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# INTRODUCTION

Achieving quality results on production inkjet printers is dependent on some important interactions and partnerships: paper and ink, printers and profiles and not least of all, the designer and the print service provider. The initial demand for this guide came from the latter, print providers who wanted to receive “clean files” from their customers and, by extension designers. However, success in an inkjet environment starts far upstream from file preparation – it is all about design preparation.

That’s why this guide was developed for graphic and information designers and not as a technical primer on inkjet presses or a simple checklist of file preparation tips (although where would we be without a few checklists?). In order for designers to truly unlock the potential of production inkjet platforms, they need to understand how they do what they do so that designs can take advantage of the weird and wonderful effects that can be created when design settings are adjusted based on an understanding of software, hardware, ink and most importantly paper.

So, while technical information will be covered, the topics addressed are limited to those that will help designers achieve quality results on inkjet presses. We also recognize that for many designers, particularly those involved with direct mail and commercial print, their projects may be produced in more than one type of print environment – and they must deliver a certain level of consistency across those platforms.

While inkjet presses are available with a wide range of ink chemistry options from black only to full CMYK color plus custom inks, for purposes of this guide we are focused on design options using full CMYK color with aqueous dye and pigment inkjet inks.

We anticipate that some readers may already have experience working in a color environment on other types of presses while some readers may have come from a monochrome production environment and the requirements of color management may be new to them. Readers who are already familiar with managing color workflows (and those who always read the end of a novel first) may want to skip to Chapter 10 and review the section for their area of primary design focus: Transaction Print, Direct Mail, Commercial Print or Book Printing, and then jump to sections referenced in the associated tables. Those readers who want to follow along from beginning to the end will also get to see how the design approaches recommended in the guide were applied to this guide. We do as we say and say what we do.

We have tried to organize the guide to be similar to the way a designer would organize a project – gathering the boundary conditions for the design, selecting the palette, creating a concept and tuning it for production. However design is often an iterative process and certain concepts are relevant at multiple points in the design process – so forgive us if we make a point more than once.

The speed, productivity and flexibility of production inkjet is helping print to maintain its position as a thriving and relevant medium for designers and their clients. We look forward to helping designers take advantage of the power that this exciting technology has to offer.

So go forth, have fun, be creative and get ready for the awesome aqueousness of inkjet!



CHAPTER 1

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# WELCOME TO THE WORLD OF INKJET

It's Different Here!



# Imagine

Imagine shooting a freight train with a squirt gun full of colored liquid. Now imagine that you could hit that train so fast and so accurately that the paint would stay on the train even though the train is moving. That's what you get when you jet ink through perfectly calibrated print heads onto paper moving at upwards of 800 feet per minute. Pretty amazing, right?

Unlike the squirt gun analogy, print heads used in production inkjet printing are mounted within a machine in a fixed position. The print heads do not move to aim at their target, but jet onto moving **media**. The drops ejected can be as small as 3 **picoliters**; that's about 39 microns. To put this in perspective, the width of a typical human hair is 80 microns and an inkjet drop is less than half that size.



## No Pressure

Today, most production inkjet printers use continuous rolls of paper running at high speed. A few models are designed to print on various sized media in sheets. These printers are referred to as “continuous” and “sheet fed” printers respectively. This is probably similar to other printers you have worked with. The difference with inkjet is that there is no direct contact between the print head and the media surface. This is known as “non-impact” printing. Tiny drops of ink are ejected from the print heads while paper, or some other printable substrate, passes underneath. Technically, they can't really be called a “press”. There is no pressure or direct offset of ink on paper as you may be used to with other print technologies, yet these tiny drops are able to form an accurate image on contact with moving paper. Cool, right?

## Inkjet Ink is Different

Understanding how ink gets on the paper is important to understanding how to control the results of your design efforts. It's also important to understand the qualities of the ink itself.

Believe it or not, the ink used in most production inkjet systems is primarily water. But don't confuse water-based inks with watercolors, these inks use highly concentrated **colorants** that are specifically designed for inkjet. Using water as the carrier for the colorant allows the fluid to be extremely thin. In high-speed printing, keeping the ink thin is important to maintaining consistent jetting without developing clogs in the nozzles that could interrupt or degrade printing.

Inkjet ink also dries differently using a combination of absorption into the media and evaporation into the air. Proper inkjet paper and drying capabilities of the printer allow the excess water to disperse quickly leaving the ink colorant on the paper surface creating more color "pop." The type of ink and the type of paper will determine just how much pop.

There are two main types of inkjet ink, **dye** and **pigment**. While the results vary based on the type of paper used, dye inks will be absorbed more deeply into the paper making the results more scratch resistant than pigment. The colorants in pigment-based inks tend to sit higher on top of the paper and are more light and fade resistant but may be less scratch resistant. There are also "fast immobilizing" pigment inks that are more expensive but allow a higher volume of ink to be used on the page to boost color results.

