Accurate color matching is essential to creating high-quality products in the textile industry. Image Source: Unsplash user Charisse Kenion

If you work in the textile industry, you understand the complexities inherent to creating the perfect hues. From raw materials to processing methods, the final appearance of your textiles depends on a plethora of variables that must be closely monitored in order to produce the colors you want. As such, color quality control is a core component of the product development and manufacturing process, helping you ensure that your products live up to your vision.

However, the textile industry faces unique challenges when it comes to implementing robust color quality control systems. One of the most significant challenges is identifying illuminant metamerism, which can be a serious barrier to color matching. Without the ability to control for this phenomenon, your ability to achieve your desired result is compromised, potentially leading to unnecessary waste and reduced efficiency. As such, investing in technologies that can alert you to illuminant metamerism is essential to producing just the right hues.

Changes in light source can drastically alter how we perceive color. Image Source: Unsplash user tu tu

What is Illuminant Metamerism?

Color is often thought of as a static fact—something either is a particular color or is not. However, the colors we perceive depend on three primary factors:

- The observer

- The object

- The light source

Changes in any of these three factors can produce vastly different perceptions of color.[1] Think, for example, of the paint color on your walls; chances are it appears to transform throughout the day as the light changes, despite the fact that both you (the viewer) and the painted walls (the object) remain constant.

Illuminant metamerism occurs when two colors look the same under one lighting condition but not another. This can create great difficulties for color matching; while samples may appear identical under artificial lights in the factory, they may exhibit significant chromatic differences when viewed

in daylight. Suddenly, what you believed to be a perfect match is revealed to be an inconsistent pairing. Unfortunately for industries that rely on color matching to create appealing, high-quality products, illuminant metamerism is not uncommon.[2]

This type of metamerism is made possible by the fact that each object produces a spectral reflectance curve determined by its color. If two objects produce the same curve, they are an identical color match, and that match will be apparent in all lighting conditions. If two objects produce different spectral curves but those curves intersect at a minimum of three points, they may be metameric. When it comes to textiles, metamerism is more often observed when two textile samples are produced using different dyes or pigments than when simply using different dye strengths or concentrations. However, the causes of metamerism can involve a variety of factors, particularly if your textile sample is being matched to a different material.

Metameric Index (MI) values can be used to determine whether your textile sample will produce an acceptable color match despite not being an identical match. Image Source: Pexels user Pixabay

The Benefits of Spectrophotometric Color Measurement

In the textile industry, spectrophotometers are critical tools for distilling color information into objective data, facilitating communication and allowing for precise monitoring of color consistency. Because spectrophotometers can analyze the spectral reflectance curves of your samples, they are also invaluable for identifying metamerism and determining Metamerism Index (MI) values.

"The MI is a single number index that indicates how well two samples that match under one illuminant will match under another illuminant," explains Norman Whetzel of HunterLab. This index comes preinstalled in some color measurement software packages, such as HunterLab's EasyMatch QC. EasyMatch QC gives you the ability to choose the illuminants that you want to analyze, allowing you to measure the degree of metamerism in a broad range of lighting conditions. This process helps you make informed decisions about color creation, in part because metameric samples may in fact

produce acceptable color matches, and the MI gives you the data you need to determine if this is the case. In general, an MI of less than 0.5 indicates an acceptable match, while an MI higher than 0.5 but less than 1 will require closer examination to determine acceptability. If the MI is great than 1, however, the samples are not a suitable match.

By integrating spectrophotometric instrumentation in your color quality control protocols, you are able to gain the highest degree of insight into your textiles and use this information to refine your processes and products. This includes not just tailoring formulations to create perfect color matches, but also determining when a match is close enough to satisfy your needs. As such, these instruments can enhance the quality of your products while simultaneously improving the efficiency of manufacturing by reducing material and labor waste.

HunterLab Quality

HunterLab has been a leader in spectrophotometric color measurement for over 60 years. Today, we offer a complete range of portable, benchtop, and on-line instruments ideally suited to the needs of the textile industry. Our continuous commitment to innovation means our spectrophotometers are designed with cutting-edge technologies to ensure the highest degree of accuracy and precision, giving you the information you need to make smart choices about your materials and processes. Contact us to learn more about our renowned instruments, customizable software packages, and unsurpassed customer support services.

1. "The Perception of Color", July-August 2008,

   "http://archive.plasticsdecorating.com/articlesdisplay.asp?ID=83

2. "Metamerism", https://www.colwellcolour.com/pdfs/Colwell_Metamerism.pdf