

CONVENTUS

B E Y O N D P O L Y M E R S

Thermoplastic Color Matching

Choosing the right color is an important step in the application development process. Color can impact branding, the ability to catch a consumer's eye, and an opportunity to offer the market a differentiated aesthetic solution. The repeatability and reproducibility of consistently meeting that color is critical to quality.

Most thermoplastic resins and compounds can be colored to satisfy application requirements. Conventus can assist in understanding any limitations that exist. The four common ways to color plastics are via 1) Pre-compounded color, 2) Color concentrates, 3) Salt and pepper, and 4) Liquid color.

COLOR MATCHING STEPS

STEP 1

Determine the optimal base thermoplastic for the application and its colorability to meet customer satisfaction. (ABS, PC/ABS, PC, etc.) Understand the chemistry of the base thermoplastic with any additives or fillers, and determine whether there are any compatibility restrictions with potential color pigments (FR, GF, etc.). And finally, determine whether there are any regulatory approvals required (NSF, FDA, ISO 10993, etc.).

STEP 2

Determine the light source for color matching (sunlight, fluorescent, cool white, etc.) to avoid the possibility of a metameric match. Colors that appear to match in one light source may not match in another.

STEP 3

Define the color match target (part, color chip, Pantone number, FED STD number, etc.). If the match involves a transparent or translucent color, determine the thickness at which the colors are to match. The level of light transmission is critical to the color match

STEP 4

Determine the match criteria - usually Delta E or CMC Delta E.

Delta E is a circular mathematical representation of the color space using $L^* a^* b^*$ values. The circle is divided into four quadrants: red, yellow, blue, and green.



It also measures lightness and darkness. CMC Delta E is the elliptical mathematical representation of color space using $L^* a^* b^*$ values. CME Dela E more accurately represents what the human eye interprets and is the preferred method for color matches.

Color match specifications should reference the tolerance of either Delta E method. (0.5, 1.0, 1.5, 2.0, etc.). Future production lots must be within this mathematical window based on values measured by a colorimeter.

STEP 5

Customers will receive color chips for approval. Once approved the matched color becomes the standard upon which production lots are measured against in terms of color quality assurance.



COLOR CHALLENGES

Although rare, there may be cases when the color is within numerical specification, but the human eye sees a slightly different color. This may occur if the color is heavier on one side of the red, yellow, blue, or green color. In this case the specification can be modified to include a sub-specification on an individual quadrant of color.

It should also be noted that when thermoplastics are processed they tend to color shift to a darker and more yellow color depending on the amount of heat exposure.

COLOR MATCHING OPTIONS

PRE-COMPOUNDED COLOR

The gold standard to ensure lot to lot consistency over the life of a program and ease of use during the part manufacturing process.

COLOR CONCENTRATES

Due to its cost advantages this is the most prevalent way to color plastic. While cost effective, it compromises color consistency and requires additional work during the part manufacturing process. Color concentrates are supplied with a recommended let down ratio (LDR), which range from 10:1 to 200:1. A typical LDR is 25:1.

SALT AND PEPPER

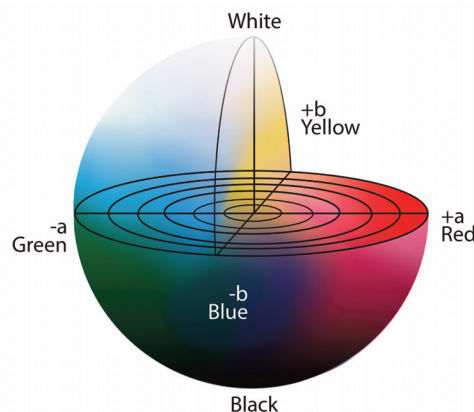
This option offers a pre-mix of color concentrate and base resin at the proper LDR to avoid having to do any mixing during the plastic conversion process.

LIQUID COLOR

An accepted way to color plastic, but can be messy and requires compatible equipment.

THE FOLLOWING DELTA E VALUES ARE VALID UNIVERSALLY:

Delta E Value	Meaning
0-1	A normally invisible difference
1-2	Very small difference, only obvious to a trained eye
2-3.5	Medium difference, obvious to an untrained eye
3.5-5	An obvious difference
>6	A very obvious difference



ABOUT CONVENTUS POLYMERS

Conventus Polymers offers distribution as well as superior custom compounding and masterbatch solutions in thermoplastic resins. Conventus partners with you to identify the best resins, reinforcements, additives, modifiers, and more to formulate a custom compound for your specific application requirements. Conventus delivers a combination of technology, performance, and quality with speed, flexibility, and service that is unparalleled in today's industry. The goal is to work as your partner to make your vision a reality.



USA - New Jersey 2001 Route 46, #310 | Parsippany, NJ 07054 USA | Tel: 973.343.7669

USA - Texas 6431 Cunningham Road | Houston, TX 77041 USA | Tel: 502.396.8070

Email: info@conventuspolymers.com | www.conventuspolymers.com

ALTHOUGH ANY INFORMATION, RECOMMENDATIONS, OR ADVICE CONTAINED HEREIN IS GIVEN IN GOOD FAITH, CONVENTUS POLYMERS MAKES NO WARRANTY OR GUARANTEE, EXPRESS OR IMPLIED, (I) THAT THE RESULTS DESCRIBED HEREIN WILL BE OBTAINED UNDER END-USE CONDITIONS, OR (II) AS TO THE EFFECTIVENESS OR SAFETY OF ANY DESIGN INCORPORATING CONVENTUS POLYMERS MATERIALS, PRODUCTS, RECOMMENDATIONS OR ADVICE. CONVENTUS POLYMERS AND ITS REPRESENTATIVES SHALL IN NO EVENT BE RESPONSIBLE FOR ANY LOSS RESULTING FROM ANY USE OF ITS MATERIALS OR PRODUCTS DESCRIBED HEREIN. Each user bears full responsibility for making its own determination as to the suitability of Conventus Polymers materials, products, recommendations, or advice for its own particular use. Each user must identify and perform all tests and analyses necessary to assure that its finished parts incorporating Conventus Polymers materials or products will be safe and suitable for use under end-use conditions. Nothing in this or any other document, nor any oral recommendation or advice, shall be deemed to alter, vary, supersede, or waive any provision of Conventus Polymers Standard Conditions of Sale or this Disclaimer, unless any such modification is specifically agreed to in a writing signed by Conventus Polymers.