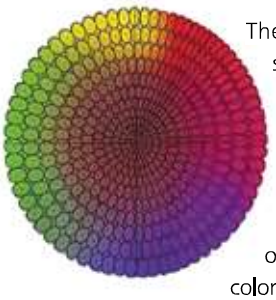
Industrial Coatings – A fascinating decoration

Patchwork might be good for quilts but certainly not for coated industrial goods. As many finished products consist of multiple components which are manufactured by different suppliers and at different locations, uniformity of color and appearance is crucial. Not only the paint batches need to be delivered with consistent quality, but also the production process of the finished product needs to be controlled.

According to Wikipedia the oldest transmitted paint formulation dates back to the 12th century. Since then a lot has changed. Industrial coatings with lower solvent content were introduced resulting in water based systems with almost no solvent. Increasing environmental demands during the last years and requirements for low VOC (volatile organic compounds) systems open the doors for powder coatings with 100 % solids content. Independent of the material, the optical properties of industrial coatings need to fulfill certain quality aspects before they can be applied on the final product.

Color and Gloss harmony

Color consistency from batch to batch is of course a "must" requirement for an industrial coating. The "correct" color has to be ensured across different material types and gloss levels. Color tolerances are dependent on the application and the hue. Studies have proven that CIELab color space is not uniform.



The diagram shows the CIELab color space divided into a multiple number of ellipsoidal micro-spaces. All colors within one ellipse are perceived as the same color. It can clearly be noticed that the size and shape of the ellipses are different dependent on the hue. Additional, chromatic colors have larger ellipses than achromatic colors and a difference in hue is more obvious than a difference in chroma.

Therefore, tolerances need to be defined by color families and differently for the individual color components (ΔL*a*b*C*H*). Over the years, new color systems and equations for solid colors were developed based on visual studies: e.g. ΔECMC– ΔE94 – ΔE99 – ΔE2000. They correct for the non-uniformity of CIELab color space and improve visual correlation. Additionally, the major advantage of these equations is that one tolerance can be used for all colors.

spectro2guide includes all new equations and even simultaneously measures 60° gloss to ensure complete appearance harmony.

BYK-Gardner Solution

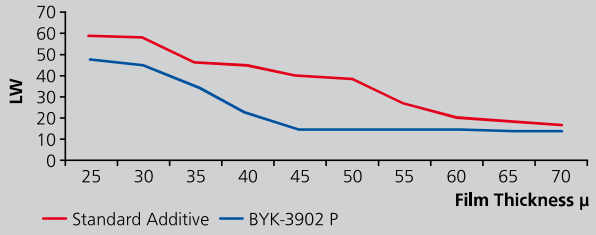
Color & Gloss
spectro2guide

Objective Visual Evaluation
byko-spectra *pro*

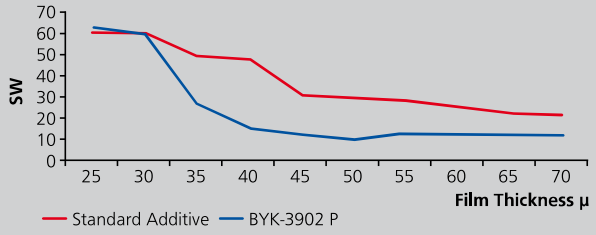
Optimization of flow & levelling properties
The appearance of a coated surface is not only influenced by color, but also by gloss and flow & levelling attributes. Eye catching finishes should look like a mirror – "high gloss and perfectly smooth". Powder coatings are highly durable and resistant finishes. As the name already implies they are in powder form and do not use a solvent. They are typically applied electrostatically before being cured under high temperatures.

Powder coatings typically have a wavy appearance. To achieve an attractive smooth look, levelling additives are used to reduce differences in surface tension, consequently, avoiding craters and improving orange peel. These additives are very often polyacrylate based and only needed in small amounts in the formulation. The graphs on the right show how the additive BYK-3902 P clearly decreases LW and SW values in a polyester/epoxy powder coating system. BYK-3902 P is particularly suitable for thin-layer powder coatings that are used to reduce costs or for applications like racing bikes were the final product is weight sensitive. Therefore, compared to a standard flow & levelling additive the improvement is especially noticeable at lower film thickness of 30 – 45 µm.

LW data dependent on film thickness



SW data dependent on film thickness



Measurements were taken with the wave-scan instrument which is rolled across the surface to scan the wavy light/dark pattern. The data of the optical profile is divided into different wavelength ranges (0.1 mm to 30 mm) by using mathematical filter functions. Commonly used are SW-data (0.3 – 1.2 mm) and LW-data (1.2 – 12mm) to describe flow levelling behavior. For small and curved parts the micro-wave-scan is beneficial.

BYK-Gardner Solution

Orange Peel & DOI
wave-scan

Measurement of Small Parts
micro-wave-scan