

The traditional production process has several disadvantages. For one thing, the kiln is most efficient when handling large batches of tiles - yet consumers and retailers increasingly demand short runs and “Just in Time” deliveries. The most serious weakness, however, is in the decorating process, because roller screen printing is a contact printing technology. This has a negative impact on ceramic tile manufacturing in a number of important ways. For example:

* **Long set-up times:** The biggest disadvantage of conventional decoration is the amount of time needed to set up the printing jobs. It can take as much as 30 minutes to change the rollers and wash down the printer.
* **Patterns repeat frequently:** The circumference of the roller determines the length of the image it can print, and therefore how frequently the pattern repeats. This limits design options and makes tiles less life-like.
* **Only flat tiles can be decorated:** A contact technology cannot print on textured, 3D tiles, only on flat tiles. In addition, screen printing cannot print right up to the edge of the tile, so tiles have a white, unprinted border.
* **Tile breakage is more common:** Printing takes place while the tile is still fragile, and the pressure of the roller on the “biscuit” can easily fracture it. Each time a tile is broken, not only is the biscuit wasted, but also the glaze and the inks. Combine this with the reduced output and it is clear that there are significant cost penalties.
* **Colour management is difficult:** Ensuring consistent, repeatable colour is important in all print applications, but especially so in ceramic tile decoration. The problem is that the colour of the tile when it leaves the decoration printer is
* different from the colour after firing. The extremely high temperatures in the kiln fuse the frits in the glaze with the pigments in the inks and reveal the true colours of the tile. Each roller change has to be followed by at least one test-

firing of the printed tile to check colour, which can bring the total changeover time to two hours, and cause more waste and extra costs.

* **Inflexible production planning:** The inflexibility we have described makes production planning very difficult. For example, the combination of long set-up times and tricky colour management works against those short runs and “Just In Time” supply chains that the market demands. Also, consider what happens in the decorating department at the end of a typical two-shift working day, when the manager receives the patterns for the next day. First, the operator changes the roller sleeves. Next, he prints some sample tiles and takes them to the kiln for firing. This takes at least an hour and a half. If the colour is right, his job is done. If it isn’t, he has to start the process all over again. And all the time materials are being wasted and costs incurred.
* **High stocks of finished goods and work-in-progress:** The need to operate the kiln 24/7 and the difficulty of matching colours encourage long runs and the holding of substantial stocks of finished goods. If a repeat order comes in, it is easier to meet it from existing stocks than to try to reproduce exactly the same colours and risk of problems caused by poor batch control or a slight change in the glaze. (We are all familiar with checking batch numbers when we buy ceramic tiles.) The same is true of work-in-progress, large batches of which are often stacked around the factory awaiting test firings to verify the colour consistency. Furthermore, space must also be found to store the screen drums needed to produce repeat print runs.

# The digital solution

Clearly the ceramic tile manufacturing industry needs a decorating solution that overcomes the very considerable challenges described above. What’s needed is a printing technology that, among other things, doesn’t break tiles, has minimal job changeover and set-up times, offers effective colour management, and can produce short runs. If it can also apply much more life-like patterns, including textures, to expand creative design opportunities, even better. Finally, we want it to do all these

things reliably, shift after shift, be straightforward to integrate into the existing production line, and pay for itself in just six months.

In the next chapter we look at how digital inkjet delivers all these benefits, and more.

# THE BENEFITS OF DIGITAL INKJET

Digital printing, using various technologies, has been around for some time. The first digital colour press for commercial printing - developed by Indigo - appeared in 1993, and since then digital techniques have had an impact on every sector of the printing industry. Digital printing has reduced costs, streamlined production processes, and made possible new products and business models.

Digital printing’s history in ceramic tile manufacture is shorter, however. The first digital printer to use inkjet technology to decorate tiles was launched in 1999 by Kerajet, with very limited success, and it wasn’t until 2008 that digital tile decoration really broke through and became the “must have” process it is today. The catalyst was the launch of the Xaar 1001 printhead and its integrated ink recirculation technology. We will explain why in the next chapter, where we look in-depth at how the design of inkjet printheads has evolved, overcoming the issues that originally held the technology back. Here we explain how the features of digital inkjet decoration solve some of the problems with traditional rotary screen printing.

