



Technofile: inkjet consumables

You can buy an inkjet printer for under £100 but with pricey inks and special papers, getting good results at low cost isn't so easy. Rosemary Haworth explains how to get great-looking, long-lasting prints without spending a fortune

Affordable inkjet printers are nothing new, but the demands we make on them have changed. Consumer interest in digital photography and printing our digital snaps has presented new challenges for printer manufacturers and driven the market into a frenzy as companies jump on the bandwagon trying to serve – and profit from – the craze for inexpensive digital prints.

If you're already a digital photography fan, you've probably experimented with printing out images. After all, you didn't take those incredible pictures of yourself standing triumphantly atop Snowdon or strolling along the Great Wall of China just to have them languish on your PC.

But the expense of frequent ink cartridge changes, as well as the need to buy pricey special inkjet or photo paper to get anything like acceptable prints, results in high-running costs. Even then performance can be patchy, particularly if photo printing was an afterthought when your inkjet was designed.

Thankfully, dedicated photo printers that produce far more realistic output are now widely available and moves are afoot

to make it easier to work out just how much it will cost you to keep that greedy ink-guzzler going and to ensure you can shop around for cheaper consumables if you choose.

Back in our February 03 issue we took an in-depth look at the burgeoning market for dedicated photo printers. Here, *PC Advisor* looks at the bigger picture and finds out how to select the ideal combination of printer, paper and ink and how long you can realistically expect the resulting images to look as fresh as the day they were snapped.

We'll also give you a few hints on cutting costs without sacrificing quality and look closer at the explosion in online and in-store digital photo printing services.

Dedication's what you need

Obviously, there's little hope of you being able to print photo-quality images unless you have a suitable printer. It's possible to spend many hundreds of pounds on an ultra-high resolution model, but there's little sense in doing so unless you're a professional photographer or intend to start a second career in printing.

Now that photo-realistic output has taken precedence over crisp text, keen amateurs can choose from a variety of impressive models available for between £100 and £200.

Photo printers tend to use six inks, rather than the traditional four (cyan, yellow, magenta and black). With two extra inks, the printer can cover the complete colour spectrum more effectively. The use of special colours such as photo black is common, as are light and dark magenta and cyan which enable photo printers to reproduce more natural-looking skin tones.

Today's photo and general-purpose inkjets can also cope with higher resolution images than their predecessors. A glance at *PC Advisor's* Personal inkjet printers chart in our February 01 issue lists Epson's £101 Stylus Color 600 as the Best Buy and cites its top setting of 1,440x720dpi (dots per inch) as one of its main plus points. For the same price today, you can get the company's Stylus C82 printer which has an optimised upper resolution of 5,760x1,440dpi. Again, our desire to print photo-realistic images is partly behind this improvement.

Reaching a resolution

Whereas lower resolutions are fine for computer-generated graphics with solid blocks of colour, a photo contains far more variations in tone and colour, each of which may be only a few pixels wide.

Even a very low-resolution 72dpi image invariably looks good onscreen because of the monitor's display limitations. Printing that same image is another matter altogether. If you're serious about your digital photos you need to ensure the originals are sufficiently detailed.

Today's average £250-£400 digital camera is capable of capturing 2.4Mp to 4Mp (megapixels). Resolution ratings for printers and digital cameras are not precisely equivalent to one another. Print resolutions are measured in dots per inch – an expression of how many individual dots of ink can be laid down within a linear inch. Cameras, meanwhile, are described by the total number of pixels that make up the complete image (such as 1,600x1,200).

A million pixels sounds like a lot of detail until you realise how this translates in printing terms. It's generally recommended that you don't attempt to print photos at less than 1,200x1,200dpi, which equates to 1.44Mp. If you want to print a 7x5in photo-sized image of a 1.44Mp digital image, the result will be far from fantastic since the amount of information contained in the image will result in a print resolution of 300dpi or less.

