



Transmission color measurement of non-opaque liquid is a critical element of quality control in a range of industries.

Image Source: Pexels user bogitw

Spectrophotometric instrumentation plays a critical role in the production of virtually all non-opaque liquids, offering vital data to detect contamination, ensure proper formulation, and assess aesthetics. By measuring the color of transmitted light through the sample, spectrophotometers are able to distil spectral information to objective numerical values, giving you extraordinary insight into any transparent or translucent liquid sample, whether you're working with pharmaceuticals, chemicals, or foods and beverages.

But while the raw spectrophotometric data provided by transmission color measurement is invaluable in and of itself, this information can also be used to evaluate products within specialized color scales. The scales act as goalposts and facilitate adherence to both internal and industry standards by offering defined, universal color parameters for non-opaque liquids. By understanding these scales, you can select the most appropriate assessment tools for your purposes and bring your color measurement protocols to new heights.



The APHA color scale was originally developed to assess the purity of waste water, but today it plays a critical role in the evaluation of a broad range of transparent liquids.

Image Source: Pexels user Karolina Grabowska

APHA/Pt-Co/Hazen Color Scale

[The American Public Health Association \(APHA\) color scale](#) is a yellowness index scale designed specifically for liquid color assessment. The scale was originally designed in 1892 to classify the color of waste water by comparing visually a sample to a dilution of Pt-Co, allowing users to place the sample on a scale of zero (distilled water) to 500 (heavily contaminated waste water). Today, spectrophotometers replace unreliable visual assessments for greater accuracy than ever before. And the APHA scale isn't just for water anymore; it now plays an essential role in a broad range of industries and is ideally suited to evaluate the color of clear oils, chemicals, and petrochemicals, including plasticizers, solvents, and petroleum spirits.

Gardner Scale

[The Gardner scale](#) is a single number color scale used for the grading of pale to brownish yellow liquids.¹ This scale was originally developed in the 1920s to classify the color of fatty acids, resin solutions, drying oils, varnishes and fatty acids by comparing samples to 18 liquid standards. While revolutionary for the time, these liquid standards were vulnerable to instability and imprecise formulation, and so were replaced by glass filters in 1958 in an attempt to enhance accuracy. However, the glass filters did not solve the problems inherent to visual assessment, leaving users vulnerable to inconsistencies.

Today, Gardner scale assessment can be performed automatically via the color measurement software that comes with spectrophotometric instrumentation, eliminating the subjectivity of visual assessment and providing accurate, precise results. Because the lower end of the Gardner scale overlaps with the top end of the APHA scale, the two systems may be used in combination as a liquid is refined to gain greater water whiteness.

Saybolt Color Scale

[The Saybolt color scale](#) is a yellowness index developed to classify the color of pale liquids on a scale of +30 (colorless) to -16 (strongly colored). This scale has traditionally been used by visual matching of a sample against a disc standard, leaving the method prone to operator error due to [differences in color perception](#), [light conditions](#), and [ambient color](#). Spectrophotometers eliminate these variables to provide reliable and repeatable classification. The Saybolt color scale is most widely employed in the petrochemical industry and is ideal for assessing jet propulsion fuels, kerosene, undyed gasoline, and petroleum waxes. Additionally, the scale is used within the pharmaceutical industry.

ASTM Color Scale

The ASTM D1500 color scale, also known as mineral oil color, is a single number color scale that grades yellow liquids on a scale of 0.5 (pale straw) to 8.0 (deep red), moving up in 0.5 level increments.² Designed to evaluate the color of petroleum products, this color scale is typically used to indicate the degree of refinement of a sample and identify potential contamination. Although the ASTM D1500 may be evaluated visually by comparing a sample to one of 16 color discs, instrumental analysis is a far more reliable method of assessment. Today, the ASTM D1500 scale is widely used to classify a broad range of materials, including heating oils, diesel fuel oils, and lubricating oils.



The HunterLab Vista allows you to capture color and haze measurement simultaneously, offering extraordinary functionality to meet the needs of everyone from beer manufacturers to petrochemical companies.

Image Source: Flickr user Martin Garrido

Vista: The Next Generation of Transmission Color Measurement

One of the most vital purposes of color scales is to measure contamination. However, color data alone often does not provide enough information to identify potential impurities and haze measurements may be necessary to gain a complete picture of sample quality. With this in mind, HunterLab has developed a revolutionary new spectrophotometer designed for simultaneous transmission color and haze measurement. [HunterLab's Vista](#) automatically captures haze results

during color measurement, making it one of the most advanced and versatile spectrophotometers available on the market today and giving users greater insight and control than ever before.

Vista comes complete with our advanced Essentials embedded color QC software interface designed to facilitate color management workflow for transmission color professionals. Essentials is preloaded with a comprehensive range of scales and indices to facilitate color classification and results can easily be saved, emailed, or printed thanks to multiple connectivity options. By combining the most sophisticated technologies with user-friendly design, Vista allows users of all skill levels to obtain accurate, precise data from non-opaque liquid samples with ease. With industry-first automatic internal calibration, a small footprint, and the ability to accommodate everything from very small to very large samples, this instrument provides extraordinary performance, functionality, and flexibility.

HunterLab Ingenuity

HunterLab has been a pioneer in the field of spectrophotometry for over 60 years. Our ongoing commitment to innovation has made us a leader in transmission color measurement technology and our products are renowned throughout the industry for their accuracy, smart designs, and ease of use. Today we offer a comprehensive line-up of portable, benchtop, and in-line instruments designed to provide high-performance solutions for our customers. For more information about the Vista or any of our spectrophotometric instruments, we invite you to [contact us](#) and let us help you find the right tools for your unique color measurement needs.

1. "Standard Test Method for Color of Clear Liquids (Platinum-Cobalt Scale),"

<http://www.astm.org/Standards/D1209.htm>

2. "Standard Test Method for ASTM Color of Petroleum Products (ASTM Color Scale),"

<http://www.astm.org/Standards/D1500.htm>