# Non-contact

For ceramic tile decoration, the first major advantage of digital inkjet is that it is a non-contact process. The distance between the substrate (the ceramic tile) and the printhead is generally 3-5 mm. This means that, unlike in the rotary screen process,

no mechanical pressure is put on the ceramic tile, which, as we know, is fragile. As a result, breakages are very rare.

Non-contact also means that digital inkjet printers can print on 3D surfaces to create textured tiles. The texture is added to the ceramic tile biscuit during the pressing process, and the printhead is then able to jet ink into the recesses that rotary screen printing cannot reach. Digital inkjet printers can also decorate right to the edge of the tiles, eliminating white edges and creating seamless expanses of tile.

# Creative benefits

Digital inkjet printing has a number of creative benefits. There is no roller, so there is

no forced limit to the pattern size. With digital inkjet printing the size of the pattern is only limited by the size of the memory of the printer control electronics. Xaar’s next generation of printhead electronics, for example, can store enough data to reproduce a pattern of 40 m2 with no repeats.

Inkjet printing can also apply designs of the highest quality and in the finest detail, creating extremely life-like ceramic tiles that are very difficult to distinguish from real marble and stone. The 360 dpi resolution and greyscale technology used in the Xaar 1001 printheads can reproduce an effective resolution of around 1000 dpi, which is as much as a good human eye can distinguish.

# Faster set-up

We saw in the last chapter the amount of time needed to set up a traditional printing line. On a digital inkjet printing line the set-up is handled by the print control software, so there is no need to physically change the rotary drums to print a new pattern. It is therefore easy to print short runs. The operator can even interrupt a production run to test-print a number of different patterns in preparation for the next day’s production; there is no need to wait until the end of the shift. The minimum print run with digital inkjet printing is just one tile, which is ideal for producing test tiles and also perfect for the short print runs required today.

Colour management, too, is software-controlled and is a more sophisticated and predictable process than on a traditional printing line. This has led to reductions in the number of glazes and ink sets used, further improving the efficiency and reducing the costs of ceramic tile manufacturing. Taken together, these factors make it easier to replicate patterns and colours, and have a significant positive impact on the stocks of work-in-progress and finished products that have to be held. Being able to fulfill a repeat order, for example, only depends on having the pattern stored digitally and the ink vendors supplying the same ink.

# Lower ink costs

In the ceramics industry the ink model has historically been an “open” one, in which ceramic tile producers do not have to buy ink from the digital ceramic printer manufacturer but are free to buy from a variety of ink vendors, changing their suppliers when they need to. This has created a healthy competitive market, which has helped to drive down the price of ceramics inks.

# Rapid payback - in less than six months

The final argument in favour of digital ceramic tile printing is that, thanks to all the above benefits, a digital inkjet ceramic tile printer can pay for itself in less than six months.

To recap, this is because costs are lower, due to reduced tile breakages, less ink consumption, and the lower ink prices from the open ink model. Faster, simpler set- up enables the short production runs that the market demands, and makes the production line much more flexible. Reliable software-driven colour management reduces stocks of finished tiles and work-in-progress, freeing up capital. Digital storage enables patterns of almost infinite size. Lastly, profit margins are higher, because the final products are of higher quality, closely resemble real marble and stone, and exhibit greater creativity than traditionally-printed tiles.

These are all good reasons for adopting digital inkjet printing. There are, however, different implementations of digital inkjet printers on the market, and several important factors must be taken into account in choosing between them. We look at these next.

# DIGITAL INKJET TECHNOLOGY

Today digital inkjet decoration has been widely adopted in Europe, where it has become an essential technology for ceramic tile manufacturers, and is now also growing fast on other continents, but its success did not come overnight. Almost a decade passed between the launch of the first digital inkjet printer targeted at the ceramics sector, in 1999, and the real start of the digital revolution in the industry in 2008. This is because it took time to develop printhead technology to print tiles consistently, to the right quality, and reliably.