The best solution for a good trade-off between detail and the size of the print is

to capture images at the highest camera setting and then adjust the print resolution in a photo-editing package.

It's possible to get your image editor to fill in and use the existing image information to create additional pixels and, to a certain extent, your printer will use its built-in software to emulate and boost the picture further. But unless there's a good level of detail in the original image, you can't expect amazing, smooth-looking photos to emerge from your inkjet.

Coats of many colours

The weight, finish, colour and thickness of the paper you print on all make a difference to your images' appearance. Inkjet photo papers are generally resin-coated but can also be nanoporous or cast-coated. Resin-coated paper has a transparent top layer of polymer that receives and absorbs the ink. It is tear-resistant and developers claim images last well due to its good light stability. Slower speeds are more suitable for printing on this type of paper since it takes a little longer to absorb ink than non-coated papers.

Nanoporous paper dries quickly and is ideal at fast speeds. Prints feel like 'proper' photos – even down to the sticky texture – but can be more susceptible to fading unless stored in a frame.

In cast-coated papers, blacks should look better as the ink's larger pigment particles can be absorbed more effectively. However, such papers are liable to kinks, particularly in areas of



Generally speaking, the type of ink and paper you use will make the difference between your prints fading after a decade or two or after a year or two. However in some cases, the choice of consumables can affect whether your digital images print well at all.

Printer manufacturers have been working hard to ensure photo prints last. Canon claims that prints from its i830 unit output on its Photo Paper Pro media can last up to 25 years, if stored properly, without noticeable fading. HP, meanwhile, has made photo print longevity an integral part of its latest ad campaign. As we've seen, the finish on the paper is a key factor, with resin-coated media being particularly durable, but nanoporous papers can also last well as long as the prints are well cared for.

If you're concerned about the fade factor, look for longevity ratings, verified by an independent research lab, printed on the paper's packaging. Alternatively, studies conducted by *PC World* magazine, our US sister title, in conjunction with Wilhelm Imaging Research compare the longevity of various combinations of paper, printer and ink and are reproduced on our website at www.pcadvisor.co.uk/printplus. And when you've found a long-lasting combination, make sure you store your photo prints properly. As with a traditional photo album, digital prints should be stored in dry, temperate conditions away from strong light. Finally, framing your prints will not only show them off, the glass will help protect them too.

It's not natural



↑ Skintones are especially difficult to get right. Neither the overly dark Mouse 2 House ink nor the Cartex ink handled this task well but the paper weight and finish also affected results for both OEM and third-party inks

Photo printing for the camera shy

If you're yet to be convinced that a home photo printer can be a match for laboratory processing, put your holiday snaps on CD or a SmartMedia card and head to the high street.

Many camera shops and chemists offer DIY photo booth printing – select the images you want to print, pick a size, perform any basic image editing that's needed and you could have your digital photos in your hand within a couple of hours.

If you've had your prints developed in the more traditional way, see if you can get a disc of your snaps too so you can also load them on your PC. The internet houses many photo-sharing and printing services so, rather than clogging up your friends' email inboxes, you can send them a link to your online photo album. They can view the images or choose any for download and print them out at their leisure at the size and resolution they prefer.

Online photo storage services are usually free or charge a nominal fee, making their money from their print services. As with your high street shop, the digital prints you order online can also appear on mugs, T-shirts and calendars. Unlike going into a high street booth, though, you have to wait several days for photos to arrive by post.

The web-based services we tried didn't recognise as many file formats as the instore option we sampled at Jessops, however, where image types, varied resolutions and a range of storage media were supported.

With both photo booth and online digital printing, the cost compared to outputting your own images on an inkjet depends largely on your requirements. As a general rule, though, either method is fairly comparable to the per-print price of traditional film developing.

black ink saturation, as ink is absorbed by the paper itself rather than by a receiving top layer. Poor light stability means prints are less durable than other types and they need to be stored carefully to prolong their life and protect them from scratches.

