



## The Color of Ink

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One of the first things you'll notice about something is its color. If there isn't a color to see, you'll notice its absence instead. Color (or lack of color) is simply something that you can't *not* notice. Text on a page or big, decorative letters on a billboard are only discernible because of their color. Different colors naturally fill and brighten our world through things like flowers and trees, rocks and gemstones, and skin tone and eye color. It's no wonder that humans have been harnessing and using colors for thousands of years! Different colors are intentionally used to decorate and provide function all over the world. Cars, magazines, computers, clothing, toys, and the advertisements for all of these items are filled with color (In this case, black *is* a color!).

### Use of Ink

One of the major ways that color is applied across industries is by using ink. The basic formula for ink has three major components: a binder or carrier, colorants, and additives. Just three ingredients may seem simple, but there is a huge variety of options for each of those components, and even more options for how to mix them together. This means that the possibilities and applications for ink are endless, but it also means that ink formulations and production approval can get pretty complicated.

### Color Expectations

Variables and opportunities for error or ink failure exist in the Research and Development Lab, production printing, packaging and shipping, consumer use, and every step in between. Major considerations include flexibility and durability; adhesion to the substrate; chemical compatibility within the ink; ink type and cure profile (temperature, humidity, etc.); coverage and consistency within an individual part, from part to part, and from job to job; viscosity and viscosity changes; streaking, drip marks, scratches, or any other surface imperfections; and numerous others. Understanding your customer's detailed needs from the beginning is paramount to efficiently developing an appropriate ink and producing the best end product possible. One small modification or update along the way has the potential to completely change the formulation or feasibility of the ink. All of these factors and variables need to be

optimized and in sync with each other for every individual ink and its specific application. However, none of this will matter if the product is the wrong color.

## The Challenge of Color Consistency

The first thing a customer will notice about a product is the color. Not that it isn't durable enough, that it loses its shine in the sun, or that the ink flakes off if you fold it. Correct color is integral to ink formulation, and one of the challenges of color is ensuring that a product produced today looks just like the same product that was produced last year, five years ago, and ten years ago. This can be increasingly difficult as ink technologies and printing methods change and improve. This means that new chemicals and methods will need to produce the *exact* same color, including opacity and gloss, as a completely different mixture of chemicals. For example, a customer may want to add their signature color, exclusively used indoors on decorations and menus, to an outdoor sign. This might mean they need to go from a conventional, solvent-based ink system to a more durable ultraviolet light (UV) ink system. All of the ingredients could be different, but the end product color needs to be indiscernible from the signature color printed on everything else. The colorant component used in this type of color matching, and in any new colors, is typically a combination of various pigments or dyes.

## Pigments vs. Dyes

Pigments are usually complex solids that are insoluble and therefore suspended in the binder or resin component of the ink. Because they don't dissolve, they are more versatile and can be used in a greater variety of mediums and mixtures without the need for polar compatibility. They are also usually more resistant to heat.

Dyes are most often liquid and dissolve in their carrier. They follow the "like dissolves like" convention meaning that polar dyes will only be compatible with/dissolve in polar solvents, and the same for nonpolar dyes and nonpolar solvents. Depending on the other components and type of ink required for the application, the perfect green dye that you want to use might not be an option, and the closest green pigment might not be close enough. In addition to their differences in solubility, pigments and dyes have a number of other differing properties. Dyes are typically less permanent and more prone to fading, but they are also brighter, stronger, and more consistent in color, less costly, and are available in a wider range of colors.

## How We Can Help

Our color experts and formulation team use their knowledge and experience to develop the perfect mixtures of ingredients to yield the most appropriate and useful inks in just the right colors. First, you'll notice the color. Over time, you'll discover the durability, enduring shine (or matte!), and consistency of the ink.

## Partner With Us

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