To understand why, we need to briefly explain how a printhead works. An inkjet printhead jets drops of ink onto the substrate (in this case, the ceramic tile) to create the image. There are two basic ways of doing this - continuous inkjet or drop-on- demand (DOD) inkjet - and digital ceramics decoration printers use DOD.

DOD printing means that a drop of ink is only generated when it is needed. To do this, the ceramic decoration printers use piezoelectric inkjet printheads. The active components in the printheads are made from a ceramic material (PZT) that flexes

when a voltage is applied to it. The Xaar 1001 printhead family employs PZT material in a unique Hybrid Side Shooter™ architecture, which we will explain in more detail below.

Piezoelectric printheads can work in two ways: direct mode or shear mode. In direct

mode, the electrical field (voltage) is applied to the PZT material in the same direction as it is polarised which causes it to change in height and width (it becomes longer and thinner). It is this expansion that is used to push or bend a membrane and force a drop of ink out from the nozzle in direct mode end shooter printhead architectures.

In shear mode printheads, for example the Xaar 1001 GS6 and Xaar 1001 GS12 industrial inkjet printheads, the electric field is applied perpendicular to the polarisation of the material. This causes the piezoelectric crystal to shear, not to lengthen or shrink. Using two pieces of ceramic material for the wall of the ink chambers, and then applying the voltage, causes the material to flex in the middle: the effect resembles a chevron. The chevron flexing is done at a very high frequency; it creates an acoustic pressure wave that travels through the ink chamber, which then ejects the ink droplet. This chevron structure is very energy-efficient, reducing the driving voltage required and so reducing power consumption and heat generation. Two chevrons are used to create the walls of each firing chamber, the top of the chamber is also PZT, and the bottom is formed with Xaar’s patented nozzle plate. The nozzle is therefore perpendicular to the flow of ink through the firing chamber and hence we have Xaar’s unique Hybrid Side Shooter™ architecture (HSS™).

All this takes place on a micro scale. Inside a typical printhead, the ink channels are only a few tens of microns across and the nozzles are typically 20-50 microns (µm). A 1 picolitre (pL) ink droplet is typically 13 µm in diameter. Compare this with the width of a human hair, which is approximately 80 µm.

# The ceramic decoration environment is challenging

Ceramic decoration presents several challenges. Firstly, the manufacturing process generates a lot of dust and debris, because the raw materials are powders. In addition, after leaving the press the unfired ceramic tiles are fragile, hot and steaming. Secondly, to produce vibrant colour, ceramic inks contain large, insoluble particles of pigment, packed tightly together and held in suspension. This makes the

ink very viscous and liable to settle, causing sedimentation.

The first digital inkjet tile printers could not cope with these challenges. The early printheads required regular maintenance to clear the nozzles of ink and other debris. This meant printing had to be stopped after only a short time to clean the printheads.

There were other problems as well: the print quality was poor, due to the low resolution produced by the binary printheads; replacement parts were expensive; and inks had a limited colour range and were expensive. The major drawback, however, was the unreliability of the printers, which led to excessive production downtime. As the printing has to be single-pass to achieve the throughput required for industrial- scale decoration, all the nozzles must be working to their full potential all the time.

The major reason for the problems with early piezoelectric printheads was their design: most were based on what is called the “end shooter architecture.” In an endshooter printhead the firing chamber has one ink inlet and one outlet (the firing nozzle), and the ink flow is from inlet to outlet. The potential “Achilles heel” with all end shooter designs is that nozzles can fail, either because they are blocked by particles in the firing chamber, caused by agglomeration of the ink or the ink settling in the chamber, or by air bubbles forming, which also blocks the nozzles. Such a failure then requires a “purge/wipe” maintenance routine before printing can resume.

