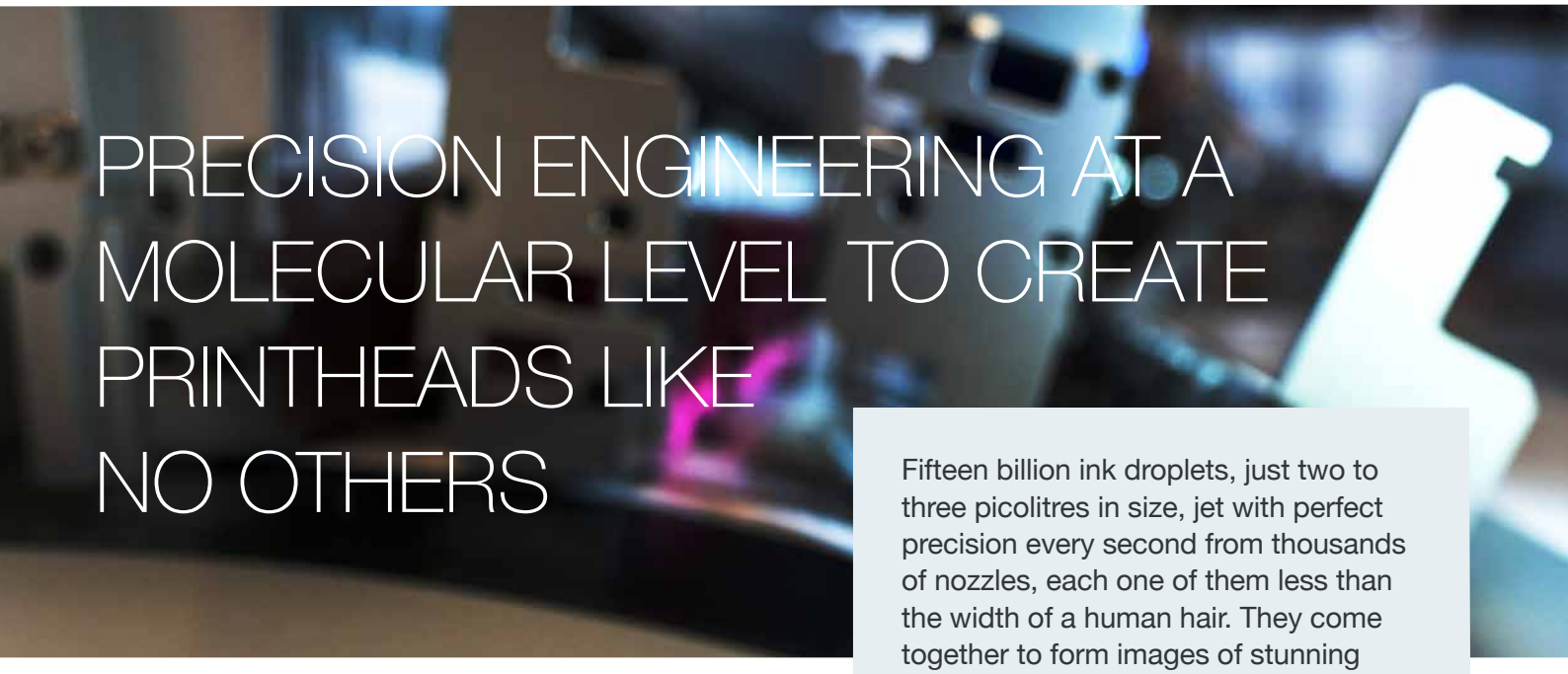
FUJIFILM



PRECISION ENGINEERING AT A MOLECULAR LEVEL TO CREATE PRINTHEADS LIKE NO OTHERS

Fifteen billion ink droplets, just two to three picolitres in size, jet with perfect precision every second from thousands of nozzles, each one of them less than the width of a human hair. They come together to form images of stunning quality, pinpoint fine text and remarkable colour consistency, whether they are jetting onto paper, carton, corrugated board, plastic, metal, wood or glass.

Multiple, intricate technologies combine to make this modern miracle of inkjet printing possible – from software to electronics to ink – but at the heart of it all lies the printhead.

To profitably deliver high quality print to the modern market, start with a printhead of the highest quality, reliability and longevity: a Fujifilm Dimatix Printhead.

Fujifilm & Dimatix

The best place to start when considering what sets Fujifilm Dimatix printheads apart is with the company itself. It began life in the US in 1984, as Spectra, Inc., a very early pioneer of industrial inkjet printheads. In 2005 it changed its name to Dimatix before being acquired by Fujifilm the following year. Fujifilm itself is renowned for its history of innovation, particularly the way in which it rapidly diversified when the bottom fell out of the photographic film market in the early 2000s. That drive to innovate has continued apace and the acquisition of Dimatix was one of many examples of Fujifilm investing in the future by buying into the finest expertise available.

Now the resources at Fujifilm's disposal, coupled with Dimatix's three decades of printhead development experience, have led to Fujifilm becoming an innovative trailblazer in the industry and have placed Fujifilm Dimatix in an unrivalled position to create some of the highest performance printheads on the market.

Fujifilm Dimatix operates state-of-the-art product development facilities in Lebanon, New Hampshire and in Santa Clara, California, in the heart of Silicon Valley. The latter is an appropriate location for the creation of this intricate technology, which rivals that being produced by the biggest and best known tech firms in that illustrious neighbourhood.

