

Digital inkjet printer aims for mid-range niche in market

One to One gets an exclusive look at Project 37, **Copytrax** and **Sun Chemical's** new digital inkjet printer, which offers competitive speeds for mid-sized runs. *Paddy Baker* reports

“WE WANTED TO PRODUCE A DIGITAL printer about five years ago, but suitable print heads weren't available then,” says Steve Woods, managing director of Cambridge, UK-based Copytrax. He describes his firm as a “niche engineering development company”, which began in 1992 designing and building high-speed floppy disk drives and autoloading equipment. This marked the beginning of the company's work serving the duplication market, which continues to this day. It has produced a number of disc printers, but this project marks the company's debut in the digital printing arena.

Work on the printer began in earnest three years ago, says Woods, and was dubbed Project 37 – a tag that has stayed with the machine through development and become its market name. Copytrax has licensed the printer exclusively to Sun Chemical (as the Coates Screen business is now called).

Robin McMillan, marketing manager, industrial inks at Sun Chemical, sees two distinct markets for Project 37: replicators and duplicators. He has distinct selling models for each market. For replicators, he sees this digital inkjet printer as complementing their existing offset or screen printers, rather than replacing them. “This product does not go head-to-head with screen and offset printing,” he says. However, although nothing can compete with the speed of an offset printer

THE CAPABILITY OF DIGITAL PRINTING NEEDS TO GET A STEP OR TWO PAST THE REPLICATORS, TO THE MARKETERS AND DESIGNERS

working flat-out, its comparatively long setup times make it relatively inefficient for shorter runs. Digital printing, by contrast, requires no pre-press time, almost zero setup time (just a few seconds to spool the print files) and no washdown time once the job has been complete. This means, he says, that when the total time for a job is calculated, digital printing of discs using Project 37 is faster than offset and screen printing for runs of up to around 1,250 discs, and faster than screen printing for up to 1,500. In fact, the overall speeds remain comparable up to around 2000 discs, beyond which the advantage of offset's higher run-on rate is felt.

So if replicators move their shorter-run print jobs from offset presses to Project 37, says McMillan, they can increase the productivity of their offset equipment, as this will increase the proportion of time it spends

printing discs, and reduce the time that it is being cleaned following one job or being setup for another.

For duplicators, the argument is more simple: duplicators mainly use inkjet and thermal printers – some may use screen printers – and will tend to outsource longer runs to ensure they can provide the rapid turnarounds that their customers require. They may have been considering buying screen or offset equipment to increase the speed of their in-house capability, but Project 37 will give them this increased speed much more cost-effectively. The result is that they can increase the quantities that they can produce in-house, and consequently outsource less.

Other advantages cited by Sun Chemical and Copytrax include ease of use by low-skilled operatives; no need for ancillary equipment such as screens, plates, squeegees and blankets; the use of few consumables, apart from ink and cleaning products; and a clean, safe environment, fully enclosed with few moving parts.

On the day I viewed the machine, final pricing had not yet been fixed, but McMillan believes that a duplication customer will achieve a payback for the machine in around 11 months, assuming 20 hours of use per week.

For replicators, payback is harder to calculate without knowing hourly labour costs, says McMillan – although he says that visitors to the Sun Chemical booth at the MEDIA-TECH Expo in Frankfurt can feed

this figure into his spreadsheet to calculate how quickly the machine would pay for itself in their facilities.

He gives an example of an environment that he believes would be well suited to the new printer: “We know of one large replicator that produces 250,000 discs per day in ‘small production’ runs – that's 70 order changes, and an average run of 3500. To do that many changes in a day, they probably have around five printing machines,” he says.

