

IJBC Presentation

1. Nessian Cleary

Hello.

My name is Nessian Cleary.

2. The bigger picture

We've all come here to talk about inkjet technology, and over the next two days we'll hear from a number of experts about the particular aspects of inkjet that they are working on. I'm going to talk in more general terms about how inkjet technology is used but you might ask why am I here talking to you? I am not an engineer, or a chemist or any kind of scientist. I work as a journalist and I specialize in writing about all the various printing technologies and how they are used, including inkjet. So first I want to talk about myself and my work, to set the context for the rest of my presentation.

3. GtI screen shot

I work as a freelance journalist and I write for various titles. My approach is a little different to other journalists. I spend roughly half of my time working on my own website, which some of you might have already seen. I chose to call my website Graphics to industrial printing because that describes how my work has evolved. I see many familiar faces here and I believe that many of you have been on a similar journey. I recycle the content from my website into the stories that I write for other magazines, and this basically pays for the website. There's no advertising or other income from this site, so I'm not going to get rich from it. But it gives me the freedom to choose what I want to write about. It is important to me that the content is independent and that readers can trust that it is impartial and know that it does not reflect someone else's marketing budget.

4. Guttenberg

I believe strongly in democracy and self determination and everyone having the right to make their own decisions. But this depends on everybody having good, accurate and detailed information. So journalism is a great leveller - it's a way to give everyone access to all the information they need to make the choices in their life. This is the same in writing about politics or printing, except that we have a much better selection of printing presses than politicians to choose from. Many people have confused journalism with marketing. But it's not my job to help you sell your products. Instead I try to give readers as much information as I can. Sometimes that means having to balance the rights of readers to know something, against the need for companies to protect their intellectual property. I write for end users who have to decide which technology to invest in, which applications to target, which presses to install. But I also write for

component developers and system integrators and academic researchers because I see how all of these things are connected and how we are all dependent on each other.

5. Mouvent Head clusters

There are many different print technologies in common use today, from offset litho and flexography through to electrophotography. But none of these are as versatile as inkjet, which is now used in all forms of printing, from wide format display graphics to books and packaging. Inkjet is also going beyond the graphics world to industrial printing and into manufacturing, which in turn is driving further innovations in inks and printhead design that will benefit all the various graphics print sectors. This image shows the inside of a Mouvent label press, with Mouvent's print head clusters at the top. These clusters combine four Fujifilm Samba printheads into a single unit complete with all the electronic cabling and ink piping, arranged in a housing that's been 3D-printed.

6. Xerox Baltoro

In the commercial print sector we can clearly see single pass inkjet taking a bigger slice of the market. The early inkjet presses were all aimed at the transactional market, which is another way of saying that the need to print variable data was more important than the actual image quality. But as the print quality has improved so we have seen web fed inkjet presses aiming for new markets, including book printing and direct mail. Recently, we've seen sheetfed presses such as the Canon i200 and i300 as well as the Xerox Baltoro, which is interesting because sheetfed service providers are trying to serve a more general purpose market, where customers expect a reasonably good image quality and on a variety of media stocks.

7. Canon ProStream

The trend here is clearly also toward being able to print to offset litho stocks, and I think it's inconceivable at this stage that a vendor would introduce a new single pass inkjet press that could not handle these substrates. There are a number of different approaches, with most using a primer like's Canon's Colorgrip to bind the ink to the media. But Canon went a step further and developed a latex ink for its ProStream, which actually does contain latex, unlike HP's latex ink, which does not have any latex. In this case, the ink contains a latex polymer component that melts during the drying and forms a film on the surface that protects the pigment on the surface of the paper.

