DJM works on Photonic driven inkjet

Inkjet at *light speed*

Drupa 2016: DJM's Samba 'Dream Machine'.

Hybrid presses (offset, flexo, rotogravure and screen printing) with inline inkjet printing would change the future of packaging printing, commercial printing and more. But for now, it doesn't have massive impact, partly because inkjet imprints at full speed with hundred percent register has inevitable drawbacks. DJM is working on a solution with *Photonic driven inkjet*.

Briefly, the goal of DJM's innovation project is to have the RIP digitally register each subsequent inkjet imprint image with a previous preprint or color register. To achieve this, data speed is needed that comes in the vicinity of 2.5 terabytes/sec. Inkjet technologist Steve Knight points out regularly that 'in the printing company of tomorrow, it's not about the print engine, but about the processing speed of data volumes.'

A dream

The 25-year-old DJM came into the picture at Drupa 2016, but also at the Grafische Vakbeurs in Gorinchem (NL). Demonstrations of inkjet imprints on (A3) sheets and envelopes, accurately fed on a vacuum conveyor belt, were carried out at both exhibitions; on Drupa even with a perforated stainless steel vacuum belt. At both exhibitions, attention was also paid to DJM's roll2roll inkjet printing systems. At Drupa, DJM demonstrated her 'Dream-Machine' live; a roll2roll full color prototype with Fujifilm Dimatix samba printheads. In Gorinchem, this was done through screen presentations. Shortly after Drupa 2016, print service provider Ramon Chozas S.A. from Buenos Aires, Argentina (RCA) ordered a 'Dream-Machine' printing system in 43 cm wide roll2sheet version, online with a unwinder, buffer, cutter and stacker from Tecnau.

This configuration has been producing transactional prints at a resolution of 1,200 x1,200 dpi for several telecom companies since 2017 with 375 ft/min (114 m/min). Everything – including real-time ripping and software links between the various systems – is controlled from one software platform; the 'Kameleon' system from DJM.
In addition, DJM developed the customized paper transport with a BST web-edge control and a triple web tension control. To prevent the risk of damaging the Samba printheads and to maximize uptime, a unit has been developed that can deal with splices/roll changes. If a splice is detected, the distance from the print head to the substrate is increased – by lowering the print web while maintaining the web tension – and were the printing process is temporarily interrupted.

Photonic driven inkjet

DJM is now working on the 'Photonic driven inkjet' project, for which the company granted an EU subsidy together with TNO. The European Regional Development Fund describes for which this subsidy is granted: 'The main objective of the project is to register substrate movements 3-dimensionally and, at the same time, to make adjustments in the control of the print module. In this way, the perfect inkjet drop is created under all circumstances and is positioned in the right place on the substrate. To achieve this, a measurement method must be developed to monitor the substrate and sensors will be developed that can carry out these measurements. In addition, an encoder must be developed that can take measurements in the X, Y and Z dimensions.' In other words, DJM aims to ensure that at an imprint speed of 1000 ft/min (300 m/min) – on, for example, previously printed offset sheets – every inkjet imprint is digitally brought into register with the offset image, regardless of position deviations between the preprints. This also applies to the full color inkjet print itself, of which the digital color units must remain in register. This requires,


European Union

European Regional Development Fund

De hieronder genoemde activiteiten worden mede mogelijk gemaakt door de Europese Unie

Kijk voor meer informatie over het subsidieprogramma op:

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Real time 3-dimensionale substraat registratie

ontvangt subsidie voor de volgende activiteit(en):

DJM is ontwikkelaar en fabrikant van inkjet print systemen. Voor deze contact-loze printtechniek is het substraat transport erg belangrijk voor het realiseren van een hoogwaardige afdrukkwaliteit. DJM's ambitie is om – toegespitst op de toepassing – altijd de beste inkjet print oplossing te leveren aan haar relaties. DJM wil nu de stap maken naar de hoogste haalbare precisie, namelijk fotonica gedreven inkjet print oplossingen.

De hoofddoelstelling van het project is het 3-dimensionaal registreren van substraat bewegingen en gelijktijdig aanpassingen te doen in de aansturing van de print module. Op deze wijze wordt onder alle omstandigheden de perfecte inkjet druppel gecreëerd en wordt deze op de juiste plek op het substraat gepositioneerd.

Om dit te realiseren moet een meetmethode ontwikkeld worden om het substraat te volgen en sensoren worden ontwikkeld die deze metingen kunnen uitvoeren. Daarnaast moet een encoder worden ontwikkeld die in x, y en z dimensie metingen kan verrichten.

In dit project werkt DJM samen met TNO op het gebied van fotonica technologie.

