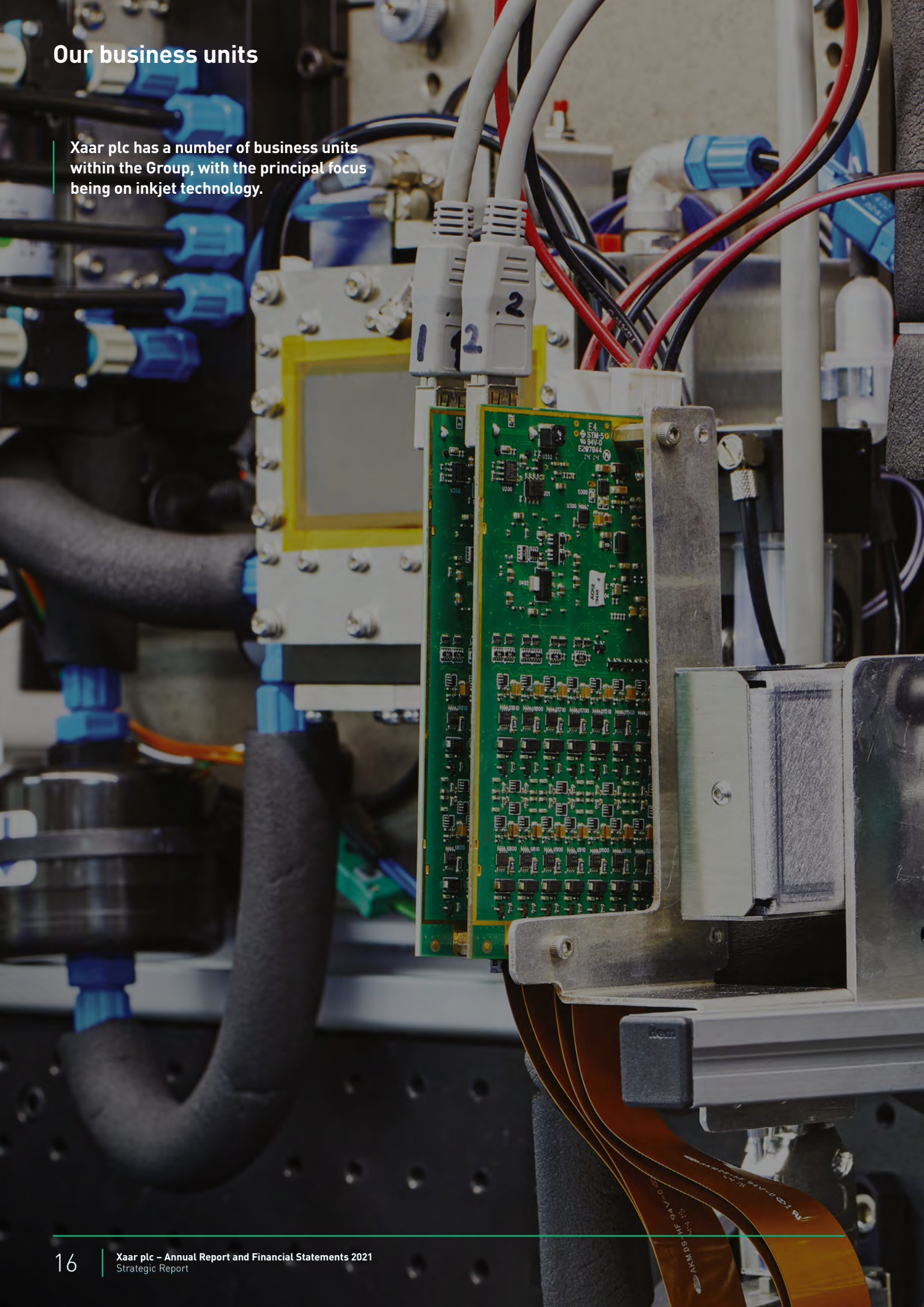
Our business units

Xaar plc has a number of business units within the Group, with the principal focus being on inkjet technology.



Printhead

Our Printhead business unit focuses on the design, manufacture, marketing and sales of printheads and associated products which are used in a variety of applications such as Ceramic Tile Decoration, Graphics, Décor, Labels and Packaging as well as 3D Printing and Additive Manufacturing.