It's not always obvious whether the paper you choose is coated or uncoated, but if the packaging details include PE (polyethylene) and/or RC (resin-coated) it means it's resin coated. Some manufacturers claim images printed on resin-coated papers are cleaner and sharper than on cast-coated media in which colours may bleed into each other.

Some inkjet papers are brighter and whiter than others, providing high contrast

and this will affect the vibrancy of prints. Paper brightness is rated on a scale of 100. The standard paper you use to print everyday documents and for photocopying will have a brightness rating in the 80s, while general-purpose inkjet papers sit somewhere in the 90s. Photo papers are the brightest, rated from 94 and up.

Optical brightening chemicals and the amount of blue light reflected off its surface affect how white the paper appears but a very bright white is not always the most satisfactory. Depending on the effect you're after, cooler, warmer whites and ivories can often look better. As our tests show, the final result will also vary depending on the printer used.

The thickness, or caliper, of the paper will partly depend on whether it's a specialist photo paper or a high-quality inkjet paper. Photo papers tend to be between 7mm and 10mm thick, while inkjet papers can be as thin as 4mm or 5mm or as thick as photo paper. It's ultimately down to personal choice what caliper you choose but some printers cope poorly with thicker paper.

Cheap or chipped?

Inkjet printers themselves are generally sold as loss leaders, with manufacturers making their profits through the sale of their own-brand ink and paper consumables. Not surprisingly, there's a sizeable market in supplying cheaper, unbranded replacement ink cartridges.

Some of these are simply the same cartridges refilled with inks and resold as 'remanufactured' products while others are so-called 'compatible' cartridges. It's also possible to buy ink refill kits which provide the equipment for you to refill your empty cartridges yourself. We also found we could extend the page yield of a cartridge by quite a margin using a handy product called Inksaver (a 15-day trial version is included on this month's cover disc).

Of course, having spent large amounts designing and producing a printer and the consumable products to support it, the printer companies are keen to protect their investment and some try to deter people from using anything other than their own brand of recommended inks and papers.

Cataract contrast



↑ In tests both the printer manufacturers' and the third-party inks produced variable results. The inks supplied by 7 Day shop (left) seemed to sink into the matt test paper but Inkjets-R-Us' offering reproduced the original image faithfully

This is anti-competitive practice according to the recyclers who refill and resell spent cartridges. The Office of Fair Trading says printer manufacturers must make it clearer that, while they might not actively encourage consumers to buy third-party replacement cartridges that are compatible with their printers, they won't be invalidating their warranty by doing so. There's some debate over whether non-branded inks and papers come up to scratch so we tried it out for ourselves.

In order to assess just how much difference using specialist papers – or even different brands of paper from those the printer manufacturer recommends – makes to the prints produced, we tested how well a variety of inkjet papers coped with a range of test images and resolution settings. We did the same for third-party inks, comparing them with the printer manufacturers' own branded inks.

You'll find a summary of the results in the tables right and below. We've also reproduced some of the prints in PDF format on the cover disc so you can compare the results firsthand.

The trials were performed on two test printers: Canon's Bubble Jet i830 (our current Best Buy personal inkjet) and Epson's Stylus Photo 830. You might think that as long as the paper was of good

Inkjet paper test results

Test paper	Weight	Type	Cost (inc VAT)	Pack size (sheets)
Epson photo paper	194g	glossy	£11.99	20
Kodak picture paper	190g	glossy	£4.99	25
MX2 professional photo paper	150g	glossy	£8.99	50
Epson premium glossy photo paper	255g	glossy	12.99	20
Canon photo paper plus	270g	glossy	£11.99	20
HP premium plus photo paper	240g	glossy	£12.99	20
Jessops photo inkjet paper	260g	glossy	£7.99	20
Kodak Ultima extra heavyweight	270g	ultra glossy	£12.99	15
MX2 heavyweight professional photo paper	270g	glossy	£12.99	40
Jessops photo inkjet paper	190g	matt	£6.99	50
Kodak picture paper	190g	matt	£7.99	25
MX2 professional photo paper	180g	matt	£9.50	150

stock, the only real difference between papers of the same weight would be price, but this isn't so. For a start, we got markedly different results using the same paper on the two printers. This is because the Epson is a six-colour Piezo printer while the Canon is a four-colour thermal (aka Bubble Jet) model.