8. Durst RSCi

This past decade we've also seen the labels and packaging sectors taking an interest in digital printing. There's a temptation to see labelling and packaging as interlinked but there are some differences

in the way they've adopted inkjet. Labelling was much quicker to look at inkjet and the result is that most inkjet label presses use UV ink. But the major trend in labelling, in flexo and digital, is for wider presses, typically 450 to 530mm, which are able to handle some packaging applications. But this brings up the problem of how to fully cure the ink to comply with food safety regulations. This is a Durst Tau RSCi, which is available in 330, 420 and 508mm widths. It's one of the fastest inkjet label presses around, running at 100mpm at 1200 x 600 dpi resolution, and 80mpm at the maximum 1200 x 1200 dpi. Part of this is down to the printheads which are Fujifilm Samba. Durst has also developed a low migration inkset, which took Durst two years of playing with raw ingredients and reformulating since the Samba has a very low viscosity threshold.

9. Bobst Mouvent

Looking around the last Label Expo show I was struck by how many hybrid solutions there are now. It feels as if this market is not really ready to give up on flexo technology. This is a Bobst DM5 hybrid, which is basically an M5 flexo press with an inkjet module developed by Bobst's subsidiary Mouvent and which is basically the print engine from the LB702-series label presses, and which can run at 100mpm with 1200 x 1200 dpi resolution. Mouvent says it could run faster but that the market demand is for higher resolution rather than faster speeds, particularly on short run jobs. Bobst expects the demand to split 50/50 between the flexo M5 and the hybrid DM5.

10. Gallus Smartfire

There's clearly a demand for relatively cheap inkjet presses for very short runs. But for everything else it feels as if most label converters are less willing to pay for the more expensive inkjet presses when they can continue to use flexo. Gallus obviously came to the same conclusion and despite spending a long time developing a sophisticated hybrid press complete with Samba printheads in the Labelfire, it now offers this much cheaper Smartfire, which uses Memjet Versapass printheads. So it feels as if inkjet still has some way to go in the labelling space, despite the high number of inkjet labelling presses currently available. I think that this is something that Memjet has understood very well.

11. Memjet Duraflex Check Rigoli details

Certainly there are quite a number of relatively cheap label solutions now using Memjet's Versapass printheads. New Solutions has a very similar machine to the Smartfire, and Rigoli also uses the same print engine to make a wider 1 metre wide packaging press, the MVZ1000 that can print to inkjet coated media including PE and PP films.

I think that we will see a lot more Memjet based printers now that the new DuraFlex printheads are starting to ship, which use pigment inks and offer much faster speeds. I think that for a lot of converters these solutions will be good enough for short run work, and at a price that they are willing to pay.

12. Monotech Add press details

This Jetsci ColorAqua developed by the Indian company Monotech Systems is amongst the first label presses to be offered with the DuraFlex heads, though I know there are plenty of vendors developing printers with this print engine. It can run at up to 45mpm with 1600 dpi resolution. Monotech says that it can print to most general coated and uncoated label stock materials without primers but that with a primer it can also print on many films and substrates and the press comes with a flexo unit for applying primer. Jimit Mittal, Monotech's vice president of inkjet solutions, told me that he has customers that print 2000 linear metres on digital and some that use digital for even longer run lengths because of the quicker turnaround times.

13. Koenig and Bauer CorruJet

Packaging is one of the most interesting areas right now. Everybody wants to get into packaging because of the volumes involved. For the same reason, everyone wants to use water-based inks because UV ink is too expensive and too complicated for the volumes involved, and not really suitable for food packaging. And it helps that water is a more sustainable material. But there's a lot of flexible film in packaging, and that means problems in getting rid of the water that carries the pigments to the substrate. So for now we are seeing a lot of inkjet presses with water-based inks targeting absorbent media such as corrugated and folding carton. This includes this CorruJet from Koenig and Bauer which takes corrugated sheets up to 1.7 x 1.3m. But Durst, HP, Screen and Xeikon are also working on these type of presses.

14. Kodak Uteco.

There are several presses in development that aim to print to flexible films, such as this Sapphire Evo from Uteco, which uses Kodak's Stream continuous inkjet and can run at 150mpm and will print to flexible films and paper-based substrates up to 650mm wide. There's a second, wider, press in development, the Evo W, which takes media up to 1.25 metres wide and uses Kodak's UltraStream print engine, which is the next generation of the Stream. Continuous inkjet is very well suited to the sort of high speed required for packaging presses, though this solution also relies on primer.

