Plastic playground equipment comes in a broad variety of colors to create vibrant plays paces for families. Image Source: Flickr user **Frances Gonzales**

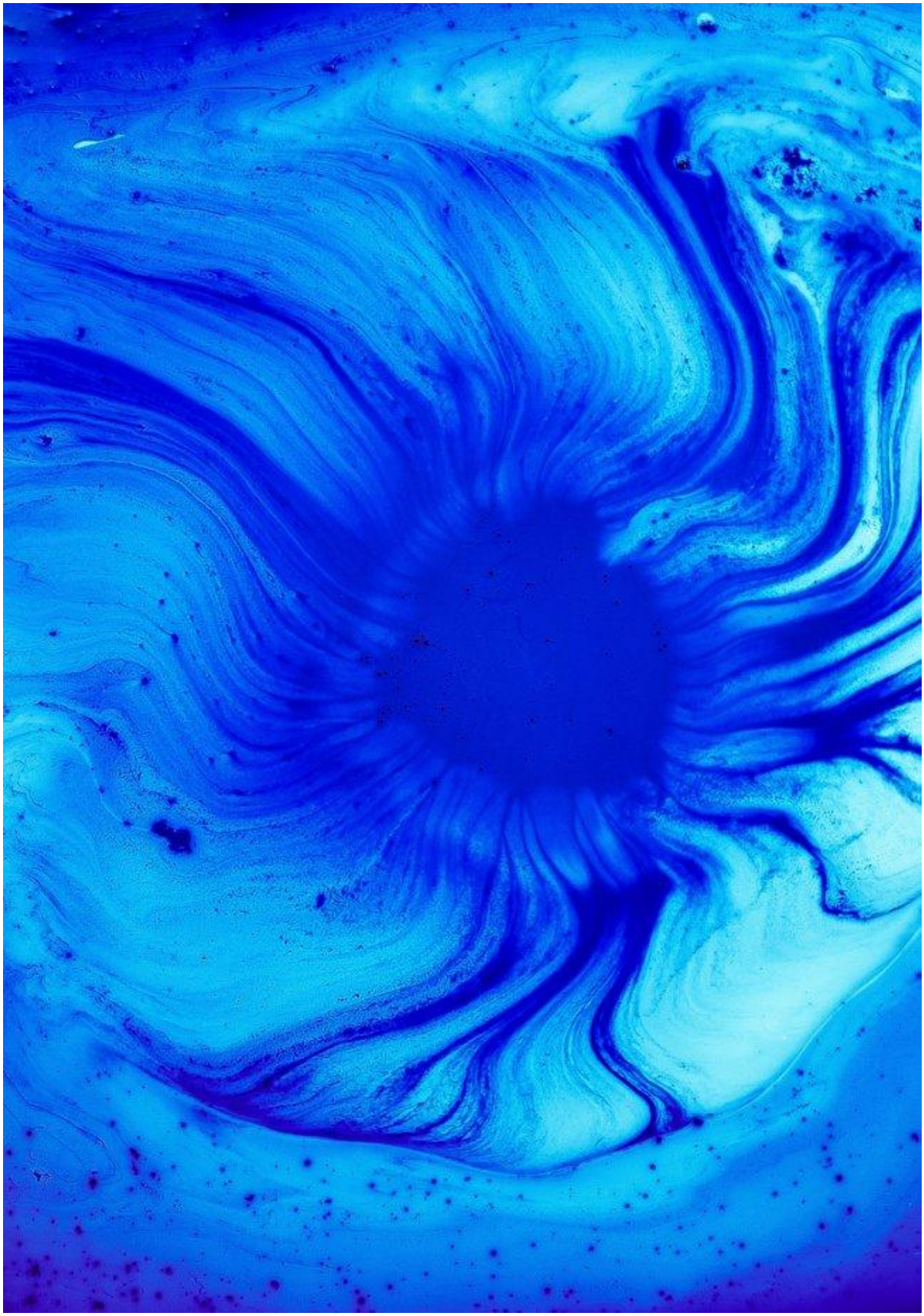
I can tell it's summer by the sounds I hear from my window. Ecstatic with summer vacation excitement, children laugh and shriek at the playground next to my house, running, swinging, and climbing themselves into exhaustion. To me, it is the soundtrack to a season full of lazy days and late night swimming

The playground was built a year ago, replacing worn and discolored plastic parts with new, brightly colored components. The result is a wonderland of swings, jungle gyms, and slides, still looking fresh out of the box. But while countless families are now enjoying this new addition to our community, few are aware of the complex processes that must take place in order to create and preserve the vibrant colors of plastic playground equipment.

The Benefits of Plastic Playground Equipment

Playground equipment can be built using a wide variety of materials, from wood to steel, rope to rubber. Plastics, however, are amongst the most forgiving materials, providing relatively soft surfaces, rounded edges, and no risk of splinters.[1] As such, playgrounds are increasingly integrating plastic components in their designs, allowing for improved safety and comfort. For the environmentally conscious, recycled plastics are particularly popular choices.