Revenue segment

Markets

Industrial	**53%**
Packaging	**30%**
Graphic Arts	**15%**
Royalty	**2%**

Product Print Systems

Product Print involves printing all kinds of industrial and promotional objects such as medical equipment, automotive parts, tools, apparel, appliances, sports equipment and toys. Xaar company EPS manufactures and sells a range of highly customised print systems for these applications, including some using Xaar's inkjet printheads.

Revenue segment

Markets

Digital	**58%**
Analogue	**39%**
Other	**3%**

Digital Imaging

Our digital imaging company, FFEI Ltd, focuses on high performance digital imaging solutions – from digital inkjet label presses to digital pathology scanners.

In March 2022 we acquired Megnajet, market leader in the design and manufacture of industrial ink management and supply systems for digital inkjet. The acquisition is part of our strategy to offer our customers a more integrated inkjet solution.

Revenue segment

Markets

Inkjet	**60%**
Life Sciences	**40%**

3D Printing

We have recently sold our remaining interest in Xaar 3D to Stratasys (see Financial Statements – note 11, page 137). Xaar 3D is developing, manufacturing and commercialising 3D printing machines with a unique 3D printing technology. The sale to Stratasys will enable Xaar 3D to succeed with their go-to-market plans.

In addition, we have developed a close relationship with Stratasys for future collaboration and ongoing supply of printheads.

We continue to work on other 3D printing projects which use Xaar printheads to deliver alternative 3D printing technology.

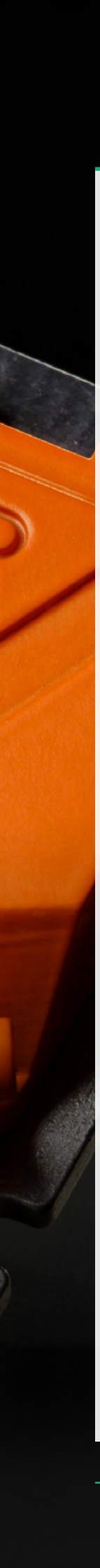
£9.3m
Cash proceeds received

£17.9m
Gain on sale of investment

£10.9m
Fair value of contingent consideration on disposal

(£246k)
Transaction costs on disposal

DELIVERING ON OUR STRATEGY



2021 summary

Product launches

The Printhead business continues to perform well with a growing pipeline of new product developments coming from the ImagineX printhead platform.

In April we launched the Xaar Nitrox to deliver greater print speeds (up to 100 metres per minute) and uniformity for unparalleled performance across a wide variety of print applications. By the end of 2021 we already had 23 projects using the Xaar Nitrox in progress, covering more than seven different application sectors.

We also launched the Xaar Irix in September. This printhead is targeted at our Coding & Marking customers in particular but also offers a good solution for printing direct to products, printing functional fluids and for 3D printing applications where a highly accurate delivery of ink drops and/or longer throw distances are important. Interest from our Coding & Marking customers has been positive with six customers already evaluating the printhead.

New opportunities

The number of customers launching new machines has increased year on year, with ten customers launching with Xaar technology during 2021. The sectors into which the machines have been launched are varied and cover labels, ceramics, direct-to-shape, 3D printing and PCB printing. Four other planned launches have been pushed to 2022 due to delays caused by COVID-19.

In June we signed a co-operation agreement to establish a 'Joint Digital Printing Laboratory' with the Beijing National Innovation Institute of Lightweight Ltd. (BNI) in China. We are now collaborating on R&D projects built on the innovative technologies from both parties as well as their expertise in inkjet printing. The Joint Laboratory will develop new applications in digital inkjet such as printing glass, electronics, 3D and automotive spray painting.

Operational efficiencies

Scalability of the Huntingdon factory has been a focus in 2021. We introduced some standard efficiency initiatives within the production area, restructuring the team into smaller work units. This makes it easier to train operators, easier to manage the teams on a day to day basis and easier to react to changing market demands through scaling up production quickly when necessary. In addition, a second initiative, the Xaar Excellence System, is now underway and covers Company-wide standards and processes.

Our IT Transformation Programme to establish a modern, secure and supportable IT infrastructure is also underway. This will enable us to deliver an optimised and consistent set of end-to-end operational processes.

