Paper is a sensitive entity; it reacts to the climate and conditions around it, making the printer a constant weather-watcher. *Ingenia* asked Jan Lyons to visit Manor Printing Services and find out how this magazine's paper faces up to the natural and unnatural conditions it is put through on its journey to becoming the printed page.

PRECIOUS PAPER

Paper needs time to relax. When the paper needed for this edition of *Ingenia* was delivered, the packs were cut open and then left for 48 hours so that the large sheets of Arctic white paper could slowly acclimatise and settle. Having started life overseas in a forest in Sweden, been pulped there and then made into paper, it now needed to adjust to the temperature and humidity of temperate Gloucestershire before being ready for use.

MOODS OF PAPER

Too much humidity in the atmosphere encourages paper to absorb moisture which will make it stretch. On the other hand, if the air is too dry, moisture will be drawn out of the paper and it will shrink. Resting it before embarking on the rigours of printing will reduce the likelihood of movement in the fibres.

The naturally absorbent quality of paper is regularly demonstrated by standard laser printer paper where, at times, ink spreads into the fibres of the paper leaving the letters slightly blurred. To avoid this, most paper that is used for printing is 'coated', which encourages the ink to remain on the surface of the paper. Coating is clay which is added at the pulp stage of the paper-making process. China clay is also used as a filler to create bulk and texture. Some paper is coated, some double or even triple coated. *Ingenia* magazine uses a matt, coated paper and although there is an attractive, slight roughness to it, the coating makes the ink stand up well on the surface to give clear, clean lettering and crisp images. The paper is environmentally-friendly, coming from sustainable, managed forests and is whitened, not by bleach (chlorine) which can form carcinogenic dioxins and serious water pollution, but by using hydrogen peroxide or ozone bleaches.

REPELLENT INK

Newly printed publications have a characteristic smell that entices some people to open the pristine pages just to inhale. The odour comes from the ink and although many printers are moving away from the more pungent-smelling oil-based inks to vegetable-based colours (environmentally friendly waste), some 'nose' remains. Fine-tuning between the inks, water, alcohol and paper is fundamental to the production of an accurately printed page.

The principle that grease and water do not mix is the chemical basis of the offset lithography printing process which is generally utilised for printing in large quantities. Using laser technology, four separate metal printing plates are created from graphic designers' disks for each of the colours on the press; cyan (greenish-blue), magenta, yellow and black and sometimes an additional special Pantone colour. The plates are made so that the printing image is grease receptive i.e. ink receptive but water repellent, whereas the non-printing areas are water receptive but ink repellent.

Paper 'acclimatises' in the printer's environment before being used by slitting the outer wrapping holding the sheets. This avoids stretch or shrinkage of the paper when going through the press. One pallet of paper will produce 1,700 copies of Ingenia, on longer print runs the press can produce 11,000 sheets per hour © Paul Hoffman

BALANCING INK, WATER AND ALCOHOL

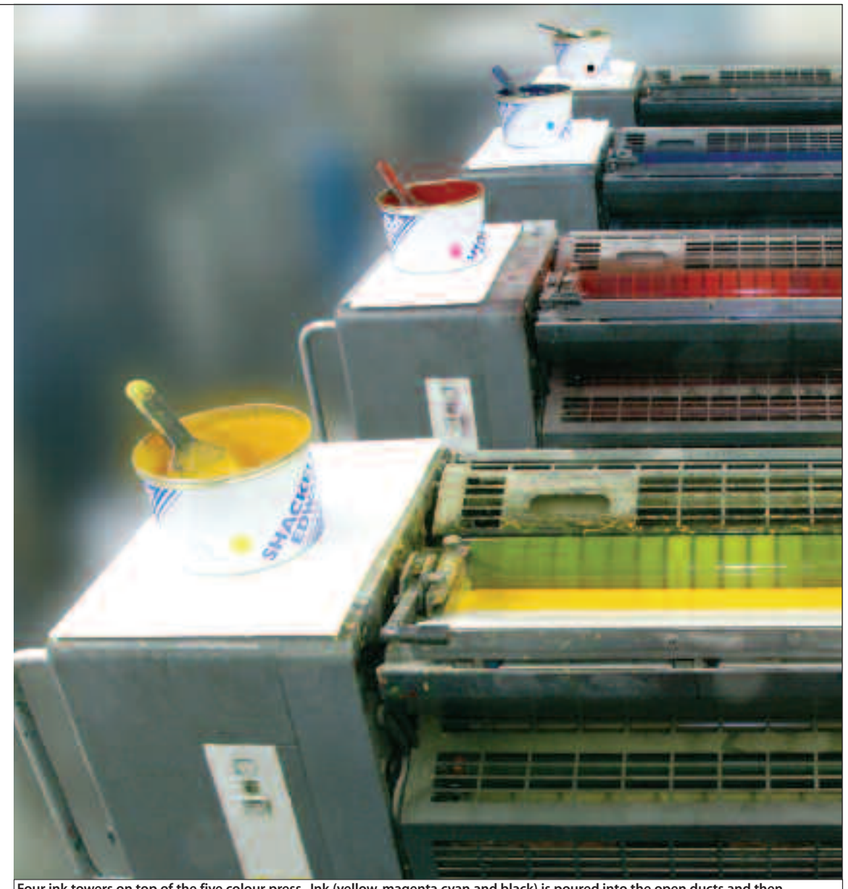
In quick succession the plates come into contact with rollers wetted by water and then rollers wetted by ink. The water needs to have a pH of 5.5 but since the water supply at Manor Printing can vary in one day from 4.5 to 6.5 depending on whether the source is from the Midlands, Wales or the South West, the variations have been overcome by installing a machine called a Technotrans which uses reverse osmosis to maintain the acid/alkali balance.