THE MACHINE ITSELF HAS A COMPACT FOOTPRINT

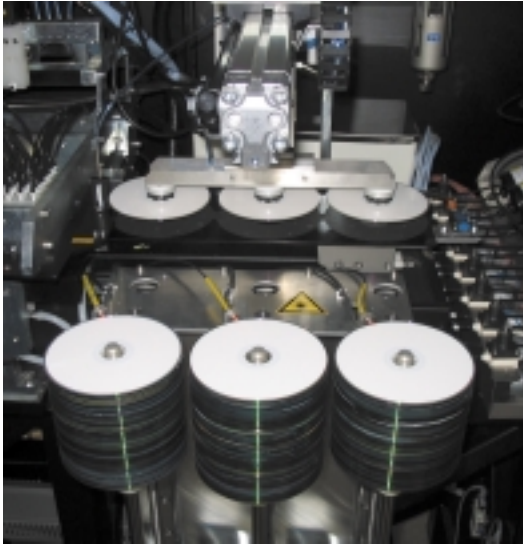
of 3.1m x 0.95m (excluding cooler unit), typically half the size of offset printers, says McMillan. The frame has been heat-treated to prevent distortion, and machined to be exactly level, prior to painting. This ensures that the discs are absolutely level under the print heads. This level of precision extends to the linear slide (with a 1 micron encoder) and linear motor, so that the movement of the discs is precisely controlled during the printing process and their positions known exactly. A water-filled cooling system ensures that the ink is kept at 44°C, so its viscosity does not vary over time.

Three discs are printed at a time, with different images if required – so one, two or three jobs can be run at



The Project 37 digital inkjet printer is aimed at both duplication and replication markets

equipment

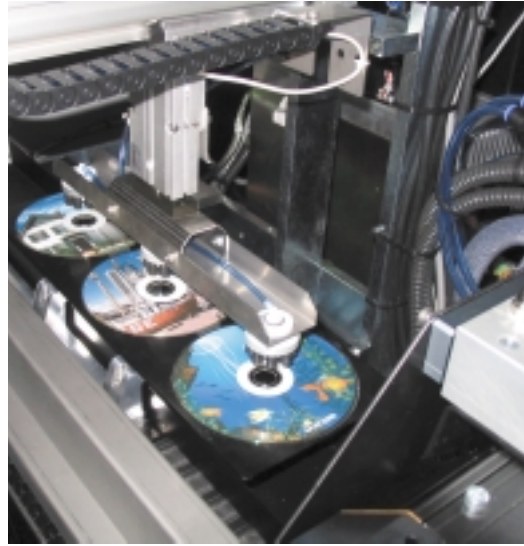


From blank discs to printed, cured discs in three seconds

once. A tiny air nozzle near the top of each of the three input spindles helps to separate the top disc from the rest of the pile, greatly reducing the likelihood of the vacuum lifters picking up more than one disc. Lasers aimed at the pick-up arms also check that only single discs have been lifted.

The discs travel a short distance (at 400mm/s under the print heads) and emerge a few seconds later, after having been cold UV cured. This minimises the potential for the heads to be deformed during the curing process.

The print and cure section is just over 600mm long – the rest of the space is taken up by disc handling before and after the print process. The overall cycle time is 10 seconds, with a 30% duty cycle (that is, printing during each cycle lasts three seconds). A print rate of just over three seconds per disc compares favourably



with around one to two minutes per disc for the kind of printers that duplicators tend to use currently – which could be anything from standard PC desktop printers to specialised disc printers from companies such as Copytrax, Rimage or others, says McMillan.

The printer contains 24 industrial piezo digital print heads (the OmniDot 318, supplied by Xaar, a local company to Copytrax) – six each for the four process colours (cyan, magenta, yellow and black). The inks are, as you might expect, supplied by Sun Chemical. If a base white coat is required, duplicators can use pre-coated white discs, while replicators require a separate screen printer – either offline or (as a future development) built into the Project 37.

Prints made by the machine are durable and lightfast, says McMillan, and the print quality can match that of screen and offset printers. However, he warns

THE OVERALL SPEEDS REMAIN COMPARABLE UP TO AROUND 2000 DISCS, BEYOND WHICH THE ADVANTAGE OF OFFSET'S HIGHER RUN-ON RATE IS FELT

that each process has its own characteristics and results – so the results are not identical.

The reason for his confidence in the print quality is that, because of its print heads, which use piezo crystal technology, Project 37 can produce eight different sizes of ink droplet when printing a digital image. (Confusingly in the case of this colour printer, this is known as greyscale technology.) Standard digital printing is frequency modulated, he explains, which means that all the dots it prints are the same size: the density with which the dots are packed determines the tone of the colour. Offset printing, by contrast, is amplitude modulated: varying the size of the dots is what provides the range of tones. (Looked at close up, offset print shows a rosette pattern – you can see this by looking at this magazine under a strong magnifying glass, or by standing close to a billboard advertisement on a railway station platform.)