The relocation of our corporate HQ from the Cambridge Science Park to the nearby Cambridge Research Park took place in July and will generate savings of £0.7 million per annum from the start of the second half of 2021. The new global headquarters houses Xaar's finance, HR, legal and marketing functions, as well as a new purpose-built R&D laboratory. Specifically configured to enhance the working environment for the team, the new offices embrace Xaar's commitment to flexible working for employees. Also, importantly the offices provide a significantly reduced carbon footprint for Xaar.

A move towards an integrated service

We appointed an Ink Business Director in March 2021 to develop and roll out a new ink strategy aimed at building collaborative partnerships with leading fluid manufacturers. We are working with these companies to fully optimise the fluid, not just in the printhead in a lab setting, but also throughout the machine development programme, end user integration and beyond. This ensures optimum print performance in the actual application environment, and ultimately delivers a better end result for our customers and their customers, as well as shortening time to market for all parties. For our UDI customers we are selling fluids, manufactured by our fluid partners under the Xaar brand. This helps to tie us into a long-term relationship with these customers and will provide an ongoing revenue stream.

We made significant progress this year towards our goal of providing an integrated inkjet solution whereby our customers can access the printing ecosystem as well as the print technology from Xaar. In July we acquired FFEI, which is enabling us to widen our product offering (of print engines using Xaar technology) to our UDI customers.

The roadmap for our Ink Supply Systems, developed this year, will ensure that we can help customers evaluate and adopt our technology – and ultimately reduce their time-to-market. One focus in 2021 has been to upgrade the Hydra Ink Supply System for use with aqueous inks.

In March 2022 we acquired Megnajet, market leader in the design and manufacture of industrial ink management and supply systems for digital inkjet.

The acquisition is part of our strategy to offer our Printhead business unit customers a more integrated inkjet solution.

We have also developed our datapath roadmap, and are now working on delivering a rich portfolio of datapath products to help our customers develop their systems and solutions and also to ensure they can take advantage of the technology advantages available from our ImagineX platform.

Building stakeholder engagement

We are now building momentum with our customer-centric business model, re-engaging with past customers and attracting new ones. Products launched this year are gaining good traction (23 projects with the Xaar Nitrox and six customers already evaluating the Xaar Irix), and we already have ten new customer launches with Xaar printheads during 2021.

Our 720 dpi print resolution is also attracting interest in our ceramics market. Xaar has the unique ability to print at this high resolution. This capability, which we showcased at Uniceramics, China, in June, has proven to be of interest to tile manufacturers looking to print exceptionally large tiles which are used for homeware products (for example, table tops).

In August we announced the opening of a new Customer Service Centre to better support our Chinese customers, delivering technical support and training and providing a fast response to customer needs.

The new marketing platform that we implemented at the end of 2020 is also driving audience engagement. Our campaigns in 2021 generated a unique reach of over 678,000 people, over 350,000 video views, over 15,000 meaningful engagements (likes, shares, comments) and gained us over 1,000 new followers on LinkedIn.

Building a viable printhead business with a stable future

We are making good progress with delivering our product roadmap. The launch of the Xaar Nitrox in April delivered our first high frequency printhead which can reach speeds of 100 metres per minute. We delivered increased throw distance via the Xaar Irix in September, and the aqueous programme is on track with the printhead now in its beta testing phase. A significant focus for our marketing campaigns in H2 has been to promote the advantages of our Ultra High Viscosity capability, with the goal of opening up new applications which involve printing highly viscous fluids to achieve new functionality, such as increased product toughness or material flexibility.

Our inkjet printhead range

Xaar Nitrox

With unparalleled productivity and performance, the Xaar Nitrox lets you create without limits

Xaar Irix

Exceptional print quality, simple to use, robust, and highly reliable

Xaar 2002
High productivity and out-of-the-box exceptional print quality

Xaar 1003 AMp
Small drop deposition on an industrial scale

Xaar 502 S
Exceptional print quality for Wide-Format Graphics

Xaar 1003 C
Ultimate versatility in ceramic tile decoration

Xaar 501
High production up-time and industrial reliability

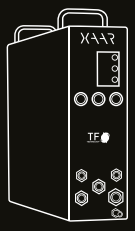
Xaar 128
Adaptable printhead with trouble-free integration

Xaar 1003 U
All round reliable high quality printing for industrial applications

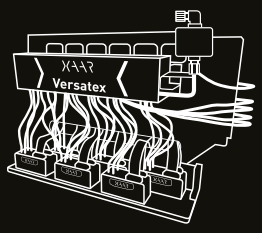
Xaar 502 O
Industrial reliability and mineral-oil free inks

