

Digital faces clean-up

Hot spot

While everyone agrees that de-inking digital print for recycling can be difficult, there is less consensus on exactly what environmental impact this has. *Barney Cox* investigates

Two of the hottest topics in the industry at the moment are the environment and digital printing. The issue of the de-inkability of digital print is the crossroads where the two meet. Improving print's environmental credentials is a crucial step towards ensuring its place in the media mix, but so is the adoption of digital technologies to improve its effectiveness.

Whether de-inking digital print is an issue that printers need to worry about depends on who you ask. Ingede, the international association of the de-inking industry, sees it as a big threat to its members' businesses and the quality of the recycled papers that they produce. However, manufacturers of the latest inkjet presses and HP's Indigo division – the machines whose output Ingede claims are potentially problematic – say that there are no problems today and that they are working to ensure there aren't any problems in the future.

"10% of current inkjet print would make a whole batch unrecyclable"
Axel Fischer, Ingede

HP, InfoPrint Solutions, Kodak and Océ formed the Digital Printing Deinking Alliance (DPDA) last year, whose stated aim is to get a better understanding of the issues involved and to work on their own products, and with partners across the supply chain, including paper mills, de-inkers and chemical suppliers, to develop workable systems.

Ingede press officer Axel Fischer welcomes the formation of the DPDA. "It's the first step of the inkjet manufacturers in recognising that de-inkability needs to be part of their products," he says. "The output has to be recyclable."

Fischer explains that the body wants to be pro-active in addressing the de-inkability of these digital processes to avoid a repeat of the problems its members had with the introduction of flexo two decades ago. "We see an issue coming up and we want to talk about it now. We wanted to pick the issue up with the inkjet makers before they get to market."

His association wants to ensure that any new printing technology can be de-inked without the need to modify current recycling systems.

"In Germany, any new product that disrupts an existing recycling process has to be labelled as such," says Fischer. "There is a clear ambition from German and EU legislation that new products should not be unrecyclable."

While Ingede is scanning the horizon, the inkjet suppliers are focused on the here and now. They say that regardless of the individual de-inkability of the output from their machines today, they make up such a small part of the total volume of paper goes to be recycled, that it's a non-issue.

"We're functioning in the existing system, but as inkjet gains share it may become more of an issue," says Kodak Graphics Communications Group business development director for media Don Burns. It's a cautious approach – the consensus is that digital print makes up less than 5% of the volume of paper entering de-inking, and inkjet is a tiny proportion of that at the moment, with the majority being dry toner, which even Ingede says its members can handle.

Difference of opinion

Where the two sides of the debate diverge is the point at which the quantity of inkjet, or ElectroInk, becomes a problem. Digital vendors say the threshold before there is a problem is 10%, whereas Ingede's Fischer says "10% of current inkjet print would make a whole batch unrecyclable". He claims that even 5% of the mix could create problems.

Kodak's Burns estimates that inkjet volumes would have to grow 100-fold before it becomes an issue, while HP senior scientist for inkjet R&D and environmental strategy Nils Miller says: "DPDA is an acknowledgement that our print is only a few percent of the total we need to research into de-inking."

De-inking is part of the paper recycling process, which is necessary to get a white stock suitable for re-use as a graphic or writing-grade paper. It is an established part of the process used by mills producing recycled paper grades and has been optimised for use with the dominant printing processes used today: litho and gravure.

The de-inking process exploits oil-based ink's hydrophobic (water-repelling) properties to separate it from the pulp. In a process known as flotation, air bubbles are blown through the pulp, attracting the ink particles. The bubbles then float to the surface of the pulp where they can be skimmed off.

The latest generation of inkjet printers intended for commercial print applications on paper from the likes of HP, InfoPrint Solutions, Kodak, Océ and Screen, use water-based inks, which is potentially a problem as the de-inking process was designed to work with the oil-based inks.

Dye-based inks could also be a problem as the dyes can't be physically removed. Ingede's Fischer likens the problem to a

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Nils Miller, HP

red sock turning a wash pink. He adds that the problem is exacerbated for European de-inkers who have invested in closed-loop water systems as part of their sustainability initiatives; firms in other regions can use a washing process.

The digital inkjet players say that bleaching is a possibility for dye inks and there are other techniques for pigment-based inkjet inks.

HP's Inkjet Web Press applies a binding agent at the time of printing, which has been shown to help produce ink particles of the right size for removal by flotation.

Ingede welcomed these results and Fischer says at least one other vendor has shared its plans for another approach that offers compatibility with existing de-inking processes.

Another form of inkjet printing, as deployed in this market by Agfa with its Dotrix machine, uses UV-cured inks. Unfortunately, whether digital or conventional, UV-cured inks and coatings are a problem when it comes to de-inking because they form large clumps that don't readily disperse.

As for other digital print processes, dry toner from the likes of Canon, Kodak, Konica Minolta, Xerox and Xeikon work well with existing de-inking technology. The relatively weak bonds they form to the paper fibres are a bonus when it comes to recycling.

Finally, there is liquid toner, of which the only commercial example is the ElectroInk used in HP's Indigo machines.

Ingede says that using its Method 11 laboratory scale experiment, the process forms big flakes of ink that can't be floated off, which show up as speckles in the finished product. This is the same problem caused by UV inks and coatings.

Testing times

Digital kit suppliers question whether Ingede's Method 11 is a valid predictor of real-world de-inkability as it relies on a small single-step laboratory experiment using one type of print, which they say doesn't reflect real-world conditions that typically use two-loop de-inking.

HP's Miller says: "There's a lot of complexity in de-inking. Part of the problem of characterising de-inking is because there is so much variation."

HP has commissioned pilot-scale testing – somewhere between the table-top test of Method 11 and full production de-inking – to investigate further. However, even with single-step tests it has found some unexpectedly positive results de-inking pigmented inkjet prints that show that de-inking chemistry and original paper characteristics can improve de-inkability, which he describes as: "An unexpected result that's a window to future research."

Both sides have valid points and the topic is as much of a grey area as Ingede says an excess of inkjet could cause recycled paper to go without a solution, but there are signs that there is a brighter future for de-inked digital print. ■

PRINT RECYCLABILITY OTHER FACTORS

While the de-inkability of digital print is receiving a lot of attention, it is far from being the only issue that printers need to be aware of regarding the recyclability of the products they produce. Other printing techniques can also create challenges when it comes to recovering high-quality fibres from waste, notably flexo print and any UV-cured printing or coating process. As with inkjet and liquid toner/ElectroInk, these processes' physical and mechanical properties don't lend themselves to readily de-inking through flotation processes. Adhesives can also cause problems and then there

are issues that are beyond the printer's control including mixing different materials together. That blue or green box in the corner of your kitchen may be convenient for you, but it is a headache for the recycler.

Last year international print federation Intergraf published *Recycling of printed products – What can the printing industry do to make it easier?*, a 44pp guide on how to improve the recyclability of printed products. Intergraf, along with paper trade body CEPI and de-inking trade body Ingede is a member of the European Recovered Paper

Council (ERPC). This body was formed to drive the industry towards meeting the goal of The European Declaration on Paper Recycling, which was adopted in September 2006 to drive European paper recycling to 66% by 2010.

The website www.paperrecovery.org includes a downloadable PDF of *Recycling of printed products – What can the printing industry do to make it easier?* Other resources include the ERPC de-inkability Scorecard – a tool based on Ingede Method 11 for assessing the de-inkability of a printed product.