

Laundry detergent manufacturers strive to create products that remove stains while preserving the color of the fabric, often requiring a delicate balance of surfactants, enzymes, and polymers to combine stain-fighting efficacy with dye-friendly formulation. With growing consumer expectations of performance as well as concern for the environmental and economic impact of laundering, detergent manufacturers require reliable, objective testing protocols to evaluate new products now more than ever before. Spectral analysis using spectrophotometers is the ideal solution for testing detergent efficacy and impact to produce optimal results and provide vital information regarding the functionality of formulas. Spectrophotometric testing protocols also allow manufacturers to provide realistic and accurate information to consumers regarding the quality and characteristics of the product as well as developing instructions for use.

The Benefits of Spectrophotometers

Spectrophotometers are designed to see color the way the human eye sees it, only better. Human color perception is limited by biology, [influenced by language](#), and [affected by environment](#). Two people can look at the same object and have different opinions about its color properties. Obtaining reliable color testing information requires laborious and exact sample preparation to ensure a color is being viewed from the same angle, with the same lighting conditions, against the same background, and by the same viewer, and even then there may be color variations that are not perceptible to the human eye or a particular viewer. Spectrophotometric instruments eliminate subjective variables to distill color information into hard data and ensure that samples are analyzed the same way every time. The advanced technologies of today's spectrophotometers can account for [variables such as texture and sheen](#), making them ideal for analyzing a full range of textiles, from heavily textured cotton terrycloth to delicate, shiny silks.

Stain Removal Testing

In a standard stain removal test, a textile swatch is embedded with a particular type of stain, such as grass, dirt, blood, body oil, cooking oil, makeup, or food products.¹ The sample is then analyzed using a spectrophotometer to obtain a quantifiable color measurement of the stained fabric. After being washed with the detergent, the sample is re-measured to determine the degree of stain removal by comparing the spectral data before and after washing, revealing even the slightest variations in color.

Color Fastness Testing

To test for color fastness, a new textile swatch is analyzed using the spectrophotometric instrument to obtain a precise baseline color measurement. The swatch is analyzed again after washing to measure the color change in the fabric. Because garments and household textiles typically undergo repeated washing over time, it is important to design testing procedures that simulate real life conditions. This means that a single wash test is not enough; the impact of detergents over the course of repeated washings is the best way to obtain an accurate picture of the full effect of laundering.² [Spectrophotometric analysis can also determine if residues from the detergent itself are left on fabrics after washing.](#)

Testing Variables

When testing both stain removal and color fastness, it is important to use a variety of textile types and wash settings to observe the effect of the detergent in different conditions. Cotton, silk, polyester, nylon, and wool may react differently both in terms of how they absorb stains and how they hold on to dye and you want to be sure that your product is as effective as possible on a full range of textile types. Testing samples via a variety of hand and machine wash settings, particularly at different temperatures, can help you create optimal washing instructions for your product. Environmental and economic concerns have given rise to the

popularity of cold-water laundry detergents, adding to the impetus to create formulas that perform in a range of cooler conditions, as the exact temperature of cold water varies by region; setting a washing machine on “cold” in Minnesota is not the same as setting it on “cold” in Florida. [3 Rigorous and precise testing protocols help you create the best products to meet the demands of today’s consumers.](#)

Full article with photos available here:

<https://www.hunterlab.com/blog/color-chemical-industry/a-better-clean-using-spectrophotometers-to-evaluate-laundry-detergent-performance/>