FOR IMMEDIATE RELEASE:

Inkjet printing: what is driving its today's adoption?

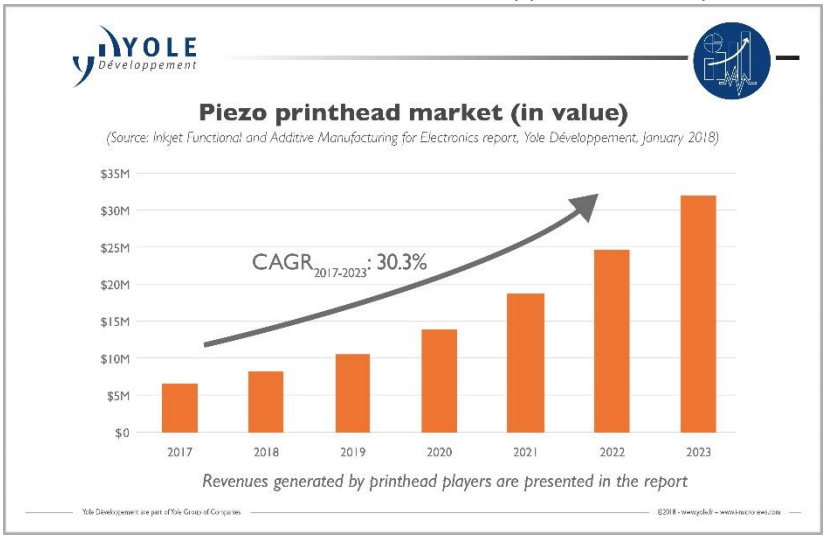
Extracted from: Inkjet Functional and Additive Manufacturing for Electronics report, Yole Développement – February 2018

LYON, France – February 12, 2018: Functional printing is leveraging the use of inkjet printing and opening new market opportunities for printhead manufacturers. The manufacturing digital revolution is underway. According Yole Développement (Yole), inkjet printheads integrated in industrial printing equipment are expected to reach more than US$31 million in 2023, with a 30.3% CAGR[1] from 2017 - 2023.

The market research and strategy consulting company Yole, releases this month its Inkjet Functional and Additive Manufacturing for Electronics report, the first research performed on the inkjet printing technology in the field of electronics, micro-electronics and micro-optics. Yole's analysts propose a comprehensive survey focused on the inkjet printing applicability including major applications today, applications foreseen and related inkjet printing roadmap.

This new report describes the current status of the inkjet printing technology adoption and various type of printhead devices available on the market. It provides an overview of the technological trends for inkjet printheads dedicated to functional printing.

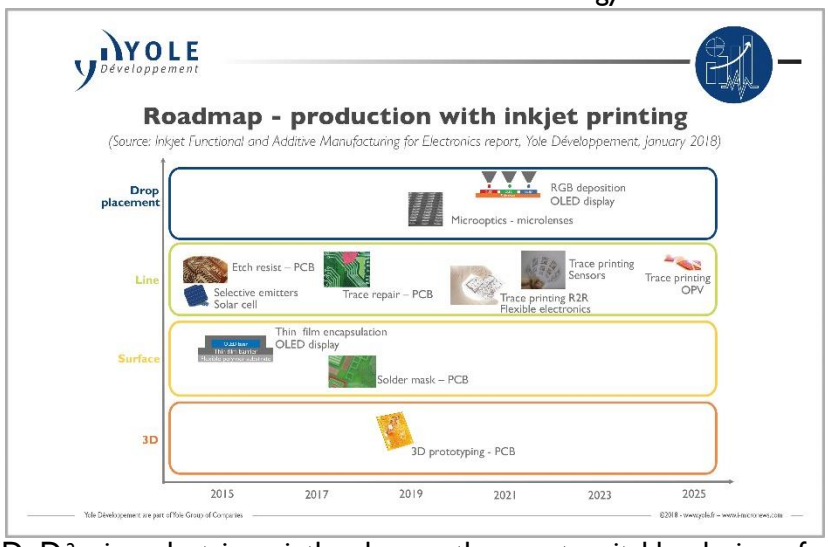
This analysis also details the competitive landscape: key players in this field are Konica Minolta, Fujifilm Dimatix, Océ-Canon, and Xaar. Other printhead players are actively looking at this new leveraging markets and new opportunities in parallel of graphic domain where they are currently doing business. Each printhead vendor is focused on gaining its slice of the pie too. In its new technology & market report, Yole is showing the printhead market shares and printhead market forecasts for functional and additive printing, along with estimated printer market shipment by application.



What are the market drivers and remaining challenges of the

[1] CAGR : Compound Annual Growth Rate

inkjet technology implementation? How is inkjet building a success story within 2.5D and 3D manufacturing? Yole's analysts invite you to discover the market evolution and latest technology trends.