Our integrated solutions

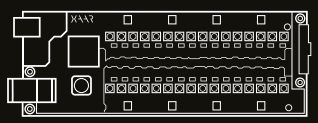
Fluids

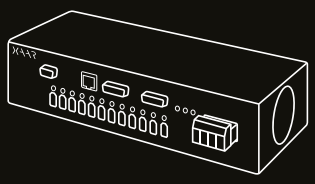


Ink supply systems

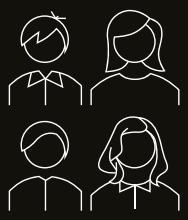


Print engines





Drive electronics and datapath solutions



Support

Printhead – technologies

Xaar's core inkjet technologies

We have a number of unique technologies which are incorporated into our printheads, and which provide distinct advantages to our customers.

TF TECHNOLOGY

TF Technology

Xaar's TF Technology is the original and still the best ink recirculation technology available. A printhead's architecture determines how well ink recirculation is implemented and therefore influences the degree to which the method delivers benefits across today's wide range of printing and jetting applications. Xaar's TF Technology, together with the unique Hybrid Side Shooter printhead architecture, enables ink or other fluids to flow directly past the back of the nozzle during drop ejection at very high flow rates.

This ensures the nozzles are continuously primed, keeping the printhead operational and the nozzles firing and – with the ink in constant motion – prevents sedimentation and nozzle blocking, particularly in heavily pigmented inks. Any air bubbles and unwanted particles in the ink are also carried away, improving reliability, even in the harshest industrial environment.

This makes jetting significantly more reliable compared to alternative printhead designs where convoluted ink flow paths means that recirculation is close to but not at the back of the nozzle.

The main benefits of TF Technology are unrivalled jetting reliability, outstanding print quality and an increased production uptime.

High Laydown TECHNOLOGY

High Laydown Technology

Xaar's High Laydown Technology enables a range of new applications, thanks to its ability to deposit large quantities of fluid in each pass. It makes possible printing very high levels of UV inks or high build varnish in a single pass for tactile embellishments on labels, packaging and commercial print. Braille and label warning triangles are also possible. High Laydown Technology delivers unprecedented ink discharge rates for gloss and adhesive effects on ceramic tiles, so that effects can be printed at high line speeds.

For additive manufacturing applications, High Laydown Technology offers increased printing productivity which significantly accelerates build rate for parts and the ability to print a broader range of fluids including higher viscosity materials; this ultimately results in tougher 3D printed parts than those printed with standard inkjet technology.

Ultra High Viscosity TECHNOLOGY

Ultra High Viscosity technology

Xaar's Ultra High Viscosity technology opens up a wide range of new inkjet capabilities and applications for OEMs and manufacturers using Xaar technology. Most printheads can only jet materials with viscosities of up to 10-25 centipoise ('cP'). Thanks to Xaar's unique TF Technology and innovative High Laydown Technology, fluids with significantly higher viscosities – up to 100 cP – can now be jetted.

The ability to lay down fluids with higher particle loading and particle sizes offers advantages such as an increased colour gamut, opacity and special effects. In addition, jetting higher molecular weight photopolymers for Advanced Manufacturing and 3D printing applications is made possible.

Where we excel

+ **We are the only truly independent inkjet technology company with over 30 years of experience.** Our independence enables a flexible, collaborative approach to ensure we remain customer-centric and focus on their goals

+ **State-of-the-art UK manufacturing facilities and an enviable R&D department** staffed by scientists and engineers with a wealth of inkjet industry knowledge and expertise

+ **A comprehensive portfolio of products to cover a wide range of applications**

+ **Engineers with extensive knowledge of inkjet and its application across many sectors as well as considerable field experience.** This means they are able to assist our OEMs and UDIs in the successful design, build, commissioning and post-installation support of all Xaar-based inkjet systems

+ **Ready-to-use development kits and an extensive portfolio of systems components** ensures that OEMs and UDIs can get up and running quickly

Priorities for 2022

- Continuing to deliver on the vertical integration strategy to support our goal of driving printhead sales
- Launch Versatex for our UDI customers
- Launch of aqueous printhead and the ecosystem to support it (such as the datapath and ink delivery systems)
- Launch Sustainability Roadmap.