But the benefits of plastic playground equipment is also aesthetic; available in a virtually endless range of colors, plastics allow for the creation of vivid and beautiful spaces for kids to play and explore. Creating those colors, however, can bring unique challenges.



Precise blends of pigments and color-protecting additives create the perfect colors for modern playground equipment. Image Source: Unsplash user **Joel Filipe**

Creating Masterbatch Color Formulations

Creating colored plastics is a multi-step process that begins with the correct formulation of masterbatches, the additives that give plastics their color. For playground equipment that will be exposed to the elements, this depends not only on the correct selection of pigments, but the appropriate integration of components such as light fast pigments and UV stabilizers to ensure longevity.[2] These additives can impact the final appearance of plastic and this impact must be accounted for during formulation.

Evaluating the color quality of masterbatches is difficult when relying on the human eye alone due the variations in color vision and lack of objective descriptors. In order to ensure that each masterbatch produces the desired color, plastics manufacturers must rely on cutting-edge color measurement technologies of spectrophotometers. These instruments allows you to objectively quantify color data and create a universal language of color that may be used across operators and locations. As Tony Bestall, Director of Silvergate Plastics writes:

The spectrophotometer can measure the color of a physical sample and also be used to check the accuracy of a color match. Not only does it identify precise coordinates on a spectrum of over twenty million colors, but it can store specific references and data, including industry standard RAL and Pantone references. More color references can be added as they are created, thereby building a comprehensive library of accurate formulations or recipes from which to match a color.

Spectrophotometers produce accurate and precise spectral data from individual pigments as well as final blends for complete end-to-end masterbatch quality control. Once a formulation has been perfected, plaques can then be created for color matching purposes.

Monitoring the Plastic Production Process

Masterbatch production is of course only the first step in the creation of colored plastics; there are many factors influencing the color of finished plastic products and multiple points of vulnerability within the production chain. Chief among these is correct masterbatch use. As Bestall explains, “When masterbatch is approved for sale, post quality control, it will be within specification and supplied at a recommended ‘use at percentage’ that will exhibit a color that is very close to the original standard.” It is vital that this use at percentage is adhered to in order to produce the desired color and avoid unwanted color variation.

But even if the correct proportion of masterbatch to polymer is obtained, incorrect coloration may still occur for a number of reasons. The most common cause is poor distribution, or insufficient mixing of the masterbatch into the polymer. This is typically the result of “static build-up within the processing equipment,” resulting in restricted flow that ultimately leads to color variation and streaking. Other potential causes for inaccurate coloration include faulty raw materials and processing errors during extrusion and molding.

Because plastics are vulnerable to undesirable color variation at several phases in the production process, it is essential that spectrophotometric color analysis is integrated throughout the production chain. This allows for total quality control at each stage of production by continuously monitoring color behavior at critical points of manufacturing and giving you the opportunity to take rapid corrective action should unwanted color variation occur.

Polymer and texture variations can present significant challenges for color matching. Image Source: Flickr user **Steffen Kjær Larsen**

Color Matching Plastic Playground Equipment

Playground designers typically rely on a number of multiple polymer types to create different components of a playground that form a cohesive whole. This use of multiple polymers introduces new difficulties, as each plastic has unique qualities that impact color behavior both at the point of production and over time.[3] Spectrophotometers are essential to observing color behavior in various polymer types and identifying correctly or incorrectly matched components. When incorrect coloration is detected, the data collected from the spectrophotometric analysis can be used to finetune process variables impacting the final appearance of the plastic and ensure a correct match.

Texture variation also produces challenges to the color matching process; even if two components are produced using the same masterbatch, polymer, and extrusion process, they may appear unmatched due to differences in texture. Smooth, glossy surfaces, for example, often appear to have more intense coloration than matte, heavily textured surfaces Since the visual appearance can change as the gloss or the texture of the plastic varies it is important to measure the total color. This is best done using a sphere Spectrophotometers such as the HunterLab UltraScanVis or UltraScanPro. As such, you are able to produce exact color matches regardless of polymer and surface variation.

HunterLab Innovation

HunterLab has been a leader in color measurement technologies for over 60 years. Our renowned line-up of spectrophotometers has been developed in response to our customers in the plastics

industry, allowing us to offer the finest instruments for your unique needs. Whether you are in the first stages of masterbatch development, analyzing the effects of UV exposure on plastic components, or performing QC checks on completed products prior to shipping, we have the tools you need to ensure the highest level of quality control. Contact us to learn more about our innovative technologies and let us help you select the perfect spectrophotometer.

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3. "Colour Matching and Colour Theory", October 29, 2013, https://www.slideshare.net/SiddharthaRoy11/mr-siddhartha-roy-colour-matching-and-colour-theory