DoD[2] piezoelectric printheads are the most suitable devices for depositing a picoliter of inks where you want, when you want, and at high frequencies. Compared to thermal ejection, which is largely used in consumer, office, and commercial printing, piezo printheads are used in industrial applications because of their higher resistance and longer lifetime in harsh environments. Furthermore, piezo ejection offers more choice in ink selection: for example, aqueous, solvent, and UV[3]-curable inks.

After lengthy research & development dedicated to utilizing inkjet printing as a prototyping tool, the first mass-production market emerged with OLED [4] thin-film encapsulation for displays (smartphones, TVs). Now driving the market, OLED display is doing much more than creating opportunities for inkjet printing. It is also democratizing inkjet technology as a new process for manufacturing electronics and microelectronics. **Jérôme Mouly, Technology & Market Analyst at Yole** comments: *"Kateeva, a US-based company manufacturing printers for OLED displays, is one of the leading companies using inkjet printing technology. After being the first to reach mass production for thin-film encapsulation, the company is now targeting RGB[5] OLED material deposition by inkjet for TV display. LG Display is currently in pilot production using Kateeva printers."*

A strong increase in wearables requiring miniaturized, "close to the skin" devices in certain applications, is paving the way for flexible printed electronics. Expensive photolithography processes with mask technology could be replaced by inkjet printing processes to deposit

[2] DoD : Drop-on-demand
[3] UV : Ultra-violet
[4] OLED : Organic Light Emitting Diode
[5] RGB : Red/Green/Blue

conductive lines on-demand. Inkjet technology demonstrates consistently improving performances in terms of deposition accuracy, high-resolution printing, and well-controlled droplet volume control. Printheads are one of a printer's key components, and they're becoming increasingly complex, requiring strong knowledge and experience.

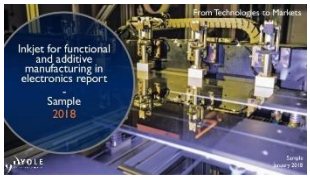
Inkjet printers bottleneck was the compatibility with high throughput imposed by industrial production level. Integration of a high number of parallel printheads is now possible thanks to single pass printing architectures and long term collaboration between printer, printhead as well as ink provider to achieve fast and accurate deposition. It is worth noting that nozzle positioning and well-controlled ejection are key to printer manufacturers and targeted applications. Printhead quality is improved by using MEMS[6] technologies and thin-film PZT[7], helping them attain the required level for electronic applications.

Can inkjet printing manufacture a full electronic device? The answer is yes, but only in prototyping applications. 3D inkjet printing can now manufacture a PCB[8] card prototype from A - Z. Nano-Dimension, a developer of 3D printing equipment solutions, released at the end of 2017 its Dragongfly 2020. In mass applications, inkjet remains one of the key steps in the manufacturing process.

A detailed description of this report is available on i-micronews.com, manufacturing reports section.

[6] MEMS : Micro Electro Mechanical Systems
[7] PZT : Lead Zirconate Titanate
[8] PCB : Printed Chip Board

ABOUT THE REPORT:



INKJET FUNCTIONAL AND ADDITIVE MANUFACTURING FOR ELECTRONICS

How inkjet is building a success story drop by drop within 2.5D and 3D manufacturing? - Produced by Yole Développement.

Companies cited in the report:

Agfa, BATM Systems, BOE, Brother, Canon, Cosemi, Dow Chemical, Dupont, Fujifilm Dimatix, Funai, HP, Intrinsiq, Japan Display, JOLED, Kateeva, Kodak, Konica Minolta, Kyocera, Lexmark, LG Display, Luxexcel, MEMJET, Merck, Meyer Burger, MGI – Ceradrop, MicroFab, Microresist Technology, M-Solv, Mutracx, NanoDimension, Notion Systems, Novacentrix, Océ – Canon Group, and many more.... Full list

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Jérôme Mouly serves as a Technology & Market Analyst specialized in microtechnologies for biomedical & medical imaging applications at Yole Développement, the "More than Moore" market research and strategy consulting company. Since 2000, Jérôme has participated in more than 100 marketing and technological analyses for industrial groups, start-ups and institutes related to semiconductor & medical technologies industry. Jérôme holds a Master of Physics from the University of Lyon

ABOUT YOLE DEVELOPPEMENT

Founded in 1998, Yole Développement has grown to become a group of companies providing marketing, technology and strategy consulting, media and corporate finance services, reverse engineering and reverse costing services and well as IP and patent analysis. With a strong focus on emerging applications using silicon and/or micro manufacturing, the Yole group of companies has expanded to include more than 80 collaborators worldwide covering MEMS and image sensors, Compound Semiconductors, RF Electronics, Solid-state lighting, Displays, software, Optoelectronics, Microfluidics & Medical, Advanced Packaging, Manufacturing, Nanomaterials, Power Electronics and Batteries & Energy Management.

The "More than Moore" market research, technology and strategy consulting company Yole Développement, along with its partners System Plus Consulting, PISEO and KnowMade, support industrial companies, investors and R&D organizations worldwide to help them understand markets and follow technology trends to grow their business. . For more information, visit www.yole.fr and follow Yole on LinkedIn and Twitter.

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