These issues with end shooter printheads held back the adoption of digital decoration until 2008, when Xaar launched the Xaar 1001 printhead. The Xaar 1001 features a number of major innovations that have transformed the market’s perception and experience of digital decoration. For the European tile manufacturing industry it came along at just the right time. One symptom of the economic slowdown that started in 2008 was a substantial decline in European house building, which had a big impact on the ceramic tile industry. Many tile manufacturers faced a choice - lose business to low-cost imported tiles, or innovate to stand out from the competition and maintain profit margins. Adopting digital decoration helped them differentiate.

The Xaar 1001’s most important new features were its Hybrid Side Shooter™ (HSS™) architecture and patented TF Technology™ ink recirculation; complementary technologies that work together to deliver unrivalled reliability and

maximum production uptime. As described earlier, as well as an inlet and an outlet for ink flow, HSS™ has a separate nozzle in the side of the ink channel - not at the end - through which the drop of ink is fired *perpendicular to the flow of the ink*. Added to this, the unique TF Technology™ - the only true ink recirculation system -

ensures the highest ink flow *across the back of the nozzle during drop ejection*, which carries any particles or trapped ink bubbles away in the ink path, not forcing

them into the nozzle. This means nozzles are continuously primed and kept

blockage-free, ensuring that the printhead is fully operational for the maximum length of time. The Xaar 1001 is self-priming, so self-recovery is fast after, for example, a mechanical shock. Only one tile will be lost and there is no need to stop the whole production line.

# Ink recirculation is vital

The importance of TF Technology™ ink recirculation cannot be stressed too much. Ink recirculation keeps the ink in constant motion, preventing sedimentation and nozzle blocking. This is essential when printing heavily-pigmented, highly-viscous ceramic decoration inks, and the Xaar 1001 can jet inks with a much wider viscosity range than can other printheads.

The TF Technology™ solution to ink recirculation, where high volumes of ink are circulated past the back of the nozzle during printing - at a higher flow rate than any other printhead - is unique to Xaar piezoelectric printheads. Other manufacturers offer what they call “recirculation” but they use different methods. For example, in many other printheads ink circulates in an upper chamber of the printhead but not in the lower chamber; i.e.there is no recirculation past the back of the nozzles in the lower chamber. The piezoelectric material sits on the roof of the lower chamber and presses downwards to push the ink down and out of the nozzles. This creates a vacuum and ink is sucked into the lower chamber from the upper chamber. Any debris or air bubbles that enter, or accumulate in the lower chamber, can still only be removed by pushing them out through the nozzles, which can cause the nozzle to block.

The fact is, printheads without TF Technology™ are less reliable, leading to longer and more frequent maintenance cycles, increased downtime and a higher cost of ownership.

# Outstanding print quality

The Xaar 1001 drove major advances in digital inkjet decoration in other ways as

well, particularly in delivering outstanding print quality using XaarDOT™ greyscale technology. XaarDOT™ allows variable-sized drops of ink to be placed on the tile. There are several advantages in variable drop size. The high native nozzles per inch (360 npi) of the Xaar 1001 printheads enables pin-sharp patterns to be achieved

using the smaller drop sizes; and drop size selection allows printing on tile types of different absorbency and into different glazes, enabling a much wider gamut of colour to be added to the tile.

To print variable drop sizes - described as “greyscale printing” - small droplets are fired very rapidly, one after the other. These “sub-drops” coalesce as they leave the nozzles. Each droplet is 6 pL, which creates seven final drop sizes from 6 to 42 pL. Using XaarDOT™ it is therefore possible to print using up to eight grey levels, which can be chosen dynamically. In fact, combining the high native resolution with greyscale means that the Xaar 1001 printheads have an effective resolution of over 1000 dpi, which is at the limit of what the human eye can perceive. In other words, the image appears perfect at normal viewing distances. This results in amazingly life-like images and sharp text with the Xaar 1001 GS6.