15. Inca Onset X2

In some respects, wide format is the ugly duckling of the printing industry. I can tell you that 20 years ago stories about wide format printing were quite hard to sell. Magazines would commission wide format features because there was a lot of advertising spend, but back then the editors didn't really regard it as a proper printing technology, and most wide format printers didn't really think they were part of the printing industry. There's a certain mechanical beauty to a Speedmaster, not so much for a rollfed solvent or a UV flatbed though its quite mesmerizing to watch a really fast flatbed like this Onset X from Inca Digital. But wide format is probably the most interesting area for me. Wide format printers have long had to cope with all sorts of substrates, including cheap tarpaulins, banners, MDF and plywood, and other builders materials.

16. Roland Switches

It's no accident that wide format has now given rise to industrial printing. For many people, industrial is not a very pretty word. Industrial printing covers many different markets, including ceramics and tiles, wooden flooring, and even plastic switch covers as seen here. Industrial is mostly quite functional though there is room for a lot of fun, brightening up a workplace or a child's bedroom with a funny message or a character from a film on a light switch.

17. Roland Toothbrushes

This is a small industrial flatbed printer, which started off as a UV LED machine, the Roland LEF2 300. But Roland has taken out the LED curing lamps and converted the printer to run an eco-solvent inkset to create a new model, the SF200. The key to this printer is that it can be used to print to items for personal use such as food containers or children's toys – basically anything that might come close to someone's mouth, where there might be an issue with using UV inks. In this picture it's printing a pattern to toothbrushes. It was originally developed to print Lego figures.

18. Roland Membranes

This is a membrane switch panel that's been printed on a prototype printer from Roland. Here, Roland had taken its existing VersaUV printer and replaced the UV inks with a water-based resin ink, and then mounted the whole unit to a flatbed table that can be heated to around 50°C. Membrane switches have to be able to withstand a million pushes but this is difficult with some UV ink, which can crack, and no problem for this resin ink. Reusing an existing printer also gave Roland a cheaper way of approaching a niche market.

19. Roland décor

This Deco printer was shown by Roland as a prototype at the last Fespa in Berlin. It's a standard EJ640 roll fed printer but Roland has replaced the solvent inks with water-based resin inks. This ink contains binder components so that it will print to uncoated materials. It was designed for wallpapers but can also print to lamp shades and window blinds, and is said to have good light fastness when compared with dye sublimation. And of course, it's using water-based inks so it ticks the demand for more sustainable solutions.

20 Direct to shape

We could be here all day talking about examples of industrial printing. But I think one of the most interesting areas is direct to shape. Some of the small flatbeds from Roland, Mimaki and Mutoh can now print to small objects of various shapes but they can't really handle curves. Then there are printers such as this XD 360 from EPS that are designed specifically for cylindrical objects such as bottles and cans. EPS is owned by Xaar so no surprise that its using Xaar printheads.

21. HP wallpaper

This wall covering was shown at Heimtextil in Germany just a couple of weeks ago. It was printed by a British company called OhPopsi, which uses HP latex printers. Wallpaper is tricky because it involves extremely low margins, there are lots of safety certifications, it has to be cleanable, and to retain a certain texture. For now, the market for digital wallpapers is fairly evenly split between HP with its latex printers and Xeikon with its electrophotographic printers, in terms of volume – there are a lot more latex printers in the market, and Xeikon says that all of their customers also run a latex machine. But these are all aimed at short run markets and it's worth noting that there are several inkjet solutions also in the pipeline. Ricoh has worked with Olbrich to produce an inkjet module for a conventional gravure production line that's reasonably fast and produces excellent results. And Industrial Inkjet in Cambridge have also worked on wallpapers.

