Inkjets vs. lasers.
Can any one printing technology meet your needs?

Its tough to be decisive in a subjective world. There are a variety of solutions offered for every problem. Every decision we make is weighed on the scale of *overall advantage* (more palatable term than compromise). Decision-making is a process of weighing benefits and drawbacks, a game of give and take that must be viewed from the balcony seats to see the "big picture." It's like going bald… while you have less hair to comb you actually have more face to wash! Carefully weighing our needs and then selecting a single workable solution amidst the claims and the hype on the market is the exercise we call life.

Compromise affects every area of our lives; from the automobiles we drive to the office printers we buy. And since this publication is Photo Electronic Imaging and not "Deals on Wheels," we'll limit our discussion to printers.

The incredible variety of printing technologies now on the market provides solutions for just about every budget and appetite, from restricted to unrestrained. In order to determine the best output device that is right for you, you'll have to deal with the issue quite holistically. There are many things to consider. For sake of argument, we'll assume that your budget limits you to a single printer; a single device that will have to address *all* your printing needs, from administrative to initial comps and proofs. As far as technologies go, we'll limit our choices to color laser and inkjet printers.

Apples Versus Oranges

When you stick a color laser printer in the ring with an ink jet printer, the level of the need will always determine the winner. If fast throughput, hundreds of copies, and laser-sharp imaging are more critical to your needs than precise color reproduction, then a color laser printer is the obvious choice. If on the other hand you absolutely *must* have very accurate color fidelity, you only print one-to-five copies per file, and you don't mind waiting for line-by-line imaging, then a desktop inkjet printer is what you need. Necessity provides the leverage.

Lets face it, if we really had our wish we'd have a photographic-quality printer that could *duplex* (trade buzzword meaning two-sided printing) 15 tabloid sheets per minute for pennies a copy.

For small design/production firms, printing needs include the production of "first-approval comps" (comprehensive proofs) as well as administrative duties. Ideally, these comps should be printed on two sides of a single sheet of actual printing stock, and should include photo-quality pictures and real typesetting.

Currently, inkjet printers (with hardware or software Postscript RIPs) can handle text, graphics and pictures with superior quality, but they're slow, expensive to run, and pretty-much print only on one side of a piece of paper.

When this same comp is printed on a laser printer with duplexing capability, it can be printed on two sides of a single tabloid-size sheet, folded, and trimmed quite quickly. Though if the project involves photographic images, the laser will usually deliver less-than-accurate results.

Let's stir the broth a little more for this scenario. Let's say that you work in a small design firm that produces the normal array of daily office printing needs, several working proofs (internal proofs for layout, type and image evaluation) and first-approval customer proofs, but you *also* must produce advertising mailers and other short-run production pieces.

While the color laser can produce all the office printing needs and the basic comp and the inkjet can handle first-approval images (even if they have to be spray-glued onto the laser's comp), there is still the problem of short-run (200-1000 copy) production mailers. Typically, these are sent to a service bureau for output on one of the large, fast (and expensive) production laser printers. So much for the budget!

What to do?

Well, now there might be a reasonable alternative available. Thanks to some very sophisticated laser printer technology by Minolta/QMS and some special papers developed by Hammermill, the limited-budget studios may be in for a break.

The Minolta/QMS Magicolor 6100

When Minolta/QMS offered to send one of their Magicolor 6100 laser printers for a product review my initial response was thanks, but no thanks. I explained to the voice on the phone that my interests and expertise revolves around the production of high-quality images and that I personally did not consider color lasers as "high-quality" color. I was assured that the 6100 was quite capable of producing accurate color.

After receiving the printer and spending (collectively) almost 15 hours trying to generate accurate color images using the stock profiles supplied with the printer, I was ready to throw in the towel. I called Minolta/QMS back and told them that while I really liked the 6100 as an office printer, I would not be able to give them a positive review on image reproduction. I suggested that they send me the return-shipping paperwork rather than have me publish a negative review.

Over the next few days, while awaiting the pickup of the printer, I went into experimental mode again with the printer (I hate to concede to any opponent, printer or otherwise). Since I had been disappointed with the stock profiles included with the printer, I decided to produce a custom ICC profile using Gretag/Macbeth Spectrolino hardware and updated ProfileMaker 3.1.5 software. I purchased a couple of reams of the stock recommended from QMS/Minolta's web site (Hammermill 28lb, 96 brightness paper), and a less-expensive, but still quite suitable HP laser/inkjet paper (22lb, 92 brightness) and went to work again. I built a custom CMYK profile for each one of the paper stocks.

Using these new profiles, I began to research again. I initially used Photoshop 6 to optimize some images, converting the files from RGB working space (I use Adobe RGB 1998) into the newly profiled CMYK output color spaces for the two different paper stocks. That's when the magic started happening. The results I experienced from the new custom profiles were nothing short of amazing.

Color management isn't just for the color scientists and "techno-dweebs" of the world, it's for all of us who want to achieve accurate color from our various input and output devices. A custom color profile is like clothing that has been tailored specifically to fit your body. Whether you have an ideal build (whatever that is) or you're horizontally/vertically challenged, a custom tailored garment will always make you look your best.

Color Management for Dummies

Here's a sixpack of keys to understanding accurate color printing, and if these basic points are understood, the feared color monster will be largely tamed and ready for your use.