Project 37 uses both amplitude and frequency modulation to print its image. Using an industry-standard technique, print head supplier Xaar calculates the effective image resolution to be 800 dpi. Project 37's smallest dot size is around 12 microns, significantly smaller than the smallest screen-printed dot (around 75-80 microns) or offset dot (25 microns).

equipment

On the IT side, the Project 37 contains a dual-core PC running Adobe Photoshop, with a built-in rip. This PC can be networked, and changing to a new job can be as simple as sending another document to an office printer – making the printer straightforward to use. An on-machine display is used mainly for engineering and maintenance purposes.

The machine also has a couple of useful features that keep downtime to a minimum. The first is that there is an extra set of three spindles at both input and output – and the machine can be switched to work with the other set in a matter of moments. Spindles simply lift off for changing – printing is paused when this happens, but resumes immediately the doors have been closed again.

The other time-saving feature is a monitor for the ink levels. The four ink tanks (each with 1-litre capacity) have a three level float system, which indicates whether each tank is full, getting low or is empty. Each tank is fed by cartridges, which are simple to connect and remove, and are available in 1, 3 and 5-litre capacities. When the 'getting low' level is reached (actually around the midway mark), a signal is sent to the operator, via the programmable logic controller, in plenty of time for a new cartridge to be located and fitted without production being halted. Another 3,000-4,000 discs can be printed once this point has been reached, says Jeff

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STEVE WOODS, COPYTRAX

Woods, technical director at Copytrax. If a tank does empty completely, the machine stops automatically.

The machine is relatively quiet – in fact, for duplicators without their own compressed-air circuit, the air compressor feeding the Project 37 is likely to be louder. There are two filters and two pumps for ink each colour. The machine also has two vacuum pumps – one for the disc table, the other for the pick-up arms. These are on the same vacuum circuit, but switched separately. There is also a small degree of vacuum in the



ink circuit, to stop ink from dripping out through the heads when no printing is taking place.

Air can also be forced through the heads for cleaning purposes. All ink that is purged in this way is filtered, and goes back into a tank where it is bled (the air is removed, a little like from a central heating system). This, according to Jeff Woods, removes the need for degassers, which can bring problems of their own.

The partners describe the machine as "print room compatible"; because it is clean and makes little noise, it is likely to be situated in a pre-press department, they say.

As well as the speed advantages already discussed, digital printing offers another significant capability that other techniques do not have – the ability to print variable data, rather than a fixed image from a screen or plate. McMillan cites a number of possible applications for this: software discs that contain multiple languages could be printed with labels that are specific to each of the countries where they are to be sold. Discs could be printed with a sequential number, for traceability or security reasons – or so that prizes could be offered to the holders of lucky numbers. He is less keen on the idea of long runs of individually personalised discs, because of potential problems sequencing the flow of discs with other personalised material through the plant.

However, he believes that there is significant potential for digital disc printing in the optical disc industry, and it needs to be developed by the market: "Someone at the customer's customer will come up with ideas. The capability of digital printing needs to get a step or two past the replicators, to the marketers and designers," he says.

The repeatability and speed of setup of the digital print process also make proofing of discs very straightforward. Unlike conventional print, there is no start-up waste, running a number of discs before a consistent output is produced. "All you do is run off three discs and send one to the client for approval. Once it has been approved, you just hit the button again," says Steve Woods.

Both partners are confident that this machine will find its place in the market. "Project 37 complements a replicator's business – and for that reason, every replicator should have at least one," says McMillan.

For Copytrax, Steve Woods comments: "For duplicators, take-up should be fast. There is pent-up demand for this kind of technology. In fact, we have already sold one to a UK duplicator."

In addition, he says Copytrax can offer a bespoke service, integrating Project 37 with other equipment such as robotic handling equipment. "We see one of our strengths as being able to offer this service," he comments.

McMillan points out that a number of customers have seen Project 37 over the last four months, and feedback has been good.

If you want to see Project 37 running live, you can visit the Sun Chemical booth at MEDIA-TECH Expo in Frankfurt. In addition, Robin McMillan will be giving a workshop at the show entitled 'Digital printing of optical discs – an added value innovation'. It will take place in Room Berlin at 12:15pm on Wednesday May 31, and will last 45 minutes.