Alcohol (isopropanol or IPA) is added to the water on the wetting roller to reduce the water's surface tension so that less water will spread further and therefore accelerate the drying process. In addition, the alcohol itself also speeds up drying. *Ingenia*'s printers, however, in line with their policy of working with a regard to the environment in all aspects of their work, have already reduced the alcohol content from 15% of the water/alcohol mix to 5% and are working towards eliminating it completely. This waste water is now clean enough to drain into the general waste.

To counteract the loss of alcohol in the drying, the printer's ink manufacturers have changed the formula of their tailor-made inks by adding more cobalt dryers to accelerate the process. Ink manufacturers also vary bespoke inks according to the pH and salts found in their customers' local water supply.

QUALITY CONTROL

The paper passes through each colour roller in sequence, taking or repelling ink on both sides of the paper at one blow, until finally, passing through a roller which coats the whole page with an aqueous sealer. Sealer will protect the print, particularly where a white page faces a strongly coloured one and when



Four ink towers on top of the five colour press. Ink (yellow, magenta,cyan and black) is poured into the open ducts and then distributed evenly through 24 rollers within the towers arriving on each plate as a very fine film © Paul Hoffman

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Clients come for a 'Press Pass'. They have already seen electronic and digital proofs and now come to see what the job looks like on the chosen paper. The clients are checking the first sheet for quality assurance and checking registration with a linen-tester eye glass © Paul Hoffman

"The accomplished printer works to produce consistently good quality results by keeping a vigilant watch over the precarious equilibrium which surrounds paper."

it is exposed to pressure in subsequent mechanical procedures. The paper completes the cycle, emerging at great speed and in vibrant full colour. A final blast of hot air finishes the drying and the sheet drops onto its neat pile of printing. Careful preparation in the setting up of the press before each new job, such as balancing rollers and adjusting ink flow, as well as removing and checking every 50th sheet throughout the run, is the quality control which ensures colour alignment and constant colour tone from one edge of the paper to the other.

THE FINISHED ARTICLE

Eight pages of *Ingenia*, four on the front and four on the back, are reproduced on each of the large B2 sheets of paper. Pages 1 to 8 are then folded and gathered together by machine, then 9 to 16 and so on. The cover, which is a heavier weight of paper – 200 grams – is printed separately and given an effective spot varnish to enhance the colour of the photograph on the front. This is now wrapped around the inside pages, 'perfect bound' with a flexible adhesive along the spine to hold it together and then guillotined on three sides.

Regular quality control at this stage ensures that pages are cut cleanly and that none have slipped and missed the guillotine, which would result in folded but uncut pages.

Each batch of printing has its own particular demands. Customers specify their choice of paper from an ever-increasing range, each of which has its own inherent characteristics and which may or may not behave as expected on the day. The accomplished printer works to produce consistently good quality results by keeping a vigilant watch over the precarious equilibrium which surrounds paper.

BIOGRAPHY – Jan Lyons
Jan Lyons specialises in writing for businesses; for their customers, employees and their industry. The subjects she has covered recently include semi-conductors, zoos and languages. Contact: jan@inbusinessmarketing.com