Piezo printing is so-called because each nozzle in the printhead is housed in a Piezo crystal. When the printhead is electrically charged, the crystal contracts and a droplet of ink is squeezed out of the nozzle. In thermal printers, resistors in the nozzles are heated via an electrical current, resulting in a vapour bubble which

Compatible cartridge test results

Company	Inkjets-R-Us	7DayShop	Cartex	Mouse2House
Website	www.inkjets-r-us.co.uk	www.7dayshop.co.uk	www.cartex.co.uk	www.mouse2.co.uk
Telephone	0845 644 1655	01481 257 336	0870 243 5610	01992 618 938
Range name	NC-0003e (Print-Rite)	CC3eP (Enhanced Quality)	NE-0T026	Jettec compatibles
Price	black=£5.95 cyan=£5.45 yellow=£4.95 magenta=£5.45	black=£3.45 cyan=£3.45 yellow=£3.45 magenta=£3.45	black=£4.99 colour=£6.99	black=£7.99 colour=£8.95
Tested using	Canon Bubble Jet i830 (4-colour thermal inkjet printer)	Canon Bubble Jet i830 (4-colour thermal inkjet printer)	Epson Stylus Photo 830U (6-colour piezo inkjet printer)	Epson Stylus Photo 830U (6-colour piezo inkjet printer)
Jessops photo inkjet print tests	Good colour balance on second test run. Fine detail on sepia; mono print bled noticeably	Contrast sharp at low res; all prints lacked definition and blacks came out sludgy brown	Only low-res tests were near to useable; defects ran from banding to too much ink absorption	Green is dominant as blacks fade away; overall subdued images were fuzzy and indistinct
MX2 heavyweight pro photo paper tests	Good colour balance and skintones looked right; no bleed or bronzing; mono print looked greenish	Good sepia print but orange hue on full colour; nice black detail, but black not dark enough	Good detail and colour balance despite black fading; patchy; black non-existent in places	Good blacks and detail levels; green dominates with other colours washed out
Kodak picture paper	Slight coalescence on fine detail but good colour balance; paper absorbed too much black	Good skintones; black almost non-existent; severe banding at high settings	Bronzed effect across all images despite absence of black where needed	More absorbent matt paper equates to darker greens and blacks
Canon photo paper plus	Generally good but slight green tinge, especially on mono print; detail indistinct on low-res images	Ink sat well on paper; detail fine and sharp lack of black caused orange/red hue	Good colour balance; dislikes fine detail on low print settings; bronzing/banding effect on black	Detail clean; blacks heavy amid tinges of green; washed-out lighter colours; faint banding