Piezoelectric vs thermal

Unlike some of its competitors, Fujifilm Dimatix printheads are all built around a piezoelectric, rather than a thermal process. The ink droplets are fired via an electrical charge and the precision achieved through this process is second to none. But there are other advantages this jetting technology has over the thermal inkjet printheads of many of Fujifilm competitors. Thermal inkjet printheads rapidly heat the ink until it forms a vapour bubble, which through expansion forces the ink out. Though cheaper to produce (and therefore to buy), thermal printheads have a much shorter life expectancy due to the ultra-high temperatures they are subjected to. This heat also places limits on the substrate types that can be accommodated – with heat sensitive materials often impossible to use. The frequent head changes required also negatively affect productivity and profitability.

Fujifilm Dimatix piezoelectric drop-on-demand inkjet printheads are recognised for their pinpoint precision at full production speed, allowing every jet on the printhead to operate at high throughput rates with exceptional accuracy. Known for their high duty cycles and long service life, the company's patented printheads also support the broadest range of ink, enabling OEMs and systems integrators to design advanced systems that are fast, reliable and economical. As a consequence, there are Fujifilm Dimatix printheads in numerous presses around the world, but they are at their very best when they're paired with Fujifilm's industry-leading inks and digital presses.

Si-MEMS

Of all the recent advances in printhead technology, within Fujifilm Dimatix or the wider industry, few match the impact that Fujifilm's proprietary Silicon MEMS (Micro-ElectroMechanical Systems), or Si-MEMS, manufacturing processes have had on the productivity, reliability, quality and efficiency of small drop, high resolution, non-impact printing and deposition.

"Silicon MEMS" describes a set of processes, developed out of the integrated circuit industry, used to "sculpt" and assemble tiny mechanical structures – micro machines – that are responsive to minute electrical currents to perform highly specialised tasks. The structures are fabricated on silicon wafers in much the same way that large scale integrated circuits, such as computer chips, are made.

The Fujifilm Dimatix Si-MEMS processes operate at sub-micron dimensions. The combination of silicon material and extremely small geometries allows Si-MEMS processes to produce operationally robust, chemically resistant, highly reliable and incredibly compact inkjet printheads.

Fujifilm is one of only a handful of companies in the world that has the technology and the expertise to perform this intricate process. Although there are many manufacturers of high quality printheads, none can match the extensive range of proprietary technologies Fujifilm owns and the full, end-to-end capability this provides, to produce printheads operating at the highest levels of performance.

Sputtering

An important part of the Si-MEMS process, and something that truly sets Fujifilm apart, is its patented 'sputtering' process. This is a high-tech, molecular-level engineering method of applying PZT (lead zirconate titanate), one of the world's most widely used piezoelectric ceramic materials, to the silicon wafer that forms the basis of the printhead. This process alters the fundamental make-up of the material at a molecular level, affecting permanent change. Similar products that use a machining process to reach the same end find that the PZT slowly reverts to its original form over time, negatively impacting both the quality and the reliability of the product. With Fujifilm's method, the material is permanently altered and the durability of the head, and the reliability of the nozzles, is therefore greatly improved.

Furthermore, while most MEMS devices are of the order of 1mm in length, Fujifilm Dimatix set out to build jetting structures in the tenths of millimetres in length, which requires substantially greater control over planar dimensions than is typically achievable with standard MEMS fabrication technologies.

Samba

The Fujifilm Dimatix Samba range of printheads is one of the best known Fujifilm printheads and it provides an excellent example of how Fujifilm has used its technical expertise across the group to create a printhead unmatched on the market. Samba printhead technology has been developed jointly by Fujifilm Dimatix and Fujifilm Corporation, and makes full use of the company's proprietary Silicon MEMS fabrication methods.

Fujifilm has also helped to develop the patented VersaDrop multipulsing jetting capability and RediJet jetting technology:

- **VersaDrop** jetting technology is the activation of the piezoelectric element with waveform pulses of varying amplitudes to produce metered amounts of ink which are pumped into a single drop before the ligament detaches from the nozzle. This capability is used to form variable drop sizes with no compromise in jetting productivity.

- **RediJet** consolidates several breakthrough innovations, unlocking the full productive capacity of a printhead while lowering the recurring service cost. The defining characteristic of this technology is the ability to minimize the initial start-up and ongoing maintenance times, along with reducing associated fluid consumption, especially when using faster drying and/or heavily pigmented ink formulations like those found in high-speed, industrial, single-pass systems.

Collectively, these technologies and other innovations enable printhead nozzles to be arranged in a matrix array, with improved meniscus formation and ink recirculation, to provide unparalleled stability, uniformity, maintainability and scalability in a compact package. Samba printhead technology delivers the breakthrough quality, speed and scalability required for wide, single-pass production inkjet printing and materials deposition applications. The first implementation of Samba inkjet technology is in a parallelogram-shaped "printhead on a chip" that measures a mere 45mm deep, and packs in 2,048 jets per module at 1,200 dots-per-inch. It is also capable of pulsing fluids in an industry-first, native drop volume of 2 picolitres at up to 100 kHz – the highest jetting frequencies yet developed. By comparison, most typical printheads feature 600 dot-per-inch spacing and an ink drop volume of 7-8 picolitres.

Why does it matter?

The demands of print buyers across the industry are changing rapidly – shorter runs, faster turnaround times, ever-better quality – with these developing market trends requiring advanced, sophisticated solutions. Fujifilm's control of the end-to-end development of its products, linking its state-of-the-art printheads with its own high quality inks and wider proprietary inkjet technologies, is what makes it possible for the company to produce presses like the Jet Press 750S, which delivers quality and reliability its rivals can only aspire to.

For further information:
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