22. HP dresses

Industrial printing also includes printing to textiles. In the beginning textile printing meant soft signage for banners and flags, and then branched into functional things like hotel carpets and clothing for work. But new types of ink, including disperse and reactive have allowed us to print to all sorts of fabrics, including cottons and silks, as well as an enormous amount of lycra and sportswear that's printed on dye sublimation printers – these dresses were printed on a HP Stitch dye sub wide format printer. Now when we talk about textile

printing, we mean soft furnishings, and silk scarves and ladies dresses. But all of this is built on wide format print technology. A few slides back I said that many editors saw wide format as an ugly duckling but we can perhaps see how this ugly duckling has turned into a swan.

23. EFI Bolt

Textile printing is important and not just because it's a huge market opportunity. Textiles cover several major sectors, including garments and home decor so the potential rewards for inkjet vendors are enormous. But using inkjet to produce textile products can have a much bigger impact. Firstly, there is a major environmental benefit. Many conventional methods of producing textiles require vast quantities of water, with the risk of contaminating water supplies and eco systems. Inkjet printers, such as this high volume single pass EFI Bolt, potentially offer a much cleaner technology.

24. Heimtextile clothing

Inkjet also has the ability to alter the supply chains. Many Western countries believe that this will mean returning textile production from countries like China and Pakistan back to Europe and the US. But I think that digital printing will really allow us to decentralise our production, to produce in lower volumes, closer to the point of demand. If we are really serious about looking after our environment and protecting our planet then we will have to alter our lifestyles and our manufacturing. So, it's lucky for all of us here that inkjet technology can play a positive part in this. But we also have to be careful not to over-promote clothing as a throwaway product. It is true that textiles are recyclable, but there's an environmental impact both in creating and in recycling these products. We have to be careful not to replace one form of pollution with another.

25. HP Product packaging/ Muller Martini book production

Of course, we all make a living out of digital printing in one way or another, so we all want to encourage more digital production. We all know that there are lots of reasons to use digital rather than conventional printing. Digital is more cost effective on shorter runs, and it allows for personalisation or versioning, and it gives us more flexibility. More importantly, printing on demand also allows us to change the supply chain, to supply books or brochures directly to the customer without the cost of storing large volumes of products in warehouses. This has transformed the book printing industry in the last 20 years and is now doing the same to packaging. But what if we could apply all of these advantages to other forms of manufacturing?

26. 3D Printing header

Let's talk about 3D printing.

There are several alternative names to 3D printing and they tell us the story of this technology. In the beginning it was called rapid prototyping - because it was only good for one-offs, just as in the beginning digital print was sold on variable data with very short run lengths. Some ten years ago many vendors attempted to push the technology into the consumer market and came up with the '3D printing' name as an easier way to appeal to the general public. There was a limited boom but when the bubble burst many of those vendors went bankrupt.

27. Stratasys Moulds

The latest name for 3D printing is additive manufacturing, because it is becoming a manufacturing technology. In some cases, this technology is used to create tooling for manufacturing lines, particularly casting moulds. But increasingly it is being used for manufacturing products, especially high value items that are produced in relatively small numbers, such as aircraft parts.

28. 3D shoes

Later this year Tokyo will be hosting the Olympics. Shoes are very personal items, and especially for high performance athletics. Many athletes want to optimise their shoes for the way they move, and the surfaces they are running on. 3D printing is an extremely efficient way of producing personalised sports shoes.

29. Massivit backlit

The frame on this backlit display has been 3D printed on a Massivit 1800. Using a 3D printer means that you can have any shape that you like, adding an extra creative twist. The frames are lightweight and easily installed. And of course the graphic is printed on a textile.

30 Metal Parts

3D printers work by building parts up in layers, and this allows for a much more efficient geometry, using techniques such as replacing solid structures with lattice structures, meaning that parts can be lighter or thinner without sacrificing strength. This also means that some sub-assemblies consisting of several parts with different shapes can now be made as a single part, saving both time and cost.

31. Material Solutions

This allows us to rethink how we manufacture things. Most factories have bespoke tooling to produce a particular item. This is the Materials Solutions factory in the UK, which will eventually be full of 3D printers and can manufacture almost anything - parts for washing machines one day, and aircraft the next. This also means we can manufacture parts anywhere - in multiple factories around the world, close to where the customers are, so that we can avoid the cost and

the environmental damage of shipping parts from one factory around the world.