Introduction to the Product Print Systems business unit

Engineered Printing Solutions ('EPS') is a recognised leader in the industrial product marking machine industry, manufacturing highly automated machines and accessories. As well as providing an industry-leading service and support, EPS occupies a niche position as one of only a few bespoke product marking machine companies in North America.

What we achieved in 2021

2021 has been a rebuilding year within EPS.

In April, we changed the leadership of EPS. Additional changes were made in Finance, Human Resources, and EH&S Management. The sales group was re-organised into two distinct groups. One group focuses on selling pad print equipment and distributed inkjet printers and their related consumable items into the medical, industrial, promotional products, and other markets. A separate group focuses on selling the bespoke inkjet systems into industrial accounts.

We achieved +9% growth in sales in 2021 and ended the year with a strong order book for bespoke systems as well as a plan for continued strong growth for 2022.

At the very end of 2021 we took the largest single order in the Company's history (for multiple units) which will be realised during 2022, and the first half of 2023. There were continued challenges related to COVID-19 including no tradeshow presence and difficulty with travel, as well as regular interruptions of work schedules and supply issues.

We also made many changes in our internal procedures and business systems to allow a more focused approach to the business and better use of our resources to achieve results.

Project focus

In 2021, EPS designed, built, and delivered a bespoke single pass machine for a leading player in the promotional products industry. Based on the XD-70 platform, this machine featured a six-axis robotic arm controlled by a vision system to load parts, inline flame pre-treatment, a five-colour, six-head print engine, and servo-controlled offload accumulators for sorting of different SKUs.

Stored recipes enable the robotic arm to locate the part from the load cell, spot check the part for correct orientation and place it on a conveyor for pre-treatment. The part then continues under the printheads for decoration. Following inline UV curing, the part is conveyed to a series of "gates" that open and close according to the recipe. In this manner, parts are sorted automatically. On average, this machine can mark 1,000 parts per hour, including changeovers.

This successful implementation of single pass printing technology to the promotional products industry is an important step forward for EPS. The COVID-19 pandemic affected this market segment greatly, as the cancellation of sporting events, weddings and closure of restaurants negatively impacted sales for promotional products. As these events start to come back online, EPS is poised to bring this disruptive technology to an established industry that is seeking new efficiencies for their product decoration services.

