



Production uniformity is necessary for everything from low-cost products to high-end items. Image Source: Shutterstock user Dukesn

The key to eliminating mistakes in any process is eliminating unnecessary steps in the process. This is one of the principles of Kaizen business practices, one of the cornerstones of the Six Sigma approach to manufacturing.¹ Designed to create uniformity that reduces the potential for errors or defects in end products, Six Sigma is often considered the gold standard for process improvement. While not every business chooses to follow Six Sigma's process improvement standards, elements of its innovative approach can be adopted to reduce problems—and, ultimately, waste—in any process.

In any form of manufacturing, products need to adhere to established standards to be viable, and often, color is a critical part of that standard. A company that makes red card stock, for example, wants every card in a package to be the exact same shade of red. Even the slightest variation in color would be clearly noticeable and compromise the appeal of the product. As such, paper manufacturers use advanced color measurement instruments to create color standards and ensure batch-to-batch consistency. Often, the instruments they rely on are benchtop spectrophotometers.

Dr. Shigeo Shingo, who helped create the Kaizen method that streamlined Toyota's production process in the 1950s, once stated, "The most dangerous kind of waste is the waste we do not recognize."² One area of waste reduction many companies miss is the waste created when relying solely on benchtop spectrophotometers for color quality control. In many cases, the time it takes to collect samples, bring them to the lab, and prepare the samples for analysis can be better spent elsewhere. Unfortunately, many companies fail to recognize this process as waste due to the essential role of color measurement. However, using technology to eliminate exclusive reliance on benchtop instrumentation could pay dividends in productivity. By adding portable spectrophotometer instruments to your color quality control process, you can minimize waste, improve the efficiency of color measurement, and enhance overall product quality.



Portable spectrophotometers can be an essential part of color quality control, whether in addition to or in place of benchtop instrumentation. Image Source: Shutterstock user Visual Generation

Portable Spectrophotometers Minimize Waste

Recreating a specific color is a necessity that transcends industries. Its purpose is both aesthetic and functional, as seen in the pharmaceutical industry where color plays a significant role in how consumers [perceive](#) and [use medications](#). It's also a potential failure point, as even minor adjustments to the production process can have a significant impact on how products are perceived and used. As such, spectrophotometric color measurement at critical points of product development, production, and post-production is essential to ensuring that each product looks the way you want it to. These may include:

- **QC spot checks/production line testing:** Quality control spot checks are completed by analyzing samples taken at various points in the production process both when issues are identified or as a proactive measure, based on the manufacturer's protocols.
- **On-site testing:** On-site testing is often done to measure when certain sensitive supplies, [such as produce](#), must be measured and color may be altered during transportation to a lab. In addition, items that must be produced on-site, such as [site-mixed cement](#), need to be measured for color accuracy and can't reasonably be transported to a lab.
- **Storage checks:** When a company chooses to produce buffer stock for future orders, stored items may need to be checked periodically to verify continued viability. Color measurement can be a critical component of this process, particularly for products that have high potential for color change, such as paper goods.

When looked at from a continuous process improvement perspective, all these steps have the potential for waste. However, QC spot checks and production line testing that rely solely on benchtop instrumentation are of particular concern. In these cases, samples must be collected from the production line, transported to the lab, and analyzed, which can be a time-consuming and laborious process that disrupts manufacturing efficiency. Meanwhile, workers must decide whether

to shut down the line during testing or leave it running—and either choice is a gamble. Shut down while testing could prevent replicating the error but may waste time. Conversely, leaving the line running could cause waste of labor and materials if testing reveals unwanted color variation that has affected subsequently produced products.

The solution to this problem is not to measure the risk and reward of each action, but instead, to find an underlying solution to the overall problem. In this case, the problem is the time and labor necessary for lab testing and its implications for such testing on the production line. The solution, then, is to eliminate unnecessary lab testing.

For many manufacturers, portable spectrophotometers offer an attractive alternative to lab-based QC spot checks and production line testing. By minimizing—or even eliminating—reliance on benchtop instrumentation, portable spectrophotometers limit waste in the production process, improving overall efficiency. Additionally, portable spectrophotometers can be used in virtually any environment, making them suitable for not only analysis within the factory, but also giving you the ability to obtain accurate color information in storage environments and in the field. This extraordinary flexibility makes them an invaluable addition to color quality control strategies, whether used alone or in concert with other spectrophotometric instruments.



Color uniformity in any manufacturing system requires a uniform process. Image Source: Shutterstock user VOLYK IEVGENII

Integrating Dual Beam Technology in Portable Instruments

When choosing a portable spectrophotometer in your color quality control process, it is important to remember that not all spectrophotometers are the same and optimizing efficacy depends on selecting the right instrument. Most spectrophotometers are designed with single beam technology, which requires time-consuming and frequent standardization. This is not only is this highly inefficient, it also makes the color measurement process highly vulnerable to human error, increasing risk for further waste. These shortcomings led to the development of [dual beam spectrophotometers](#), which are capable of comparing the light paths of two beams without the need for an initial test sample. Because these spectrophotometers take the test and reference samples into account simultaneously, they are not only more accurate and less vulnerable to human error, they also eliminate both known and potential waste.

In the past, there were both economic and practical barriers to integrating dual beam technology in portable spectrophotometers, as the complexity of dual beam mechanisms meant increased potential for failure, higher servicing costs, and large footprints. In recent years, however, HunterLab has spearheaded the development of portable dual beam spectrophotometers, becoming one of the few companies to offer these instruments. Today, our [MiniScan EZ](#) line gives users the ability to accurately, precisely, and easily capture color data in virtually any environment, allowing many manufacturers to decrease reliance on benchtop instruments and implement more robust color quality control systems.

HunterLab Innovation

The goal of any Kaizen-based process improvement initiative is to create a systematic production method which simplifies the steps taken in any process. Limiting steps also limits the potential for error. In the case of color measurement, using advanced portable spectrophotometers can remove the lab analysis step, offering a more streamlined QA method. HunterLab's innovative portable instruments harness the power of dual beam technology to offer a fast and easy way to check color accuracy while eliminating unnecessary lab testing. However, portable instrumentation does not have to work alone; rather, it can [complement benchtop and on-line instrumentation](#) to create more comprehensive and efficient quality control processes. [Contact us](#) to learn more about our renowned instruments, customizable software packages, and world-class customer support services.

1. "Kaizen: Eliminate Waste and Improve Your Project", February 14, 2017,
<https://www.6sigma.us/six-sigma-articles/kaizen-eliminate-waste/>
2. "Dr. Shigeo Shingo", <http://www.process-improvement-japan.com/shigeo-shingo.html>