Cost per page	Canon Bubble Jet i830 print test	Epson Stylus Photo 830U print test
60p	Higher resolution images reproduced well; best overall result for the mono printing; colours slightly too vibrant	Good colour balance even on mono/sepia prints; smudging/banding on large areas of black and slight fuzziness to fine detail
20p	Good skintones and mid-palette results; black feels rather heavy; images appear very flat	Good colour reproduction; images appear fuzzy at all resolutions
18p	Coverage of large areas of black is poor; some banding and speckling	Slight oversaturation, particularly on skintones; generally handles fine detail well though
65	Good reproduction of detail despite heavy-handed colour palette	Low-resolution images came out surprisingly well; tends to be oversaturated but palette is consistent; good photo realism
60p	Smoothest photo-realistic finish overall; all prints suffused with colour; lighter shades tend to bleach out	Darker colours handled better than most papers; detail looks very good although skintones aren't the best
65p	Best portrait print and colour balance; results inconsistent, first test run images severely banded	Even after re-testing, results very poor; images heavily speckled and banded; blacks appeared oily and bronzed
39p	Copes well with fine detail; colours a little too bright	Fine detail comes out well except at darker end of spectrum; tendency to overcolour so skintones appear a little orange
87p	Brilliant at high resolutions; heavy banding and patchy colouring below 600x600dpi; paper sticky to touch	Great reproduction at high resolutions but print quality inconsistent; poor detail and colour handling on lower-quality images
33p	Dark colours too dark and light colours too light, partly due to the bright white paper stock and weight	Detail fuzzy at all resolutions and some banding present
14p	Good colour balance and saturation levels; low-resolution printing not recommended	As with other matt papers, colours are too pronounced
32p	Colours look great across the spectrum, neither over nor under saturated	Paper has nice feel but blacks are particularly poorly handled
7p	Low cost makes it good as test paper; paper feels noticeably cheaper; extremely white, making colours look unnatural	Oversaturation means detail becomes fuzzy; not the best paper for this type of printer

forces the ink through and on to the paper. Epson's printer uses variable-sized ink droplets whereas Canon's uses extremely fine nozzles that eject just two picolitres of ink at a time, compared to the more usual four or six.

You might think four-colour printing is the cheaper option but cost depends on how many of the ink cartridges you have to buy and how often they need replacing. If your six-colour photo printer has only two separate ink cartridges (one for the five colours and one for the black), it could be extremely costly to run as you'll have to replace all the colour inks at once, even though only one or two have run out.

On the face of it, it therefore looks more expensive to run a six-colour printer that has separate inks, but if you only need to replace inks singly, it can be quite cost-effective. Compatible ink cartridges tend to be filled fuller than their OEM products, but often the capacity isn't listed on the packaging so direct comparisons are difficult.

Even more worrying is the fact that it isn't always possible to use cheaper inks. We had no problem swapping our Canon inks for an unbranded equivalent set but, try as we might, the Epson printer wouldn't allow us to output a single thing with a non-Epson black ink cartridge.

The software knew the difference because of a smart chip on the cartridge that supposedly acts simply as a low-ink alert mechanism but effectively barred us from testing the quality of the Jet Tec compatible product which arrived without the necessary chip.

What the papers say

Our first test attempted to determine if using a particular brand of paper makes a difference. Often, the non-branded papers produced results that were every bit as good as the well-known brands.

Neither the Epson nor the Canon printer seemed to like Kodak's 190g Picture Paper – the Canon print was very heavy-handed with the black and showed poor graduation across the darker shades. There was also evidence of banding and speckling (or coalescence).

Despite its tendency to over-ink, the Epson print came out marginally better, with speckling being the most noticeable fault. With the third-party inks we tried, the Kodak paper's high absorbency meant blacks all but disappeared into the pulp – great if you're after a soft, sepia-tone effect but not ideal otherwise. On the same weight paper, the Canon printer produced some very passable results when printing on matt rather than gloss.

Heavier weight papers weren't necessarily the answer, we found. We were forced to reprint the test images using both HP's Premium Plus Photo Paper and Kodak's 270g Ultima paper as both came out so poorly, displaying a range of image defects.

When we specified the very highest print and paper settings on the Canon printer (rather than the standard photo setting we'd stuck to throughout the tests in the interests of fairness) using Kodak's paper, there was a marked improvement. However, neither printer liked its ultra glossy finish and we found that, in general, the 270g paper produced no better prints than standard stock.

Oddly, though we had issues with the colour balance when using the non-branded inks (poor black coverage and green or orange casts were the most common problems), the inks tended to interact with the photo papers at least as well as the OEM inks. Take a look at the *Compatible cartridge test results* chart on page 74 to see what we thought of their performance. ■



Compare the longevity of various combinations of paper, printer and ink at www.pcadvisor.co.uk/printplus