Het operationeel programma (OP) EFRO Oost-Nederland is een gezamenlijk subsidieprogramma van de provincies Overijssel en Gelderland en werkt aan structurele versterking van de economie. Oost Nederland zet de EFRO-middelen in op innovatiestimulering en koolstofarme economie. Het doel is dat meer Oost-Nederlandse MKB-bedrijven meer omzet halen uit nieuwe producten.

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in combination with a resolution of 4,800 dpi and print width of 40 inches (1000 mm), the aforementioned data processing of 2.5 terabyte/sec. The total project value comes to approximately one million euros. DJM founder and owner Dick van der Maal talks about how this project idea originated. 'Thinking about what's next', I focused on the biggest obstacle of variable hybrid inkjet printing. Print hardware is not the first concern, it's always the speed of data processing. In a previous project, for example, we had to recognize an object for T-shirt prints, then convert the deviation and finally re-rip the repositioned imprint. Initially it seemed to apply exclusively for imprinting non-register imported sheets or flat objects, but now we also see comparative issues in hybrid web inkjet imprinting. For example, due to long web length with axial and radial fluctuations. This puts even more pressure on ultra-high-speed processing of large data volumes'.

DJM's HP C800 print modules integrated on web finishing line.

Opto electronics

'In 2010 I heard about Intel's replacement of copper to light beams (opto electronics) on microchips. Furthermore, I understood that the European investment program Horizon 2020 had defined photonics as one of the five key-technologies. Further studying, photonic microchips turned out to do all kinds of operations based on light. In comparison to electrons, photons are also extremely lightweight. This offers opportunities to process much more information while using less energy. Not only for processing or sending data, but also for other applications, such as sensors. Meanwhile, there is already been a lot published on this subject. In the Fraunhofer Project Center at the University Campus in Enschede (NL) a machine was developed for the production of photonic chips in collaboration with PHIX Photonics Assembly and was the first step towards mass production. Through our partner

We need data rates of 2,5 terabyte per second.

DJM's 'Dream Machine' at Ramon Chozas Argentina.

TNO we came up with our project idea at "OP-Oost", the European Fund for Regional Development in Arnhem (Operational Program ERDF 2014-2020 East Netherlands). We are the secretary of the project and will be pulling the weight. The steel construction of the prototype is done by our "neighbour", Den Ouden technical services. TNO will assists us in the development into a prototype. The life span of our project is three years and has recently been kicked-off.'

Concrete interpretation

Curious I take a look at R&D and DJM's mechanical engineering with Van der Maal and his international sales director Arwin van Oostveen. There, the required project disciplines – ICT, mechatronics, inkjet processor technology, measurement/control technology and machine construction – are implemented in concrete terms. Van der Maal: 'Fujifilm's Samba printhead is one of our starting points, but the total printing application differs per customer. Print width, job path, inline converting and so on; we never say 'no' and our systems are always scalable; for example, starting with monochrome recto verso and later expanding to full color. This frame will be soon transformed to the next 'Dream-Machine'.

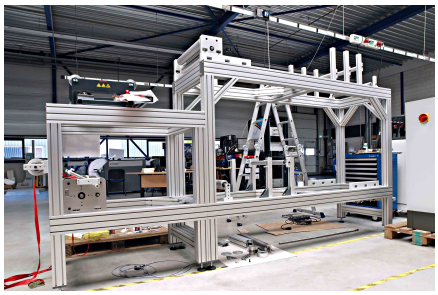
Founder and CEO Dick van der Maal at Print18 in Chicago.

Arwin van Oostveen at Print18 in Chicago.

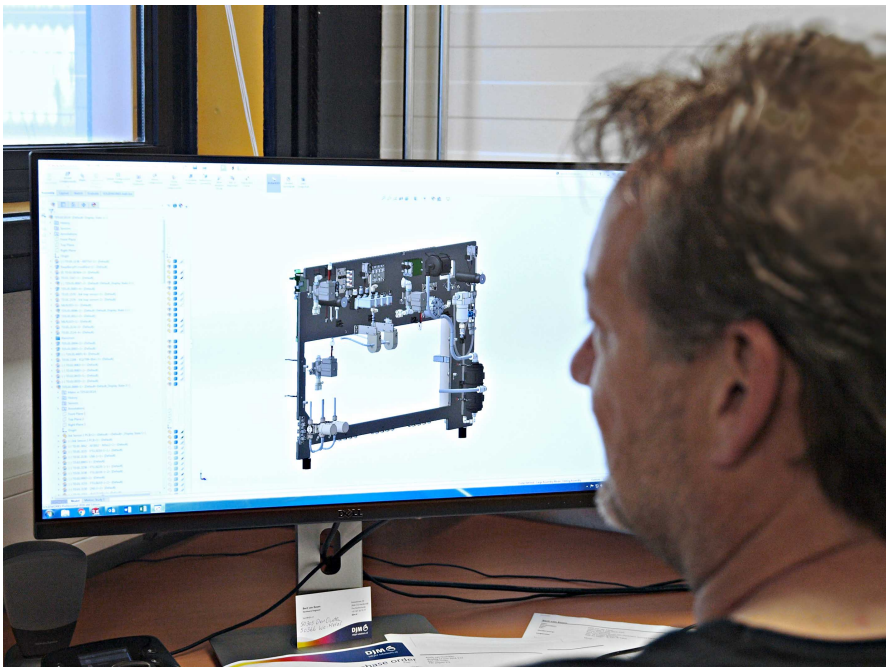
After the first machine for Argentina, the second went to South Korea, the third to Russia. In the meantime, they are supplied throughout the world; Germany, the Czech Republic, North Africa, the USA and also in the Netherlands. This company has a high-speed full color inkjet system for printing envelopes.' In the production facility we see a recto verso printing system with six thermal C800 color print

