UV control allows you to test the color of your products as they are seen under daylight conditions. Image Source: Unsplash user Breather

Have you ever noticed that printer paper appears even more brilliantly white when you view it outside in the direct sunlight than it does inside under the the warm glow of an incandescent lighbulb? This is no coincidence. Paper manufacturers frequently use Fluorescent Whitening Agents (FWAs) that are designed to absorb UV light, and then re-emit it back at the viewer in the blue end of the visible spectrum.[1] This re-emitted light produces a brightening effect on the paper, making it appear even whiter to the naked eye. In addition, FWAs may also compensate for yellow paper coloration or other variations in color. In other words, manufacturers can use UV light, natural light and different-colored light sources to make their products appear even brighter, and thus, more visually-appealing to customers.

However, while FWAs are an essential material in some industries, such as paper, textile, and plastics, they also make accurate color measurement more challenging. FWA-enhanced samples can appear dramatically different in color to the human eye depending on whether the product is viewed outdoors, or under artificial lighting conditions. The color of the light source also has an impact on the appearance of the product. This is one of the reasons UV control is essential for color measurement—it allows you to account for many different lighting conditions, including daylight and indoor environments. Using spectrophotometers with UV control options, you can get a more accurate color reading on your FWA-enhanced products, allowing you to view your products exactly as your customers will see them.

What is UV Control?

The ultimate goal of UV control is to obtain more accurate color readings of your samples under various lighting conditions. In natural daylight conditions, UV control essentially allows you to view the sample as the human eye would see it outdoors. To accomplish this, many spectrophotometers attempt to match the CIE standard illuminant D65. Commonly called the “daylight illuminant,” D65

closely matches the amount of light that you would see on a clear afternoon in Northern or Western Europe.[2] Spectrophotometers have the ability to simulate these conditions in the lab, producing a consistent environment in which to test samples.

This is where UV control comes into play. UV control options include the use of xenon light sources, motorized UV filters and calibrated fluorescent standards. Each of these options can dramatically improve the accuracy of your color measurements when testing FWA-enhanced samples. In spectrophotometers, UV control works by allowing you to see products as they appear under natural, UV daylight conditions. This is helpful for industries that use FWAs, as you can measure exactly how the product appears to your customers, even if you measure the product in an indoor, controlled lab setting—it simulates daylight conditions for you.

Paper manufacturers often use FWAs to enhance the appearance of their products under UV light sources. Image source: Pexels user Tirachard Kumtanom

Achieving Accurate Color Measurements for Whitened Products

One of the most important benefits of UV control is the ability to obtain accurate color measurements for bleached or fluorescent white products. The problem with products that have been dyed with FWAs is that traditional whiteness measurement standards may not be accurate. The FWAs interact with the UV light, which can cause a variation between the whiteness index measurement and how the human eye perceives the color of the product. In other words, the spectrophotometer may not measure the color accurately, according to how your customers will see it. UV control corrects for this by calibrating the spectrophotometer so that it corresponds to a specific UV standard. So, if you wanted to test your product's appearance under simulated daylight conditions, then you could calibrate your spectrophotometer so that it controls the amount of UV light emitted, allowing you to see your products as your customers will see them under those conditions.

UV Control Methods for Fluorescent Samples

The UV control method that you use to measure whitened products will depend on what type of measurement you want to make. If you want to measure your product as it would appear in outdoor lighting conditions, then you may use UV calibration and fluorescent standards to achieve this. Many of HunterLab's spectrophotometers offer UV control and are supplied with fluorescent standard calibrated to a Ganz whiteness value traceable to the Hohenstein Institute in Germany. From here, the software in the spectrophotometer automatically reads the fluorescent standard and adjusts the motorized UV filters until the calibrated Ganz value is achieved. You can repeat this process monthly, or whenever you change the instrument's lamp.

Alternatively, you can eliminate UV entirely, allowing you to view the sample as if it were indoors under incandescent or LED lighting which has limited or no UV content. To do this, you can insert the spectrophotometer's UV filters completely and take a measurement of the sample without UV interference. You can then compare this measurement to one made while the UV filter is in its normal position—this should tell you exactly how much impact the FWAs have on the final color of your product. By using one or more of these methods, you can accurately test your fluorescent samples under a variety of lighting conditions, including simulated daylight.

Many spectrophotometers are equipped with xenon light bulbs, which closely mimic natural daylight conditions. Image Source: Pexels user Pixabay

UV Control Compensates for Lamp Age

In addition to helping you accurately measure fluorescent white samples, UV control can also extend the use of your lamps over time. As your light source ages, its illuminating qualities may change. The bulb often begins to dim, and this in turn can impact the results of your color measurement tests. When you perform UV calibration every week, or whenever you change your light source, your spectrophotometer will adjust to the new conditions, compensating for the difference in light

source. If you have a lamp that is capable of flashing one million times throughout its lifetime, this is an essential tool. UV control will ensure that every flash that lamp makes, whether it's the first time or the 30,000th time, will lead to accurate measurement results.

Achieving Illumination Agreement Between Different Instruments

One final benefit of UV control in spectrophotometers is that you can ensure more accurate readings between multiple instruments. Illumination agreement between different color measurement instruments can be a challenge—an instrument with an older lamp, or one that uses a tungsten bulb may get a very different color reading compared to an instrument with a newer lamp, or one that uses xenon bulbs. In addition, xenon bulbs are a closer match to the D65 standard compared to halogen bulbs, and this will have an impact on how these different instruments measure color. UV control takes some of this variation out of the equation, since you can calibrate for this change of light source in advance. The result is a more accurate color measurement protocol that works well for a wide range of industries, and that is designed to last for the entirety of the instrument's lifetime.

HunterLab Options

HunterLab carries a wide variety of spectrophotometers that contain built-in UV control options. The LabScan XEs, UltraScan Pros and the UltraScan VISes are all capable of accounting for UV light variations. Moreover, many of these instruments take UV control one step further—you can adjust the spectral distribution of the xenon lamp to more closely match the D65 illuminant, meaning that you can achieve even more accurate color measurements. Contact us today to find out more about our spectrophotometers and how UV control can enhance your quality control processes.

1. "Fluorescent Whitening Agents", http://www4.ncsu.edu/~hubbe/FWA.htm

2. "Illuminant D65", https://en.wikipedia.org/wiki/Illuminant_D65