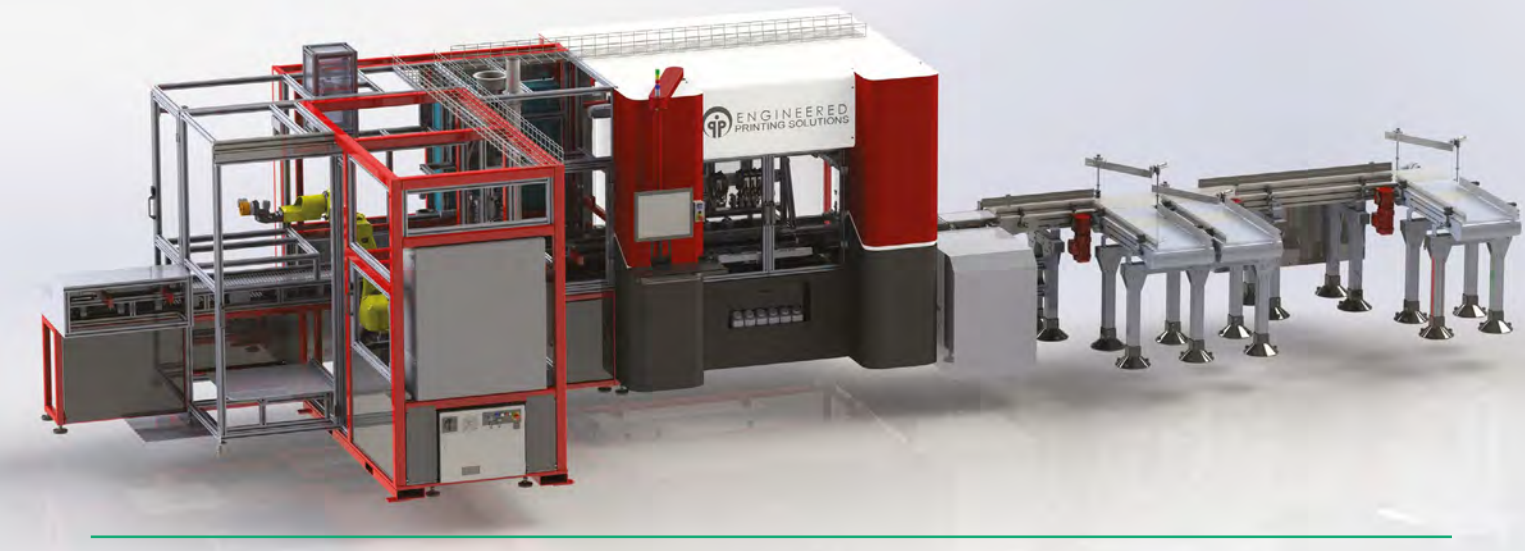
Where we excel

+ **Our core strengths are designing, building and integrating machines which allow our customers to product mark their parts in a highly automated manner, enabling significant cost savings and virtually unlimited print flexibility and personalisation.** We offer unparalleled service and support which in turn ensures we build long-term relationships with our customers

Priorities for 2022

In 2022, we will continue our efforts to standardise the base print engine platforms which become part of our customised inkjet solutions. The benefits of more standardisation will be lower costs and improved lead times.

At our core, EPS is an innovative group of very talented inkjet and automation experts who utilise their creativity and experience to design, build, and deliver specialised printing systems for our customers.



Digital Imaging

Introduction to FFEI

Established in 1947, FFEI has an impressive reputation for developing innovative and award winning digital inkjet and life science solutions – from concept to delivery. Most importantly, FFEI works closely with customers to ensure their market knowledge is transformed into the digital imaging system they need to meet their bespoke requirements. The two core FFEI application areas are digital imaging solutions for label presses and digital pathology scanners.

Where we excel

- **Over 65 years of know-how in industrial digital imaging technology**
- **An extensive core technology patent portfolio**
- **A reputation for developing sophisticated solutions from concept to delivery**
- **A culture of innovation and a keen focus on customer needs, underpinned with highly capable and committed employees**

FFEI Inkjet

The inkjet side of FFEI focuses on the design and manufacture of inkjet print engines which it sells to OEMs to incorporate in their own systems and brand as their own.

The FFEI print engine includes an ink system, a control unit to run it and mounted Xaar printheads. The OEM will take these elements and mount them into their own press to add a new print feature.

To date, FFEI has focused on the labels and packaging market where the print engine provides an efficient way to add digital embellishments to analogue presses, for example, varnish embellishment, high laydown embellishment, high opacity white, variable data coding/marking (which is very difficult without digital capability) and spot colours.

FFEI will continue to service its own customers as before but is developing a roadmap of products for Xaar's UDI customers which is launching in 2022 under the Xaar brand Versatex. This is a stripped back standard print engine which, because of the changes, is more versatile and open to a range of different applications. It offers a more complete solution for the UDIs who have less inkjet experience and who are looking for a standalone engine, helping them to keep development costs down and get to market more quickly.

FFEI Life Sciences

Digital pathology scanning technology

Over ten years ago FFEI applied its digital scanning expertise to the challenge of whole slide imaging (WSI) for pathology. Today its award-winning technology has been successfully taken to market by a number of blue chip clients. Central to the success of these scanners is FFEI's patented 'dynamic focus' technology, which delivers unparalleled scanning speed, z-stack functionality and high-resolution imaging.

Whether customers are seeking to add imaging capabilities to their existing core competencies, or are planning to extend their existing imaging portfolio, FFEI can help.

Optical imaging and detection technologies developed by FFEI have been successfully applied to a number of different laboratory formats and applications in partnership with a number of blue chip companies.

Product portfolio development is ongoing and there is now a pipeline of next generation scanning technologies; some are very close to market readiness, while others require further development. FFEI is now looking for new partners to reap the rewards of these next generation scanning systems.

Sierra slide colour calibration technology

FFEI's solutions include its patented Sierra slide and the unique capability to integrate with cloud-based ICC colour management profile generators. The Sierra slide calibration technology universally standardises WSI image quality to the highest ground-truth fidelity across all digital pathology scanning systems. This ensures the true and normalised colour of stained tissue biopsies are presented to pathologists, researchers and AI alike.