The Xaar 1001 GS12 printhead jets larger 12-84 pL drops, delivering even more ink for bolder tile colours and effects. Alternatively, the Xaar 1001 GS12 can deliver the same ink coverage as the Xaar 1001 GS6, but at double the print speed. With both printheads the improvement in the quality of print is significant compared to what can be achieved with binary printheads, where the drop size is always the same. This enables ceramic tile manufacturers to achieve a stunning replication of natural materials like marble and granite, as well as highly decorative creative new designs.

# Watch Xaar technology come to life

You can explore further inside the Xaar 1001 printheads by downloading Xaar’s “Xaap” app from the Apple App Store onto your iPhone. Use the Xapp AR feature to scan the Xaar AR trigger images and view 3D animations showing how the Xaar 1001 works. The animations show, for example, the patented TF Technology™ combined with HSS™ architecture in action. Ink is shown flowing directly past the

back of the nozzles, ensuring they are continuously primed and remain blockage- free.

# Ink optimisation

To achieve the high quality and special effects that consumers expect on ceramic tiles, ceramic ink manufacturers have created innovative new inks specifically for digital inkjet printing. Xaar fine-tunes the way the printhead fires the drop for each of our approved inks to ensure optimal jetting. This is called “waveform optimisation”, and it involves developing a waveform for each ink/printhead combination. This ensures drop placement accuracy, optimised operating voltage, print reliability and, ultimately, increased throughput. The Xaap app can also be used to explore the benefits of using optimised waveforms. Once successfully validated and approved, the digital ceramic ink is warranted against long-term damage to the printhead and the optimised waveform will deliver unrivalled print performance and trouble-free operation. (Go to [www.xaar.com](http://www.xaar.com/) to see the range of ceramic inks approved for use with the Xaar 1001.)

# Drive electronics

So far we have spoken about the mechanical operation of the printhead itself. However, it is important to understand too how the printhead is instructed to print a specific ceramic tile design. After first being created in the design studio, each design is transferred as a bitmap image format to a PC, where it is usually manipulated to generate separate colour instantiations of the same design.

A digital decoration printer is generally controlled by a further PC. This first receives the image file before passing the data to the Xaar drive electronics which decode the image and pass the appropriate signals through the HPC (Head Personality Card) to the Xaar 1001 printheads. The Xaar drive electronics are easy to configure and straightforward to integrate, simplifying printer construction for manufacturers.

# CONCLUSION

This white paper has described the benefits of digital decoration of ceramic tiles: reduced wastage, more flexible production, higher quality, wider product ranges, and so on. Above all, digital is a technology that meets the requirements of

manufacturers, retailers and their customers in a competitive market.

These benefits are not expensive. A typical digital decoration printer can be paid for in under six months of production, and so the investment is not difficult to justify. In addition, digital is simple to integrate into existing lines, and so disruption to

production is minimal.

The arguments for digital are compelling, and so digital inkjet ceramic tile decoration printers will become the dominant decorating technology in a very short time. This is already the case in Europe, where over 80 per cent of manufacturers have converted and digital is a “must have”. Now the same digital revolution is taking place on other continents, and in the countries with the largest installed base of tile manufacturing lines, such as China, Brazil, India and Iran. Combined with a global ceramic tile market that is currently growing at around 10%, there is a huge opportunity for companies who embrace digital decoration.

To grasp the opportunity it is necessary to choose the right digital inkjet printhead technology, and this is Xaar’s TF Technology™ and HSS™ architecture. Xaar 1001 printheads, with their ability to jet a variety of fluids onto a range of substrates, are having a dramatic and transforming effect on many different market segments. As well as ceramic tile decoration, they are being used to reshape manufacturing processes in a wide variety of applications, including wide-format graphics, labels, packaging, decorative laminates and outer case coding, as well as advanced manufacturing applications which require printing with specialist fluids - for example, flat panel screen displays, solar cells, and semi-conductors.

Continuing developments in printhead technology will further advance digital decoration. At Xaar we are working on delivering higher speeds, more colour and more special effects - enhancements that will enable innovative manufacturers to create tiles for even more applications. Digital is freeing the ceramic tile industry to explore new frontiers in a market with almost limitless potential.

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