Steinwall
PLASTIC INJECTION MOLDING

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# COLOR IN PLASTIC PARTS

TECHNICAL ARTICLES | PROPERTIES OF PLASTICS

## What is color?

Specifying a color for a plastic molded part can be very important. The molded part may need to match other colored parts in an assembly or it may need to stand out from the rest to give a more dramatic appearance. Yet, what is color and what factors affect it?

To help understand color, let's first break it down into three components: an observer, a light source and an object. We must have all three in order for color to exist. Consider an object in a completely darkened room; there is no light (yet there is an observer and an object), thus there is no color. Look at the night sky, yet not at a star, planet or other satellite; there is no object, thus no color. Finally, if there is no one to view object under a light source there is no color; color requires an observer. Now we have what components of color, this begs the question "how do these components work together to give color?"

Let's start with light. Light is electromagnetic radiation with wavelength to which our eyes are sensitive. The range of visible light (with some individual variation) is 390 to 770 nm. Light sources (or illuminants) are characterized by their power of light at each wavelength in the visible spectrum (the energy distribution). The energy distributions of light vary widely depending on the source. With regard to color, how the energy distribution and the object interact is the important factor.

When an illuminant is directed at an object, some light is reflected at the surface and some is absorbed into the object. Thus, color is the result of how the object reflects and absorbs energy from the illuminant. If one uses two differing illuminants, each having differing energy levels in the visible wavelength, the color will be different! Additionally, if one has two varying materials colored with the same pigment, where the material difference affects absorption or reflectance, the two materials will again have different color!

The observer is the final piece to the color puzzle. If a human is the observer, the eye and the brain are involved. Since there are variations from person to person in the degree of light sensitivity, colors seen by different humans are not identical! To decrease human variation, a "standard human observer" model was established and is known by its French name as CIE (Commission Internationale de l'Eclairage). This standard uses terms of L* a* b* to characterize all color. L* represents lightness, a* represents redness-greenness and b* yellowness-blueness. The CIE standard allows for repeatable measurement of color in order to standardize the observer component.

Color depends on the interaction of three factors: light source, object and observer. If any of the factors change, the color changes. These components have individual and interactive properties that affect overall color of an object.

Now that we have a background understanding of what color is and what affects it, our next discussion will discuss the steps to take when attempting a color match.

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