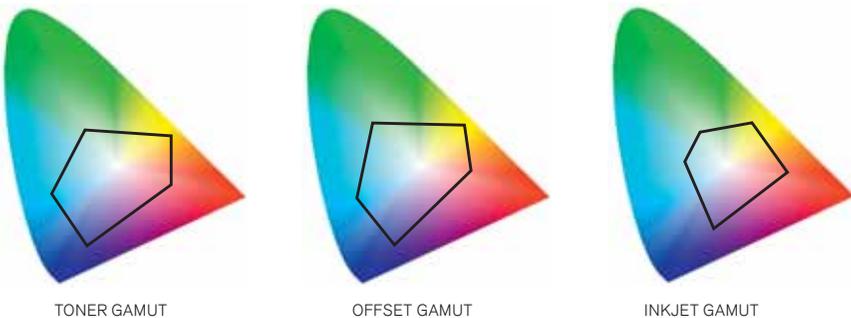
Most high-speed production printers use Cyan, Magenta, Yellow and Black (CMYK) for color printing. Some may offer a "demand" or "spot" color which is manufactured to match a particular PMS color. Adoption of these PMS colors by print providers is somewhat expensive and therefore fairly rare. Also, the PMS color is typically "tuned" to deliver best results on a particular paper type. Use of that spot color on a different paper type will yield different results even when using the same PMS color settings. Keep in mind that, unless your print provider tells you differently, all colors referenced in a design file will be printed with CMYK inks.

**“ With inkjet there is no direct contact between the print head and the media surface.**

**TALK TO YOUR PRINT PROVIDER:** Print organizations typically choose dye, pigment, or **fast-immobilizing pigment** based on the best fit for the majority of work that they do. Many transaction printers choose dye inks since long term color fastness is not a major concern, while book printers will typically choose pigment since durability is key to that market. Ask your print provider if their inkjet press availability includes any special PMS colors and on what paper they have been tested. Don't be surprised if there is an "up-charge" for PMS color since these inks are usually more expensive. See Chapter 5 for additional important topics to discuss with your print provider.

## Different Color Gamut

Creating colors using CMYK with pigment or dye inks delivers a **color gamut** that is different from toner or offset. The overall size of the color gamut – the number of colors that can be accurately rendered using CMYK inkjet inks – can often be less than offset and toner and also can vary between dye and pigment inks.



The extent of the color gamut is also strongly influenced by the type of paper used. The surface of the paper affects the amount of ink that can be absorbed and the amount of ink colorant that stays closer to the surface. More ink closer to the surface means more color. The inkjet process works best with paper which has been designed with a surface "treatment" or an "inkjet coating" to keep the colorant nearest to the surface. A typical offset grade paper's surface is not designed for the aqueous inkjet process. The interaction of paper and ink as well as why "inkjet" paper is so special will be discussed in detail in Chapter 6. *Choosing the correct paper types may be the most important factor influencing design.*

To help you visualize the impact that paper has on color reproduction, consider this test conducted using dye based ink on an **uncoated** sheet, an **inkjet treated** sheet and an **inkjet coated** sheet. There was a **114 percent swing** in the number of colors that could be matched from the lowest grade uncoated sheet to the highest grade inkjet coated paper. There was a **55 percent improvement** when moving from uncoated to inkjet treated. We will talk more about why in Chapter 6.

Paper used	Uncoated	Inkjet Treated	Gloss Inkjet Coated
Number of Colors Matched	147,335	228,854	314,669

Source: Schilling Inkjet Consulting

If you don't understand what you are working with, you may only be accessing half of the colors available to you!



## Inkjet is Different from Offset

While there may be a slight sacrifice in color gamut when moving from offset to inkjet, there is also a lot to be gained. The traditional offset process, which requires an image to be transferred by pressing a blanket cylinder directly to the media, only produces static images. If you want to design a series of direct mail pieces, each must be a separate job with its own films or plates. With inkjet, every print can be created with different text, images and colors. This allows long runs with lots of variability or short static runs to be produced more cost effectively than on offset presses.



## Inkjet is Different from Toner

If you are currently designing for color toner devices, you already have access to personalization and a fairly wide color gamut but not to the speed or capacity that inkjet printing can offer. Inkjet presses turn jobs around in a fraction of the time that toner machines do. Also, if you've ever had challenges with color drifting from one run to another in a toner environment, that problem will be virtually eliminated with inkjet. The inkjet process allows consistent run to run color because, unlike toner devices, there are no moving parts used to transfer an image onto paper and fewer parts that degrade print quality as they age.



## Sometimes Different is Just Different

Sometimes different can be better. As this guide is being written, new inks are being formulated, new inkjet papers are being launched and the inkjet color gamut is expanding. At the same time, printers are getting faster, the available finishing is becoming more sophisticated and running costs are dropping, thereby bringing production costs closer and closer to long-run offset presses.

Unlike designing for offset or toner where whatever boundaries existed in the past decade are pretty much what you have to work with now, inkjet is an expanding, vibrant new technology where the boundaries are falling away and your design palette is growing every day.

**“ If you don’t understand what you are working with, you may only be accessing half of the colors available to you!**