32. Ricoh AMS 550

Inkjet is just one of several competing technologies in 3D. In printing, inkjet competes against offset litho, flexography, screen printing, toner. In 3D we also have FDM, Fused Deposition Modelling, for extruding plastic filaments, SLS, selective laser sintering, which uses the heat from lasers to fuse material particles together, and stereolithography, which uses UV light to cure resins, and which is similar to the way a UV ink works. But inkjet has one great advantage - it is relatively cheap to scale up. This Ricoh AMS 550 is an SLS printer that prints plastic polymer parts.

33. HP

There are several different methods of using inkjet in 3D printing. HP, for example, uses a binder jetting technique based around a fluid with a binding agent, basically an adhesive. The printer lays down a powdered material and the binder is jetted according to the shape required, gluing the powder together to form a layer of an object. The unused powder is brushed off and a fresh layer of powder is spread across the bed with the binder jetted to form the next layer of the object. The finished object usually has to be heat-treated to burn off the remaining binder and ensure that the material is fused together to form a solid object. HP is by far and away the most advanced of the graphics vendors having developed a number of 3D printers, all using HP's thermal inkjet printheads. The larger models have separate materials handling so as to optimise the printing time, and which are designed for manufacturing.

34 HP Metaljet

All of these produce plastic parts but HP is also developing a 3D printer capable of producing metal parts, shown here at last year's Formnext show. There's a lot of interest in printing metal parts but it's worth remembering that a lot of very interesting plastic materials have also been developed.

35. VoxelJet VX200

A variation on Binder jetting is High Speed Sintering, or HSS, as used by both Xaar 3D and Voxeljet and working with polymer-based materials. This picture shows a VX200 printer developed by Voxeljet and using Xaar printheads. As with binder jetting, this involves first laying out the material powder on the bed and then jetting a fluid to define the shape being built. But in this case, the fluid absorbs infrared heat so that when heat is applied to the powder bed it only melts the powder necessary to form the desired shape.

36. Carmel 1400

Another approach is materials jetting, which involves jetting a fluid that is highly loaded with elements of the build material, which can include ceramics or metals, so that there's no need for a separate powder. Needless to say this approach requires a printhead capable of recirculation. This is significantly more difficult because of the much greater potential for clogging the printhead, not to mention the supply system that takes the fluid from its tank through to the printhead's fluid chamber. A good example of this is the Carmel 1400 3D printer as developed by XJet, which is available in both metal and ceramic printing versions.

37. Ramon Pastor quotes

This quote is from Ramon Pastor, HP's vice president and general manager of 3D printing and underlines just how committed HP is to 3D printing but also sums up the value proposition behind 3D printing.

"A significant number of large format support parts are now 3D printed. Indigo also uses 3D printing extensively. Also part of the line tooling for our printheads is done with 3D printing. So we are looking at the whole portfolio and are moving design when we have the business opportunity for 3D printing."

38.

He went on to say

"Each part that we have moved to 3D printing is because it makes economic sense, because the break even point has changed because we have consolidated three or four parts to a single part. And because we have faster time to market."

This is exactly the same reason why so many offset and flexo printers adopted digital printing – because digital allowed them to do something in a different way that changed the breakeven point.

39. Everything is connected

The great strength of inkjet technology is that it works across many different applications, from textiles to commercial printing, to wide format and 3D manufacturing.

42.

Solutions in any one of these fields will end up benefiting all the others, whether that's recirculating printheads, or binders that can adhere to plastics or functional fluids. This in turn is leading to inkjet

becoming more widespread and helping to lower the cost, still the main barrier to inkjet technology.

I want to leave you with one last thought – that inkjet is moving beyond printing and becoming a manufacturing technology. Everyone talks about Industry 4.0, but the true revolution is to centralise the ordering process and decentralise the manufacturing, and that depends on being able to manufacture on-demand, whether we are talking about labels or car parts, something that inkjet is very well suited to.

43. Contact details

Thankyou for listening to me.