First, understand that all printing devices print CMYK. Some inkjets print using six colors, but four of them are CMYK! There is no such thing as printing using red, green, and blue inks… there's no such animal. Inkjet printers do a better job when they are fed RGB files because their printer drivers convert RGB files to CMYK (using their own internal profiles). Actually, if you send a CMYK file to an inkjet, the results will be tragic. Laser printers, on the other hand, print best when they are fed CMYK files. Conversely, printing an RGB file to a laser produces muddy, lackluster images.

Second, the conversion of any image from RGB to CMYK is a critical one. This process is called color separation, which refers to the way color images are broken down (separated) into four channels of color (cyan, magenta, yellow and black [black is labeled "K" instead of "B" to keep it from being confused with blue]). This conversion from RGB to CMYK produces component color channels, each one (ideally) matched-up to one of the four ink colors. As these four component channels are successively printed, one color on top of another, a reconstructed "composite" image appears on the printed sheet.

Third, the incredibly important fact that the CMYK colors used by different technologies is in fact quite different. The cyan toner powder used in one brand of laser printers may well not be the same color as that of another brand, and laser toner cyan is significantly different than inkjet cyan. The same rule is true for all the other three colors in each system. The physical materials that end up as inks, toners, transfers, emulsions, etc. originate from different sources. Suffice to say, the same file printed on two different devices will, by all laws of physics, look significantly different.

Fourth, if reasonably similar results are desired from two different devices, a color comparison system must be employed to accurately map how colors print on each machine so that a reasonable simulation of one device can be achieved by altering the native capabilities of the other device. The good news is that such a system has been developed, and it's called *profiling*. Profiling is how we determine how colors are represented on a specific device. The extremes of each printer's color printing capabilities are referred to as the device's *gamut*. Profiling an image is no more than mapping-out the color capabilities of a device.

Fifth, realize that each technology, "ink," and paper combination form their own unique color identification. We discover the identity of each combination by measuring their collective characteristics. The process goes like this. We send a carefully measured set of color patches (usually in the form of a CMYK file) to a particular device using a particular paper. When the printing device delivers its output, a very sophisticated measurement tool called a spectrophotometer now measures those same color patches for *hue* (what color it is), *saturation* (how rich or dull the color is), and *lightness* (how light or dark the color is). These measurements are then compared to the known original patch values. The difference between the two measurements becomes the basis on which a profile is generated. A *profile* is for the most part just a scientific word for a formula that transposes, as closely as

possible, a printer's native capabilities (color space) into a known and accepted industry norm for color print.

Sixth, and finally, a word about how to use color profiles. While there are several ways to use profiles in the printing process, the most obvious method is to convert an RGB file to CMYK in Adobe Photoshop using the "Profile to Profile" (Photoshop 5.5), or the "Convert to Profile" (Photoshop 6) feature in the Image/Mode menu. When this menu item is selected, the entire contents of your ColorSync folder will be listed for you. Carefully select the profile that has been constructed for your printer technology and the paper you will be using. The process will be completed by Photoshop, and you'll be good to go.

Having completed the initial profiling of the unit and the two stocks I had purchased, I saw small issues that were not really perfect (you may not be this fanatical about this). The blue chalk stick on the extreme left still contained too much magenta, rendering that color more *royal* than the *navy* blue that I knew was the true color. The background color also contained too much blue to reproduce the neutral gray measured in the test image file. There was also an overall lack of image saturation that left the print a little flat.

All of these issues were handled by Gretag/Macbeth's Profile Editor 3.5.1. This editor provides software adjustment and measurement tools so profiles can be tweaked to whatever level of perfection you require. The final adjustment profile results are seen (left/right/above/below). Here you can see the same composite image processed for inkjet, laser (without a profile) and the Magicolor 6100 using one of our final profiles.

Even after building an accurate profile for the stock I was using, there was still some detail work to do ensure reliable results from this laser printer. When first testing your profiles you will probably print directly from Photoshop. This is perfectly well and good if you do all your printing from Photoshop, but most of us venture forth into page layout programs to perform our final projects. I advise that you save your final images as .eps files to be included into whatever page makeup file you work with. Save the files <u>without</u> saving (Photoshop Save options) Halftone Screen, Transfer Function, or PostScript Color Management- the printing device RIP will determine the firs two and the last has been addressed by the profile used.

One final detail to remember. When printing files containing these profiled images, turn off all color management controls and options in the Print dialogs. Simply set the Color Management options to Color/Grayscale and leave the rest alone. In the case of the Minolta/QMS 6100 dialog box, set the "Printer Specific Options" and the "Color Options" as seen in the illustration (left/right/above/below).

Conclusions to be drawn…

1) Inkjet printers will still hold the advantage in producing vibrant, saturated color prints. If you are looking for prints suitable for framing, the inkjet may be your choice still. However, be forewarned that the very same knock-your-socks-off color that looks good in a picture frame may not be able to be replicated on a four-color printing press.

2) If you are willing to take the time, energy, and expense, as I did, to build accurate profiles for your paper stocks, the Minolta/QMS Magicolor 6100 will prove to be a very viable printer in all respects. It escapes the "one trick pony" status of the inkjets by providing

everything from administrative chores, to accurately producing first-approval color proofs, to the production of short-run (50-500) two-sided color literature.