Multiple Samba printheads positioned in ceramic print bar.

modules (CMYK) from HP and prints the web on two sides. 'This solution is similar as the one at Paragon Customer Communications in Germany. It is a printing solution for the production of loyalty programs and mailings. The print modules use HP's TIJ4 technology, which is also used in HP's T-series inkjet web presses. They are perfect for integration and for full-color imprints, but are restricted to HP's water-based inks', says Van Oostveen.



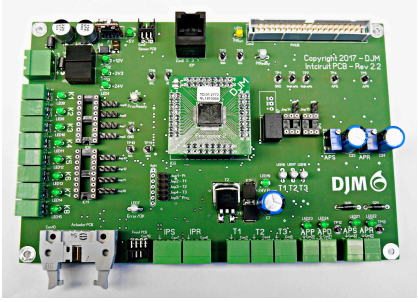
'Dream Machine' under construction.



In-house engineering of all components. In screen the ink management backplane of Samba print module.

At the engineering department, we see a technician modifying a technical drawing of an ink management backplane on a computer. 'This is for a Samba print module and is developed in-house mechanically as well as electronically. One design aspect is that this ink management is designed to work completely autonomous.' The ink management module is also very suitable for other printhead suppliers, such as Kyocera. DJM's design philosophy is based on that developed technologies can be applied widely.

Printhardware is not the first concern.



DJM's in-house developed printed circuit boards.

Back at mechanical engineering, we see the ink management system for the Samba print modules in prefab stage. We can also handle various printed circuit boards, all with copyright numbers and DJM logos. 'Own development'; says Van der Maal with proud. 'It is true that we manufacture externally on our specifications, but we bear the ultimate responsibility. That is why, for example, we check all solder joints again microscopically. The functionality is checked thoroughly during the endurance test of the final printing machine.'

Assembling the ink management back plane.

Samba

DJM's quest for the most reliable printhead in the highest print quality segment led to Fujifilm Dimatix' Samba printhead. Van der Maal: 'in the 1200 x 1200 dpi printhead category, the Samba is the best and most reliable piezo printhead I know, suitable for water-based and UV inks. Looking at the installed base and the performance that Samba printheads

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Samba print module (20,3 inches wide) integrated in web offset press.

have delivered in Fujifilm's JetPress 720 since Drupa 2008 is significant. In addition, the parallel nozzle rows running at an angle of 60 degrees are cleverly positioned. Among other things to compensate for missing nozzles and reduce cross talk of the nozzles. The Samba's native droplet sizes are also adjustable, varying from 10 picoliter to 2.6 picoliter (for photo quality). The next best and more affordable alternatives are for example HP's thermal printheads, Kyocera or Memjet.'

Future plans

Philosophizing about DJM's plans for the future in the success of the 'Photonic driven inkjet' project, Van der Maal sees the inkjet imprint market as the growth domain for it. That is not a new area for us. Take this project for example for a Russian customer. They were looking for an optimal inkjet imprint solution, integrated on their eight-color Drent Vision web offset press. For them we developed the inline Samba print module with twelve samba printheads creating a print bar of 20,3 inches (517mm). Thanks to the high print resolution, this customer can process a wide range of applications from mailing, statements and tickets. At this moment, they are using several Samba print modules in 24/7 production.' 'And if DJM's 'Photonic driven inkjet' system should print sheets or packaging with piecemeal positioning, would that be conceivable?', asking curiously. 'We will use this feeder for full-color imprints of an earlier offset print,' says Van der Maal, pointing to a large sheet feeder of the BDT (75x106cm). 'It has been developed for the packaging industry and as sheet insert for, for example, large format offset preprints. We also manage to integrate on state-of-the-art web presses, offset, flexo, rotogravure and screen printing.''And for full color inkjet imprints on a folding box machine or a packaging line to integrate?' Maybe promising, but now too early as feasible to close to the results of our Photonic driven inkjet development project.'

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