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## HOW SHOULD WE MEASURE COLOR? FIVE FREQUENTLY ASKED QUESTIONS

**CUYAHOGA FALLS, OHIO (MAY 18, 2017)** – For manufacturers, choosing the right color for a product or packaging is one challenge, and ensuring that colors match from batch to batch is another. To achieve the latter, it is important to understand a few principles of color measurement that help customers empirically differentiate between similar colors. To get started, consider the answers to some of the most frequently asked questions we receive at Americhem as color experts.

### 1. What options exist for examining color?

There are two main ways to examine color: visually and instrumentally.

- Visually examining color means simply looking at two or more colored objects and determining if the color looks the same to you. The benefit of visual examination is that consumers will also be perceiving color visually, making it a more “realistic” means of measurement than an instrumental reading. That said, color perception is highly subjective since it varies based on the observer’s eyes, brain, lighting conditions and surface conditions of the product. As a result, it is difficult to know if a consumer will perceive color the same way you do.
- Instrumental examination involves using a device such as a spectrophotometer to assign numeric values to a color. This makes comparisons simpler and eliminates some inherent inconsistencies with visual color perception. However, they cannot tell you how people will perceive the color in various environments. Complex instruments may also give inaccurate readings if handled by an inexperienced user, if a setting is misadjusted, or if a user does not account for factors such as viewing angle and reflectance.

### 2. When should you use visual examination versus instrumental examination?

To determine which form of examination makes the most sense for your purposes, determine whether you are chiefly seeking to measure *perceptibility* or *acceptability*. Perceptibility deals with whether the colors look different to you, and acceptability deals with whether the variance between shades of a color is within an acceptable range based on established tolerances. Because color perceptions vary, in most manufacturing scenarios it makes sense to instrumentally measure colors to determine acceptability of a batch. Getting an exact color match is both difficult and expensive, so usually you will be seeking color that is “close enough” to a standard. Remember, however, that a human will be the one ultimately judging whether a color looks

like it matches. A best practice is to do a visual examination, followed by an instrumental examination, then conclude with another visual examination to ensure a color is acceptable by all accounts.

### 3. How close is “close enough” with regard to color variance?

The answer to this depends on your application and the color tolerances you have set. Color measurement tools will provide you with a host of values, from difference in lightness/darkness to differences in chromaticity to differences in hues. Using these values, you will need to determine whether a batch “passes” or “fails” when compared to a reference standard’s color values. This typically means graphing values and determining whether they fall within an acceptable range of tolerances, which are denoted by a box, circle or ellipse on the graph. If your batch’s value is graphed inside the designated shape, it is acceptable, and if it falls outside, it is not acceptable.

### 4. Which pass/fail system is best for determining acceptability?

At Americhem, we recommend use of the elliptical pass/fail system as it gives you the best point of reference when determining a tolerance that accurately reflects whether a batch will meet your criteria for acceptability. We have found that pass/fail boxes and circles are more apt to designate batches as unacceptable when they would have worked just fine in real-world settings, which can be an expensive problem. The probability of false positives/negatives drops drastically with use of an elliptical system, as it better accounts for the realities of how we view color.

### 5. What dictates a “good” standard against which we should measure?

Failure to use a reliable standard could jeopardize the quality of the decisions you make across every batch you measure. Ensure that computed values for whatever standard you are using are statistically valid, representative of the batch, and reproducible within acceptable limits of repeatability. Also, ensure that physical objects representing a standard are clean, uncontaminated, undamaged and in the same form as the batch samples you are measuring. Carefully document and abide by storage and handling processes for best results.

*Color measurement is a mixture of art and science. It can take years to fully grasp, and even then, you may have questions. At Americhem, our color experts are available to assist with your next color measurement challenge. For more information, contact Scott Blanchard at [sblanchard@americhem.com](mailto:sblanchard@americhem.com).*

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